GOVERNMENT TOMORROW FORUM

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BOT ROBOTICS &
ICS SMART CITY LAB

GOVERNMENT TOMORROW FORUM HANDBOOK

ROBOTICS

An Official Government Tomorrow Forum Publication 2027

Sung Hoon Back, CEO of Sejong Smart City

«Our model combines private-sector creativity with public support»



KINDNESS TOWARDS NEW THINGS

Building new citizen culture around innovation and new processes integration into everyday life

THE AI CITY'S CONDUCTOR

Setting up new functions within city management to better integrate planning, AI implementation, and culture

ROBOTS AS PEOPLE INFRASTRUCTURE

Physical AI applications for better autonomy, independence, and capability of citizens

URBAN PLANNING AS INNOVATION TOOL

Creating predictable environments where robotics and intelligent systems can be tested, financed and deployed



GOVERNMENT TOMORROW FORUM

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GTF
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GTF Governance Lab Geneva

Changing the way governments work through science, insight, and deep discussions.

The first edition of the GTF Governance Lab Geneva united 12 experts from all across Europe and beyond to discuss how public services and policies can be evaluated — both at design and at running phases.

This discussion provided the GTF Governance Handbook to be presented end 2026, and the GTF Pathways, unique AI-powered tool that allows to use the GTF Pathways metric to better design and evaluate public services and reforms.

The second edition of the Lab will focus on Fighting Entrentched Bureaucracy. The Lab will discuss ways to change both the psychology of public servants and the actual processes within cultures that are particularly reluctant to minimize bureaucratic processes.

More information at governmenttomorrow.com/governance

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Foreword — GTF

By Philip Borg
Project Lead, GTF Robotics & Smart Cities Lab

Government Tomorrow Forum has one main mission: to become the world's premier platform for ideas about improving governments, ideas that are practical and effective. In a competitive landscape filled with scholars, politicians, private companies, think-tanks and engaged citizens all proposing new governance strategies, GTF stands out as a universal and genuinely inclusive platform.

Our Labs embody this inclusivity: they are spaces, rare among the world's hierarchies, where even students can debate their ideas on an equal footing with ministers, advisors to governments, and renowned engineers.

Our Robotics Lab was created because of a shift we could no longer treat as a subject for later. For a decade, the governance of technology has largely meant the governance of information: data, platforms, algorithms, models. That work is not finished, but something else has started: artificial intelligence has acquired a body. It moves through streets, enters buildings, shares pavements with children and wheelchairs, lifts things, delivers things, and occasionally fails in public.

When software fails, a service degrades. When an embodied system fails, it does so in physical space, in front of witnesses, under somebody's jurisdiction. Every question that digital governance could answer slowly : liability, standards, public acceptance, who is accountable at 3AM, physical AI is capable of asking urgently and locally.

We chose South Korea for the first edition because it is further along this road than almost anywhere else, and because Korean practitioners were willing to discuss what has not worked as openly as what has. The discussion in Busan produced something better than a list of best practices. It produced a sharper question, which closes this handbook's lab report and opens its research agenda.

This handbook opens with interviews with practitioners, presents a summary of the Lab meeting enriched with research from the GTF team, proposes a general framework, and closes with policy recommendations and pilot projects that can be implemented at any level of government, with particular attention to cities, whose flexibility is greater and whose distance to the average citizen is much shorter.

In partnership with governments, cities, universities and corporations worldwide, GTF is committed to extending its impact in the coming years. The Forum warmly welcomes feedback, ideas and insights on this report. If you are interested in participating in one of our Labs, please reach out via the contact form on governmenttomorrow.com.



The GTF Robotics Lab Research Questions

What the Lab worked on in 2026 — and what it will work on in the coming years.

Government Tomorrow Forum explores the influence of technology on societies since its founding in 2023. Our non-partisan research has already produced a number impactful policy concepts, pilot projects, and AI-powered products, such as the globally recognized Government Service Passport based on the GTF Pathways® methodology.

Our Robotics Lab continues this work, expanding our curiosity and our expert analysis to the research questions presented on the next pages.

Societal readiness for Physical AI

Examining how public trust in robotics forms, what shapes acceptance of machines in shared space, and how governments can communicate the benefits of physical AI through tangible improvements rather than technical ambition.

Institutional capability and systems integration

Investigating what skills, roles and organisational structures governments need in order to govern robotics, and why the people who can connect technology, planning, regulation and service delivery are so scarce.

Robot-ready urban and business design

Studying how cities should design neighbourhoods, streets, buildings and infrastructure (including private one) so that robotics, autonomous mobility and intelligent systems can be deployed safely, predictably and at acceptable cost.

Regulatory sandboxes and institutional learning

Assessing how temporary regulatory exemptions can be converted from one-off permissions into continuous, evidence-generating processes that improve permanent law.

From pilot projects to public services

Analysing the conditions under which robotics demonstrations become sustainable urban services: infrastructure, business models, operational data, procurement and public acceptance.

Private sector robotics

How robots can influence strategic and consumer-oriented businesses that impact the way we move, eat, and live.

Convergence — by 2030 already?

Looking at how robots, autonomous vehicles, digital twins and city operating systems may integrate, and what governance that integration will require.erating processes that improve permanent law.

The Lab Glossary

Terms and definitions used by this Handbook.

The importance for every public servant, policymaker and government sector leader to be on the same page regarding the most essential technological phenomena cannot be overestimated. It serves as a basis for mutual trust and is a prerequisite for the successful adoption of policies, processes and tools by the entirety of the workforce. In robotics this matters more than usual: the field's vocabulary is shared with science fiction, and a single imprecise word can move a policy discussion from logistics to anxiety in one sentence.

Physical AI

Artificial intelligence embodied in systems that sense, move and act in the physical world : robots, autonomous vehicles, drones, automated logistics and intelligent infrastructure. The defining difference from software AI is consequence: a physical AI system's errors occur in shared space, under a specific jurisdiction, and are witnessed by the public.

Autonomous Mobile Robot (AMR)

A robot that navigates an environment without fixed guidance such as rails or magnetic strips, using sensors and onboard decision-making. AMRs are the category most likely to appear in public space first, performing delivery, cleaning, patrol and inspection tasks.

Cobot

A robot designed to work alongside human beings rather than behind a safety barrier. Until recently most industrial safety law assumed separation; the shift to collaborative operation is one of the main regulatory frontiers in robotics.

Conductor

The integrating function a city needs: a person or office that does not need to play every instrument : robotics, planning, regulation, procurement, service delivery, but understands how they fit together and can make them act in time with one another.

Deployment

The sustained operation of a technology as a real service, with funding, maintenance, accountability and users who depend on it. Distinct from a demonstration, which shows that something can work once, under conditions chosen by the demonstrator.

Digital Twin

A continuously updated virtual model of a physical asset, building, district or city, fed by live data. In robotics, digital twins allow routes, failures and interactions to be simulated before deployment and monitored during it.

Embodied Intelligence

Intelligence that arises from interaction between a system and its physical environment. Progress in language models does not transfer automatically to embodied intelligence, where an unpredictable physical world remains considerably harder than text.

Human-Robot Interaction (HRI)

The study and design of how people and robots behave towards each other, including the unwritten rules of shared space: who yields, how intent is signalled, what distance feels acceptable.

Last Mile

The final segment of a journey or delivery, from a transport hub to a door. The most expensive, least automated and most socially sensi-

tive part of urban logistics, and therefore the part robotics addresses first.

Neighbourhood Scale

The spatial unit at which physical AI most directly affects daily life: a district of a few thousand residents, where mobility, logistics, care and everyday services intersect. Identified during the Lab as a more productive planning unit for robotics than the metropolis.

Physical AI Belt

Seoul's designation for a linked robotics and AI corridor connecting the Yangjae AI Tech City cluster with the Suseo robot cluster. A working example of robot-readiness written into metropolitan spatial planning rather than technology policy alone.

Regulatory Sandbox

A mechanism granting temporary, conditional exemption from specific rules so a new service can be tested in real conditions. Korea's industrial convergence sandbox is among the most active in the world. A sandbox becomes a learning institution only when the evidence it produces is systematically fed back into permanent regulation.

Robot Density

The number of operational robots per 10,000 employees, the standard International Federation of Robotics measure of automation intensity. Currently a manufacturing indicator; no equivalent measure yet exists for robots in public space, which is itself a governance gap.

Robot-Readiness

The degree to which a city's culture, institutions, physical fabric and regulation allow robotics to be deployed usefully and safely. The organising concept of this Handbook.

Safety Case

A structured, auditable argument that a system is acceptably safe in a defined context, with the supporting evidence stated. Standard practice in aviation and nuclear power; increasingly proposed for autonomous systems in cities.

Teleoperation

Remote human control or supervision of a robot. Most 'autonomous' urban robots rely on human operators at some ratio; the ratio, the operators' training and their response times are legitimate subjects of public regulation.

Urban Operating System

The combined software, data and control layer through which a city manages traffic signals, utilities, sensors, emergency response and, increasingly, autonomous systems. The point at which individual robots stop being devices and start being infrastructure.



Physical AI Is A Governance Quesiton

The GTF Robotics Lab did not choose South Korea as its homebase by accident: the country is one of the global leaders in practical, society-impacting innovation. And robotics is a huge part of it.

The statistics panel

South Korea has 1,220 industrial robots per 10,000 manufacturing employees. The world average is 132.

No country is close. Singapore has 818. Germany has 449. Japan has 446. The United States has 307.

And yet, until November 2023, a delivery robot could not legally cross a Korean pavement. Under the Road Traffic Act, mobile robots were classified as automobiles. It took an amendment to the Intelligent Robot Development and Distribution Promotion Act to let them onto sidewalks, four years after the first pilots began.

An outdoor mobile robot in Korea once had to satisfy 16 assessment criteria to be certified. Today it has to satisfy eight. The operational safety certification covers specifications and operating speed, exterior, dynamic characteristics, surrounding recognition, emergency stop, waterproofing, crosswalk passage and control device, and the processing period has fallen from 60 days to 30. Replacing a part can still require recertification, and ISO certificates are not recognised, so international products start again from zero.

Sources: International Federation of Robotics, World Robotics 2025 (2024 data); Seoul Economic Daily; Korea Institute for Robot Industry Advancement, Outdoor Mobile Robot Operational Safety Certification.

A country can lead the world in building and operating robots and still be unable to put one on a street corner. The constraint is not engineering, but the accumulated structure of rules, institutions, professional boundaries and public expectations that every city has built for a world without machines in it.

In Korea, technological change has been repeatedly associated with economic advancement and visible improvement in everyday life

This is the first finding of the GTF Robotics & Smart City Lab, and it inverts the usual framing. The question before governments is not when the technology will be ready. In several domains it already is. The question is what cities, institutions and citizens must become before that readiness is worth anything.

Consider how the Korean obstacle actually worked. Robots were not banned because anyone decided robots were dangerous. They were classified as automobiles under a statute written long before autonomous machines existed, and the classification did the rest. No deliberation, no risk assessment, no public debate, simply a definition, applied consistently, producing an outcome nobody intended. Governance failures in physical AI rarely look like bad decisions. They look like old categories operating correctly on new objects.

The same pattern recurs internationally in a different register. In December 2025, a substation fire cut power to roughly a third of San Francisco. Robotaxis, correctly programmed to treat dark signals as four-way stops, stopped. One operator later disclosed around 1,600 vehicle stoppages and 64 vehicles requiring manual retrieval; a 911 dispatcher reportedly waited on hold for nearly an hour. No soft-



ware had failed.(Moe & Andrews, 2026). No traffic law had been broken. What failed was the absence of an institution responsible for a fleet of autonomous vehicles as a piece of urban infrastructure during an emergency.

We underscore the importance of this parallel because it shows the same gap from the other direction. Korea's difficulty is regulation written too tightly for a technology that did not exist. San Francisco's was the reverse: no regulation at all for a technology that now exists. Both are governance questions, and neither is a robotics question.

Public reaction follows the same logic. In Chicago, a petition against sidewalk delivery robots gathered more than 4,300 signatures by April 2026, with over a quarter of signers filing incident reports: collisions, injuries, robots blocking wheelchairs and strollers. Toronto, Knoxville and Jackson have banned delivery robots from sidewalks or bike lanes outright. (Moe & Andrews, 2026). These are not rejections of robotics in the abstract. They are responses to machines deployed into public space without anyone having decided who yields, who is liable, who answers the phone, and who asked the neighbourhood.

This is why one of the most useful phrases produced in Busan came from a discussion about culture rather than law. Participants contrasted South Korea's comparatively high receptiveness to new technology with greater resistance in parts of Europe, and traced it to recent history: in Korea, technological change has been repeatedly associated with economic advancement and visible improvement in everyday life. Koreans, as one participant put it, are accustomed to change and tend to perceive it as natural. The conversation named this **kindness towards new things**.

Kindness towards new things is not a national character trait. It is an earned expectation, built by a long run of technologies that made life demonstrably better. It can be spent. Every robot deployed carelessly into a neighbourhood draws down a balance that took decades to accumulate, and the Chicago petitions show how quickly the balance can go negative.

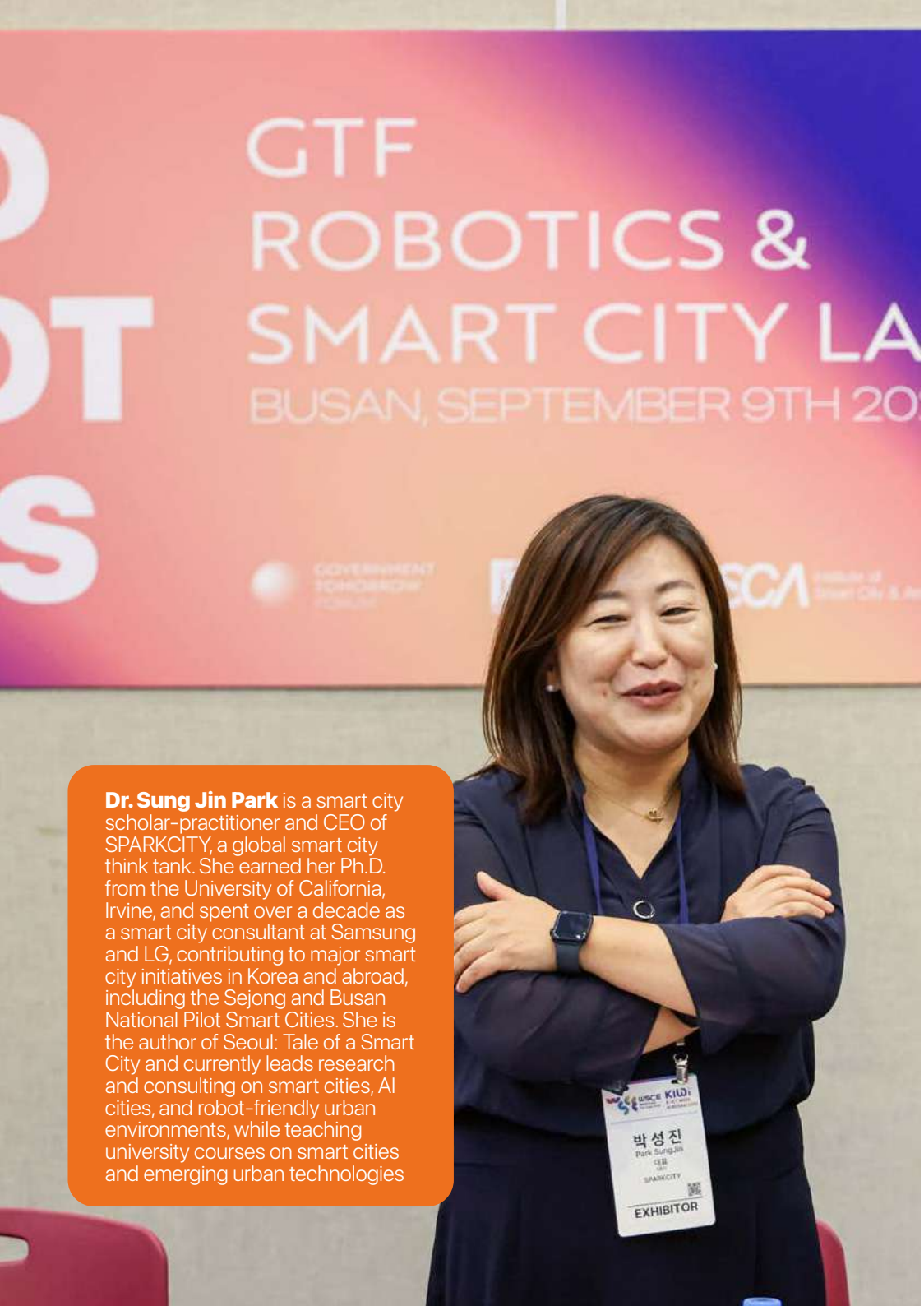
It follows that the governance of physical AI is not primarily a safety-engineering problem, though safety engineering is necessary. It is the problem of designing institutions capable of two things at once: letting useful machines into shared space quickly enough to matter, and retaining public confidence while they are there. Those two objectives are in tension, and that tension will not be resolved by choosing one.

The central task for public policy, as the Lab concluded, is therefore not to choose innovation over responsibility, or responsibility over innovation. It is rather to create institutions capable of reconciling both.

One of the main objectives of this Handbook is to show that robotics cannot be left to ministries of industry and departments of ICT. Physical AI touches mobility, housing, planning, building codes, public safety, elderly care, labour, procurement and emergency response. Where artificial intelligence proved to be a cultural phenomenon rather than a technological one, **as indicated in our very first handbook, "Artificial Intelligence: Government's Handbook", Physical AI proves to be a spatial and institutional one**. It lands in a particular street, under a particular authority, and it is governed well or badly by people who may never have met.

"Private Companies Should Take The Lead"

An interview with Sung Jin Park, CEO of SPARKCITY, exploring what Korea can teach the rest of the world on robotics and its integration in our everyday lives.



Dr. Sung Jin Park is a smart city scholar-practitioner and CEO of SPARKCITY, a global smart city think tank. She earned her Ph.D. from the University of California, Irvine, and spent over a decade as a smart city consultant at Samsung and LG, contributing to major smart city initiatives in Korea and abroad, including the Sejong and Busan National Pilot Smart Cities. She is the author of Seoul: Tale of a Smart City and currently leads research and consulting on smart cities, AI cities, and robot-friendly urban environments, while teaching university courses on smart cities and emerging urban technologies

In the interview, Sung Jin Park sets out four conditions that have sustained South Korea's smart city development: a dedicated legal framework since 2008, when the U-City Act was introduced and later revised into the Smart City Act; continuous competitive government funding since the Smart City Challenge of 2019; integrated city operation centres already running services such as CCTV monitoring, public safety and traffic management; and city-owned communication networks that give municipalities their own control over connectivity.

She is careful not to offer these as a model to copy. Her argument is that smart city development is not principally about technology or individual projects, but about creating the conditions under which cities can keep innovating, learning and improving over time.

On why some societies welcome new technology while others resist it, Park resists the cultural explanation. People welcome technology when they see opportunity in it, and become resistant when the benefits are unclear or when they do not trust how it is being introduced. She points to national industrial strategy as a driver of public enthusiasm in Korea, and to Amartya Sen's Development as Freedom as a way of understanding the appetite for digital technology across emerging economies. Adoption, in her account, comes down to opportunity, trust and people's sense of control.

On the division of labour between state and market, Park argues that smart city projects should be understood as investment projects rather than conventional profit-making businesses, and that both sides need to share that understanding before entering a strategic partnership. Government should create opportunities, provide funding and maintain a flexible regulatory environment, for which she cites Korea's Smart City Regulatory Sandbox. The private sector should own business models, commercialisation and long-term viability, and think beyond the pilot: who pays, how it operates sustainably, and whether it can expand to other cities.

GTF: Why is South Korea leading in the smart city field, and which of its methods are transferable?

Sung Jin Park: There are many reasons why South Korea has been able to develop and sustain its smart city initiatives. But based on my experience, I would highlight four key conditions that have supported Korea's smart city development over the years.

First, a strong legal foundation. Korea has had a dedicated legal framework for smart cities since 2008, originally introduced as the U-City Act and later revised into the Smart City Act. Unlike traditional urban planning laws, it focuses specifically on smart city development and industry growth. It also requires a national smart city plan every five years, helping maintain policy continuity and providing a foundation for central government support to local governments.

Second, continuous government funding. Since the Smart City Challenge was introduced in 2019, Korea has continued to offer competitive smart city funding programs on a regular basis, although their names and formats have evolved. Major programs have offered substantial funding, often over two to three years. These funding opportunities have become key drivers for local governments and smart city companies to work together, test new ideas, and turn them into real projects.

Third, integrated city operation centers. Many Korean cities already have operation centers that manage services such as CCTV monitoring, public safety, and traffic management. These centers provide an existing operational foundation, allowing cities to introduce new smart solutions, upgrade existing services, and build on successful projects rather than starting from scratch.

"The key lesson is that smart city development is not just about technology or individual projects but about creating the right conditions for cities to keep innovating, learning, and improving over time."

Fourth, city-owned communication networks. Instead of relying entirely on leased networks from telecom companies, many cities have invested in their own dedicated high-speed networks. We saw dedicated communication infrastructure in early smart city projects like Songdo, and more local governments have since developed their own networks. This gives cities greater control over connectivity and more flexibility in delivering smart city services.

Of course, these four conditions don't explain everything about Korea's experience. And I'm not suggesting that other countries should simply copy the Korean model.

But the key lesson is that smart city development is not just about technology or individual projects. It's about creating the right conditions for cities to keep innovating, learning, and improving over time.



— Why do some societies welcome new technology while others resist it?

— I think it's tempting to explain people's attitudes toward new technology as a cultural difference, but the reality is more complicated. People tend to welcome technology when they see opportunities in it. They become more resistant when the benefits are unclear or when they don't trust how the technology is being introduced.

Look at the United States, China, and South Korea. All three have strong technology industries and see innovation as a driver of economic growth and national competitiveness.

"The government's role is to create the conditions for innovation, while the private sector's role is to turn innovation into sustainable businesses."

In Korea, for example, we've been living with this mindset since the early 2000s. Companies like Samsung and LG have driven digital innovation, and now Hyundai is expanding into robotics and Physical AI. The government that took office in 2025 also aims to make Korea one of the world's top three AI powers.

So, adopting new technology is not just about using new products. It also creates opportunities for domestic companies to test, improve, and commercialize their technologies before competing globally. In this way, national industrial strategies can help encourage public enthusiasm for innovation.

I also see strong interest in technology across many emerging economies, but for a slightly different reason: the opportunity to improve people's lives.

This reminds me of Amartya Sen's Development as Freedom, where he emphasizes expanding people's capabilities and opportunities. I think digital technology can play a similar role by giving people better access to education, information, and economic opportunities.

Generative AI is a good example. Today, even individuals or small teams can accomplish tasks that once required much larger organizations. For people in developing countries, this could open up entirely new possibilities.

Of course, being open to technology doesn't mean accepting everything. Concerns about job displacement, privacy, surveillance, and inequality are real. And when technology is introduced without public involvement or clear benefits, resistance is understandable.

So, for me, technology adoption ultimately comes down to opportunity, trust, and people's sense of control. When people believe technology can expand their opportunities and improve their lives, they're more likely to embrace it. But when they feel it's being imposed on them, they're more likely to resist it.

— What should the state do, and what should it leave to the market, when launching smart city projects?

— To answer this question, I think we first need to understand the nature of smart city development.

Smart cities are not just about applying existing technologies to urban problems. They are also about bringing future technologies into today's cities, testing them in real-world environments, and preparing them for commercialization. In other words, smart cities can help create new markets and future industries.

This means smart city projects often involve considerable uncertainty and risk. So, especially in the early stages, we need to see them as investment projects rather than conventional profit-making businesses.

I think both the public and private sectors need to share this understanding before entering into a strategic partnership.

— So, in the end, what should the government do?

— I see two major roles. First, make sure there are opportunities and provide funding to help emerging smart city markets develop. Without public support, many innovative technologies may never have the opportunity to be tested in real urban environments.

Second, create a flexible regulatory environment. Smart city projects often face regulations that were designed before these technologies even existed.

South Korea has a Smart City Regulatory Sandbox that allows companies to test innovative technologies under special regulatory conditions.

For example, Korea introduced safety certification for outdoor delivery robots in 2023, and in July 2026, it changed regulations to allow robotic parking systems in apartment complexes. These are good examples of how regulatory changes can open up new markets.

— Then, what should be left to the private sector?

— I believe companies should take the lead in developing viable business models and finding ways to commercialize and scale their solutions.

Public agencies are not necessarily experts in emerging technology markets or business profitability. These are areas where private companies should bring their expertise and take responsibility for long-term business viability.

Companies need to think beyond the pilot project: Who will pay for the service? How will it operate sustainably? And can it expand to other cities?

So, my view is that the government's role is to create the conditions for innovation, while the private sector's role is to turn innovation into sustainable businesses.

And most importantly, both sides need to understand the investment nature of smart city projects and share a long-term commitment to making them work.







Sung Hoon "Billy" Back is the CEO & President of Sejong Smart City, which has full responsibility for building the first smart city from a green field in Korea. Before he joined Sejong Smart City, he was the Head of LG CNS's Transportation Business, overseeing the company's entire transportation and mobility business portfolio and smart city projects domestically in Korea and worldwide.

"We Must Design Attractive Services"

An interview with Sung Hoon Back, CEO of Sejong Smart City, uncovering the South Korea's most ambitious smart city project's philosophy.

Sung Hoon Back is building the thing this Handbook keeps describing in the abstract: a smart city in a green field, for about 2,200 residents, with incredible ambition. His account of what moves a project of that size is not sentimental: the biggest roadblock is regulation, and the only reason Sejong can proceed at the required speed is that the government designated it a pilot and committed to lifting obstacles through a regulatory sandbox. Without that mechanism, he says, the project could not move.

What drives completion is less technical than it sounds. Back names the passion and enthusiasm of every stakeholder, close working relationships, and early government subsidy, which he likens to the fuel needed to start a large locomotive moving. He adds a quality rarely named in policy documents: a 'bulldozer mindset' among officials willing to push a project forward and remove obstacles. Without that kind of leadership, he says, it will not work.

On value to residents he is equally direct. The technology can give people more free time, spare them carrying heavy items from the car park, let them harvest produce from a vertical smart farm and cut their utility costs. But some residents will not use it, and cannot be made to. Because the services arrive as part of a utility fee, Sejong has to offer them as optional rather than mandatory, which creates an immediate problem of profitability. Designing services attractive enough that residents choose to pay for them is, in his words, one of his major responsibilities.

The financing model is a long-term concession: roughly five years of construction, then ten years of service operation, with a decision at the fifteen-year point on whether to continue. He draws the comparison with T-money, whose initial concession ran about ten years and which has now operated for more than thirty, on the grounds that once a private operator has built specialised knowledge and systems, a government cannot easily take them over. Export comes later. Vietnam, the Middle East and the wider Arab world are the priorities, and Europe is the hardest, because its regulatory environment is heavier than Korea's.

GTF: Which factors drive smart city projects to completion, and which ones can derail them?

Sung Hoon Back: There are many technologies available: autonomous vehicles, demand-response services, smart farms, smart homes and data-driven personalised services for individuals. People talk about these services, but Sejong Smart City is proceeding in a real environment. We are going to apply the technologies in a residential area for approximately 2,200 people, with groundbreaking planned for November.

The biggest roadblock is regulation. Under very strict regulations in Korea, it is difficult to proceed at the required speed. The government therefore designated this as a pilot and demonstration project. Our consortium was selected, and the government committed to lifting roadblocks through a regulatory sandbox. Without that mechanism, we could not proceed at the proper speed.

— What factors promote the successful completion of a smart city project?

— The passion and enthusiasm of every party and stakeholder are key. The stakeholders have to work in a very close relationship; otherwise, we cannot make progress. Government support is also necessary. This project received some government subsidy to help it start. Moving a large locomotive requires fuel at the beginning, and that is the role the government is playing for us.

The determination of government officials is equally important. I call it a 'bulldozer mindset': officials must be willing to push the project forward and remove obstacles. Without that kind of leadership, it will not work.

"When we sell homes in the smart-city complex, residents sign the relevant documentation, but we cannot force them to use the technology"

— Why is South Korea leading in the smart city field, and which of its methods are transferable internationally?

— Koreans are very technology-oriented and generally do not mind using new technologies. In Sejong, the average age of the population is under 40, so the residents are relatively young and comfortable with adoption.

Korea also has the ppalli-ppalli - 'quickly, quickly' - spirit, which has helped the field grow. The previous government declared smart cities to be a national growth engine and supported the development of smart-city technologies. Korea also enacted a Smart City Law, which has helped projects like ours to proceed. More broadly, Korean culture is often receptive to new technology and actively looks for it.

— That reflects something we discussed during the Lab. In many Western countries, people can be more resistant to technological adoption.

— Adoption is often easier here. Western societies are also very concerned about data privacy. Privacy matters in Korea too, but we have strong data-protection and security technologies, and people generally believe that their data will be protected.

— That may go hand in hand with institutional trust. Koreans may place more trust in government institutions and technology than Europeans or Americans do.

— Yes. We generally trust government technology, and that is one factor supporting adoption.

— Where does a smart city deliver real value to residents, and where does it meet indifference or resistance?

— The technology can give residents more free time. For example, they may no longer need to carry heavy items from the parking area to their homes. They can harvest lettuce, cabbage and other produce from a local vertical smart farm. They can also save energy through smart technology and reduce their utility costs. These are practical advantages for people living in a smart city.

At the same time, some residents resist new technology. A person may say, 'I never order on Coupang or use an app. I still use a 2G phone.' Not everyone wants to use the available services.

When we sell homes in the smart-city complex, residents sign the relevant documentation, but we cannot force them to use the technology. Some may refuse because the service becomes part of the utility fee. We therefore have to begin with smart-city services as an optional offering rather than making them mandatory.

That creates an initial challenge for profitability. We have to design services that are attractive enough for residents to pay for them. Willingness to pay is crucial, particularly if the model depends on subscriptions or recurring revenue. Creating that value proposition is one of my major responsibilities.

— In your writing, you mention Southeast Asia and the Middle East as priorities for future expansion. How does the Sejong model work, and how might it be exported?

— Our first goal is to make the project successful in Sejong and then export the same model abroad. It is a form of public-private partnership. We received some government subsidy, but a major share of the financing comes from the profitability of the land development.

The model is based on a long-term concession. There is a construction period of approximately five years, followed by another ten years of service operation. After the initial 15-year period, the government and the operator can sit together and decide whether to continue for another ten years.

T-money provides a useful comparison from my own experience. I believe its initial concession was around ten years, but it has now been operating for more than 30 years. Once a private operator has developed specialised knowledge and systems, it is not always easy for the government simply to take them over.

The model therefore combines private-sector creativity with public support. Our shareholders invested because they want to operate the city and deploy their technologies. If the project performs well, the government has a reason to renew the concession.

— What factors drive your market selection for expansion, and what are the biggest barriers to making that expansion work?

— We have not yet pursued international expansion intentionally. Organisations from Vietnam, Thailand and the Philippines have approached us because they want to share ideas and learn from the project. However, I do not intend to expand this year or next year. We need to make the Sejong project successful first.

Once the project is established - perhaps in around two years - we can begin taking the model abroad. Vietnam is one of the highest priorities, together with the Middle East and the wider Arab world. Southeast Asia and the Middle East appear to offer the strongest immediate fit. Europe would be more difficult because the regulatory environment is even heavier than in Korea.

Other potential markets include parts of Latin America, South Africa, New Zealand, Australia and the United States. T-Money has already exported systems to New Zealand. New Zealand is relatively small, has the resources to invest and is willing to import technology.





lab meeting notes

The GTF Robotics Lab Meeting Notes

The Summary of the hours-long in-depth discussion in Busan, on September 6th 2026.

The World Smart City Expo in Busan hosted the first meeting of the GTF Robotics & Smart City Lab on 9 September 2026. The discussion created the base for the policy recommendations and pilot projects in this Handbook, and surfaced several robotics-related challenges that rarely reach policy documents. **Participants included**:

Igor Lys
President, Government Tomorrow Forum

Sungbin Yim
Vice Chairman for Global Cooperation of Institute of Smart City and Architectur, CEO & President of Favors People

Sung Jin Park
CEO, SPARKCITY

Sung Hoon 'Billy' Back
CEO, Sejong Smart City

Kibong Lee
Director General for Urban Policy Ministry of Land, Infrastructure, and Transport

Donyun Kim
President, Institute for Smart City and Architecture

Seongjin Park
Founder and CEO, Human Robotics Inc.

Philip Borg
GTF Fellow, Project lead of the Robotics Lab

Junghoon Hwang
Director and Principal Researcher, Intelligent Robotics Research Center, Korea Electronics Technology Institute (KETI)

Dong-seok Song
CEO, NOVATEK

Inhee Kim
Visiting Research Fellow, Urban Planning and Design Research Division

Jack Minty
Counsellor for Digital Trade and Technology, UK Embassy in Seoul

Igor Lys, the President of GTF, opened meeting opened with two simple questions that appeared much simpler than they really were: what does an intelligent city mean across different cultures, and what might robotics and physical AI look like in 2027 and 2030? The discussion shortly demonstrated that neither question can be answered through technology alone.

Part 1: Culture, Acceptance and the Purpose of Robotics

Culture and technological change. Participants contrasted South Korea's relatively high receptiveness to new technology with greater resistance in parts of Europe. Korea's recent development history was offered as one explanation: technological change has been repeatedly associated with economic advancement and improvement in everyday life. Koreans are accustomed to change and tend to perceive it as natural. The conversation produced a useful expression for the phenomenon : kindness towards new things.

Trust in novelty itself. This raised a broader governance question. Public acceptance of robotics may depend not only on whether a particular technology is safe or useful, but on whether citizens trust technological novelty as such. Acceptance is therefore partly inherited and partly spent.

Communicating benefit, not capability. It was highlighted that AI and technology need to be explained through tangible improvements in people's lives : health, income, environment and convenience, rather than primarily through technical language or abstract technological ambition.

Resisting the replacement narrative. Participants repeatedly rejected the simplistic framing of robots replacing human beings. Physical AI was discussed instead as a means of expanding human capability and removing unwanted tasks.

Robots as infrastructure for people. This was clearest in the discussion of elderly and disabled citizens, where robots could become shared neighbourhood infrastructure enabling people to stand, move, work and participate more fully in society. As one participant summarised the distinction, large autonomous systems such as buses constitute infrastructure for the city, while another category of machines can become "infrastructure for human being, individual human being."



The neighbourhood as *the* unit. Rather than seeing the entire metropolis as the sole smart-city unit, several interventions suggested that smaller neighbourhood units could be more responsive, more human-centred and better suited to deploying shared robotics, mobility services and AI-supported public services.

The main takeaways from this part of the discussion formed the base for the policy recommendations on robot-ready neighbourhoods and for the pilot projects on assistive robotics and public acceptance.

Part 2: Institutions, Planning and Regulation

Two professions that do not meet. The Korean experience revealed an institutional problem: the worlds of technology and urban planning frequently remain separate. Smart-city officials may come from ICT, telecommunications and electrical-engineering backgrounds, while urban planning continues to be organised around architecture, civil engineering and traditional planning. Participants described the difficulty of finding individuals capable of understanding the whole system.

Capacity building ranks with



legislation. Capacity building was identified as just as important as legislation, a point that applies well beyond Korea.

The conductor. The metaphor proposed during the discussion was that governments increasingly need a conductor: a person who does not need to play every instrument but understands how the technological, spatial, commercial and human components fit together.

Planning as an enabler of innovation. Urban planning emerged not merely as a constraint on technological development but as a potential enabler. Seoul's experience with innovation districts and the Physical AI Belt illustrated how a clear metropolitan plan, followed by location-specific strategies and structured negotiation with investors and public authorities, can make technological projects more predictable and executable. One participant summarised the lesson: "Technology innovation can be realised, but if you support it by urban planning, then the process becomes very predictable and fast and flexible."

Sandboxes and their limits. South Korea's Smart City Act and regulatory sandbox mechanisms provide ways of temporarily overcoming barriers to new services. Participants noted, however, that conflicts can remain between smart-city legislation, planning rules, building codes and other regulatory systems. The challenge is not simply to deregulate but to create institutions capable of experimenting, learning and adapting regulation as technologies encounter the complexity of real cities.

Governments need a conductor: a person who does not need to play every instrument but understands how the technological, spatial, commercial and human components fit together.

From concept to deployment. Sejong Smart City offered a concrete example of the transition. The project combines public authority and private investment and is designed around integrated services including mobility, autonomous transport, logistics, healthcare and urban platforms. Participants explicitly described smart cities as a potential Korean growth and export model.

This part of the discussion made possible the policy recommendations on the Physical AI Conductor and on turning sandboxes into learning institutions.

Part 3: Imagining 2027 and 2030

Deliberately different forecasts. The future-gazing section produced divergence rather than consensus, which the Lab treated as a finding rather than a failure.

Mobility before humanoids. Some participants expected autonomous mobility to have a much more immediate effect than general-purpose humanoid robots. Others emphasised advances in dexterity and the ability of machines to reproduce human functions rather than human appearance.

A caution against extrapolation. A recurring warning was that progress in language-model-based AI should not automatically be extrapolated to embodied intelligence, where interaction with an unpredictable physical environment remains considerably more difficult.

2027: bounded tasks. In the nearer term, participants expect more robots to leave controlled pilots and perform bounded tasks such as delivery, logistics, cleaning and security in campuses, hospitals, residential complexes and commercial areas.

2030: integration, not quantity. By 2030 the bigger change may not simply be more robots, but the integration of robots with autonomous vehicles, digital twins, infrastructure and city control systems.

The demonstration trap. As one participant cautioned: "A successful demonstration does not automatically mean successful real-world deployment." The transition needs to be evaluated through sustainability, public acceptance, infrastructure, operational performance and regulatory readiness, not demonstration videos alone.

Two logics in friction. The discussion repeatedly returned to leadership and institutional resistance. Technology providers naturally seek implementation and speed; governments carry broader responsibilities for public safety, social stability and citizens' rights. The coming years are likely to produce increasing friction between these two logics.

The central task for public policy is not to choose innovation over responsibility, or responsibility over innovation. It is to create institutions capable of reconciling both.



lab recommendations

Lab Key Takeaways

What we learned from the Busan discussion — and what our participants brought home as ideas and insights.

Each GTF Lab meeting serves as a basis for further research. Face-to-face discussions on complex subjects allow us to unearth less obvious questions and to detect trends and coherences between different experts' positions. GTF Labs choose their experts carefully, to balance political experience at national and municipal levels, academia, business and service users.

The Busan meeting allowed us to take away the following points, which became the basis of the research resulting in this Handbook.

1

Kindness Towards New Things

Technological adoption depends not only on regulation and infrastructure, but on whether societies are culturally prepared to trust novelty.

2

The Neighbourhood Is the Natural Scale of Physical AI

The most meaningful applications of robotics may emerge not at city scale, but in the last mile of everyday human life.

3

Robots Should Become Infrastructure for People

The strongest use cases are not those that imitate humans, but those that expand human capability, autonomy and time.

4

The AI City Needs a Conductor

Urban planners, engineers, technologists and policymakers increasingly need an integrating function capable of connecting separate institutional worlds.

5

Urban Planning Can Accelerate Innovation

Planning is not only a constraint: designed well, it can make technological deployment faster, more predictable and more investable.

6

A Successful Demo Is Not a Successful Deployment

The real test of robotics begins when technology enters complex, regulated, imperfect everyday environments.

7

From Individual Robots to Urban Systems

By 2030, the major shift may be integration between robots, autonomous vehicles, infrastructure, digital twins and city operating systems.

8

Regulation Must Learn

Sandbox mechanisms can turn regulation from a static barrier into an adaptive process shaped by evidence from real deployment.

9

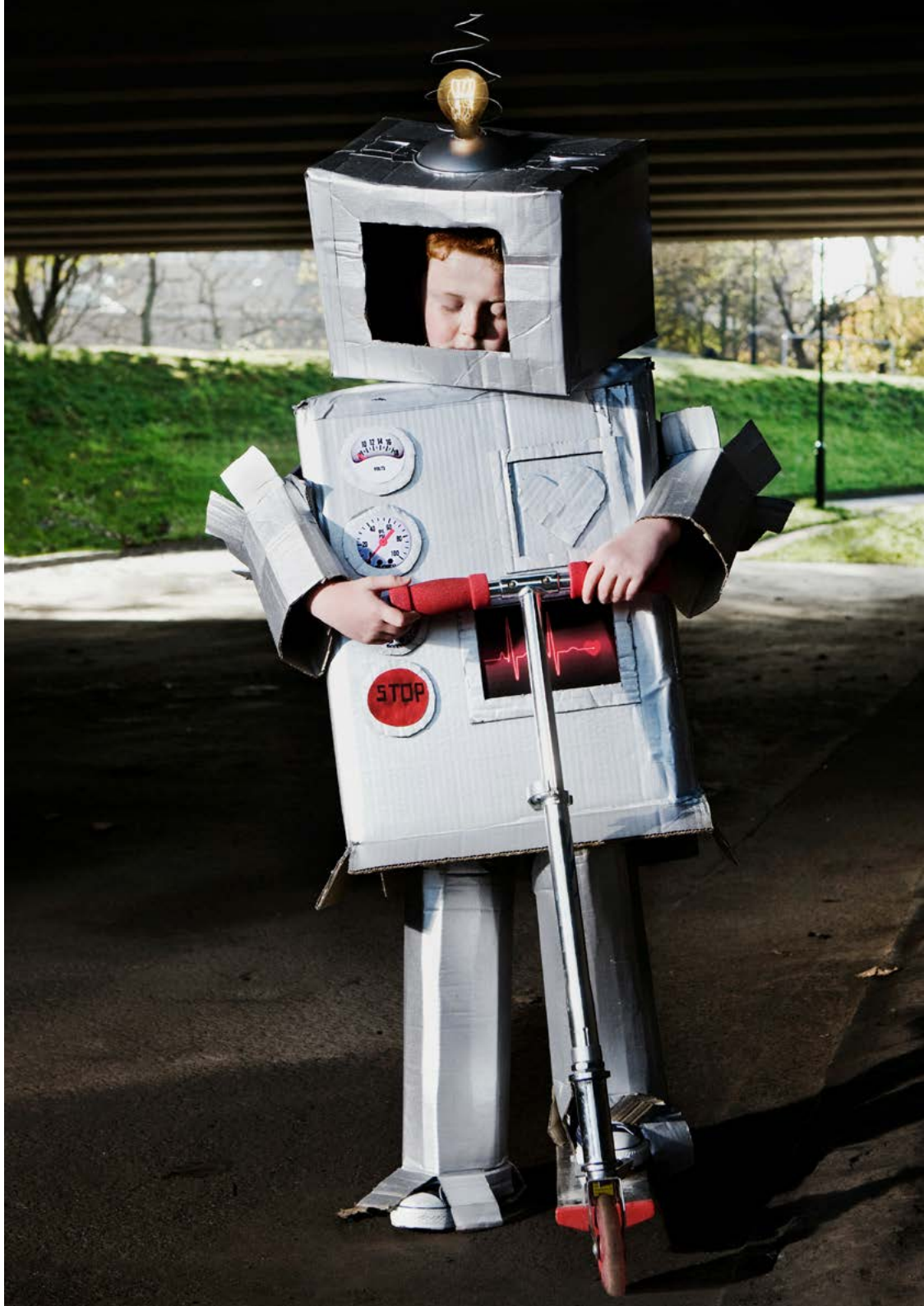
Political Leadership Is Part of the Technology Stack

Large-scale urban innovation still depends on leaders capable of coordinating institutions, managing resistance and sustaining momentum.

10

Physical AI Is a Governance Question

The defining challenge is no longer simply what robots can do, but how societies choose to integrate them.



The 4R Robotic Readiness Framework

Building on the Lab discussion, GTF proposes a specific approach to preparing governments of all levels for physical AI, the 4R Framework.

The approach is based on what the Lab identified as the commonplace weakness of most governments facing robotics: the assumption that robot-readiness is a technology-procurement problem, to be solved by buying robots, and therefore owned by whichever department owns the technology.

It is not. A robot that cannot be insured, parked, charged, repaired, reported, explained to a neighbourhood or accounted for after an accident is not a deployed robot, whatever its specification. The Four Readinesses : Cultural, Institutional, Spatial and Regulatory, name the four distinct kinds of preparation a city needs, each owned by different people, each failing independently.

The framework has one structural property worth stating plainly: the readinesses do not substitute for one another. A city with excellent regulation and no public consent will stall. A city with enthusiastic citizens and no spatial preparation will produce demonstrations and nothing else. Korea's experience is the clearest available evidence: world-leading industrial and cultural readiness, held up for years by regulatory and institutional gaps that had nothing to do with robots.

As a general methodology, the 4R (or the Four Readinesses) can inspire practical solutions at all levels, from municipal to national.

The following pages explore the 4R framework in details.

Cultural Readiness	**Institutional** Readiness	**Spatial** Readiness	**Regulatory** Readiness
Will people accept it?	Can anyone run it?	Will the city fit it?	Can the rules adapt?
Acceptance is earned by visible benefit, not explained by technical arguments	Robotics crosses every departmental boundary and belongs to none	Robot-readiness is built into streets, buildings and plans, or retrofitted expensively later	Static permission is not enough; regulation must generate and absorb evidence
Trust in novelty is inherited, spendable, and local	*The integrating function, "the conductor" is scarce and must be deliberately created*	*The neighbourhood, not the metropolis, is the working unit*	*Sandboxes without feedback loops are one-off favours, not institutions*

The 4R Framework: Cultural Readiness

Public acceptance of robotics is not a communications task to be run after deployment. It is a precondition, and it behaves like a budget.

The Lab's phrase, kindness towards new things, captures something governments routinely misread. Receptiveness to novelty is not a fixed national trait. It is an accumulated expectation, built by a long sequence of technologies that visibly improves daily life, and it can be drawn down by a short sequence that does not.

This has three consequences for policy. First, benefits must be communicated in the terms citizens actually use: health, income, environment, convenience and time. Technical language and national-competitiveness framing do not transfer. A delivery robot justified by its contribution to the robotics industry is a robot nobody asked for.

Second, acceptance is unevenly distributed and locally held. A city average conceals the neighbourhood where the robots actually are. Pedestrians with mobility aids, parents with pushchairs, and people who work on the street experience shared-space robotics very differently from the general population, and they are precisely the groups who appear in incident reports.

Third, the groups most affected should encounter the technology before it is permanent. Exposure under conditions where people can ask questions, object, and be answered builds a different kind of acceptance from exposure by fait accompli.

Governments should measure this. Acceptance is treated as unmeasurable largely because nobody has been asked to measure it; neighbourhood-level surveys before, during and after deployment are neither difficult nor expensive.



Research note by
Seongjin Park, doctoral researcher

In transportation terms, the acceptance of new mobility technologies can also be understood through the concept of generalized cost. Generalized cost includes not only travel time and monetary cost, but also physical effort, waiting and transfer inconvenience, safety-related uncertainty, and accessibility constraints. As these burdens are reduced, and as convenience and reliability improve, the value of new technology becomes more visible and meaningful to users.

The relatively rapid adoption of robotics and new mobility technologies in South Korea should not necessarily be explained simply by saying that Korean society prefers new technologies. Rather, it is also important to consider that people have repeatedly been given opportunities to encounter and experience new technologies in real-life environments. Delivery robots, autonomous shuttles and robotaxis, and smart-city demonstrations are increasingly designed to connect these technologies with actual everyday services.

Societal readiness for Physical AI should not be understood solely as a pre-existing cultural characteristic. It can also be developed and strengthened over time as new technologies are repeatedly associated with tangible improvements in everyday life.

The 4R Framework: Institutional Readiness

Robotics, alongside AI, is a rare technology of our generation that belongs to no single department and requires all of them.

The Lab described the problem precisely. Smart City officials come from ICT, telecommunications and electrical engineering. Urban planners come from architecture, civil engineering and planning. Each profession is competent. Neither is trained to see the whole system, and almost no one is employed to.

A single pavement delivery robot touches transport, planning, public space, licensing, data protection, accessibility, emergency services, procurement and, if it fails publicly, communications. In most cities each of these sits with a different official, and none of them owns the outcome.

The Lab's answer was the conductor: someone who does not need to play every instrument but understands how the technological, spatial, commercial and human components fit together, and has standing to make them act in time. This is a real job, not a coordination committee, and it is the subject of the first policy recommendation in this Handbook.

Capacity building therefore ranks with legislation. A perfectly drafted robotics statute administered by officials who cannot evaluate a safety case will not produce safe deployment, and a city that cannot read an operator's teleoperation ratio cannot regulate it.



Research note by
Seongjin Park, doctoral researcher

The conductor of an AI city should not simply be an expert in robotics or AI itself. Rather, it should be a person or organisation capable of understanding transportation systems, urban planning, robotics, infrastructure, operations, legal and regulatory frameworks, and human behaviour as parts of a single interconnected system.

Generative and multimodal AI are advancing rapidly. However, the outputs produced by AI cannot always be assumed to accurately represent real-world urban conditions. One of the most important competencies of the conductor is therefore the ability not to accept AI-generated outputs at face value, but to assess their real-world validity by comparing them with actual urban conditions and observed data. Even if an algorithm identifies a route as optimal for a robot, that route cannot necessarily be considered optimal from an urban-system perspective if it compromises pedestrian safety or accessibility.

Senior policymakers do not need to understand robot sensors, algorithms or control systems at the level of an engineer. They must understand the conditions under which a robot can operate reliably, and the conditions under which its performance may become limited, similar to the concept of an Operational Design Domain in automated driving. They also need to understand what happens when the system does not operate as intended: how a robot can be brought to a safe state, how the system can be safely recovered, and how alternative operational arrangements can be provided.

The 4R Framework: Regulatory Readiness

The question is not whether regulation permits robotics, but whether regulation improves as robotics is deployed.

Korea's experience shows both halves of the problem. Mobile robots were classified as automobiles under the Road Traffic Act and barred from pavements until the Intelligent Robot Act was amended in November 2023 : four years after pilots began. Obsolete categories did the blocking, not policy. At the same time, **Korea's industrial convergence regulatory sandbox** has been among the world's most active: in October 2026 it granted an exemption allowing twenty bipedal humanoid robots to work alongside humans in semiconductor, automotive, shipbuilding and logistics facilities, lifting fence-and-separation rules written for stationary industrial robots, on condition of risk assessment, with the explicit intention that the data gathered would inform future safety standards.

A sandbox that grants an exemption and records nothing is a favour. A sandbox that grants an exemption and systematically harvests operational evidence is an institution for improving law. The difference is procedural, cheap, and almost always omitted.

Regulatory readiness also means proportionality. A requirement adopted sensibly in isolation can be prohibitive in combination, and governments rarely assess the cumulative burden. Korea's consolidation of its outdoor-robot assessment criteria from sixteen to eight, with the certification period halved and the safety threshold held, is what proportionality looks like when evidence is allowed to act on rules. Recommendation 3 returns to it.

Finally, regulatory readiness extends beyond the machine to the fleet. The San Francisco blackout of December 2025 showed that a correctly behaving fleet can still immobilise a city, because no rule addressed the fleet as infrastructure. Robots are regulated as products. Increasingly they need to be regulated as services.



Research note by
Seongjin Park, doctoral researcher

Robotic and autonomous systems encounter interactions with people, infrastructure conditions, and unexpected situations that are difficult to fully reproduce in simulations or controlled testing environments. Regulation should therefore not attempt to define every possible risk in advance. A more practical approach is to allow demonstrations under appropriate safety conditions and use the resulting operational evidence to continuously refine safety and operational standards.

Demonstrations should collect operational data from the beginning rather than focusing only on whether a test is classified as a success or failure. Relevant data may include pedestrian–robot interaction, safety and near-miss events, delay and operational performance, infrastructure compatibility, accessibility, public acceptance, system failures, and unexpected behaviour. Accidents should not simply be treated as failures of a particular demonstration, but analysed and used as evidence for improving future deployment criteria, operational and safety requirements, and infrastructure design standards. An effective regulatory system should incorporate a continuous feedback loop: deployment, monitoring, incident and failure analysis, rule revision, re-deployment.

Privacy is a recurring constraint. Autonomous robots rely on vision sensors such as cameras to perceive and navigate their surroundings, so their deployment also interacts with regulations governing personal data and video information.

The 4R Framework: Spatial Readiness

Urban planning is the most underused instrument in robotics policy, and the Lab's least expected finding was that it accelerates rather than restrains.

The formulation from the Busan Lab was unusually clear: technology innovation can be realised, but supporting it with urban planning makes the process predictable, fast and flexible. The mechanism is straightforward. Planning converts uncertainty into known conditions. A company that knows which districts permit autonomous operation, what the charging and maintenance provision is, and which authority decides, can price and finance a deployment. A company negotiating all of that from scratch, per site, cannot.

Seoul's Physical AI Belt is the working example: a designated corridor linking the Yangjae AI cluster with the Suseo robot cluster, written into metropolitan spatial strategy rather than technology strategy, with construction and completion dates attached.

The scale matters as much as the instrument. The Lab converged on the neighbourhood, a district of a few thousand residents, as the natural unit of physical AI, because that is where mobility, logistics, care and everyday services intersect, and where the effects of a deployment are experienced by people who know each other.

Most of what spatial readiness requires is unglamorous: kerb and crossing design that machines can read, charging and storage provision, service entrances, lift access, surface quality, and digital models of the built environment accurate enough to route against. None of it is expensive at the design stage. All of it is expensive afterwards.



Research note by
Seongjin Park, doctoral researcher

Robots should not be assumed to perform equally well across all urban environments. Sidewalk width, gradients, physical obstacles and pedestrian density can significantly affect the operating performance and safety of the same robotic platform.

Technologies such as wearable robots and small personal robotic mobility devices based on wheelchair platforms can support the mobility not only of older adults, but also of people with disabilities, pregnant women, children, and other mobility-vulnerable groups. If these technologies enable people to travel distances that were previously difficult to cover on foot, or improve first- and last-mile access to public transport stops and stations, their role goes beyond simply adding another mode of transport. They can expand an individual's effective activity space and improve access to urban services and opportunities.

This is closely related to Seoul's walkable daily-life neighbourhoods and the broader N-minute city approaches being discussed in many cities, where a key question is how many essential services and activity opportunities people can reach within a certain amount of time. In new urban developments such as Gwangmyeong–Siheung, future mobility, autonomous driving and robotics are being considered from the urban planning stage.

From Robotics Research To Robotics Action

GTF is convinced: ideas are not outcomes. Institutions must act. Empowering them is our goal.

The 4R Framework is a general approach, born from the GTF Robotics & Smart City Lab's work. It is universal and can be applied at any level, from a district to a nation.

For the sake of demonstration of this universality, this Handbook suggests three policy recommendations and four pilot projects. These are selected to be used either as a base for concrete political action or as inspiration for an internal discussion to generate locally adapted solutions.

This Handbook suggests three policy recommendations and four pilot projects. These are selected to be used either as a base for concrete political action or as inspiration for an internal discussion to generate locally adapted solutions.

Each policy recommendation and each pilot project is presented via a list of objectives their application should solve, a general overview of the implementation process, and evaluation criteria. The two latter sections are given as a reference and are specifically devoid of precise metrics. Even if the Handbook presents the most universally applicable ideas, each must be separately adapted to a given local reality.

Policy recommendations — expore on the next pages.

- **Appointment of a Physical AI Conductor at Metropolitan Level**
- **Robot-Ready Neighbourhoods**
- **Robotic Learning Sandbox**

gtf policy recommendations

Appointing a Physical AI Conductor

The Lab produced a metaphor that proved more useful than most policy language: government increasingly needs a conductor. Not someone who plays every instrument, but someone who knows how the technological, spatial, commercial and human parts fit together, and has the standing to make them act in time with one another. Today, almost no city employs this person. Robotics is instead distributed across a dozen officials, none of whom owns the result.

Summary

GTF recommends that metropolitan and large municipal governments create a named, senior Physical AI Conductor with a cross-departmental mandate covering robotics and autonomous systems , reporting to the mayor or chief executive rather than to a technology department, and holding convening authority over planning, transport, public space, licensing, public safety, procurement and digital services.

Objectives

Create single-point ownership of robotics outcomes. Give one named official responsibility for whether physical AI deployments in the city succeed, fail or cause harm, ending the condition in which every department holds one piece and nobody holds the outcome.

Translate between professional worlds. Bridge the gap the Lab identified between ICT and engineering backgrounds on one side and architecture and planning on the other, so that neither profession's blind spots become the city's.

Give deploying organisations one door. Replace sequential negotiation with six departments by a single accountable interlocutor who can convene them, shortening timelines without weakening scrutiny.

Build and hold institutional memory. Accumulate what the city learns from each deployment , what worked, what failed, what residents objected to, in one place rather than dispersing it across projects that end.

Act as the public face when something goes wrong. Ensure there is a known official who answers to residents, press and elected members after an incident, rather than a vacuum followed by a ban.

Connect the city to national frameworks and to other cities. Represent the municipality in national regulatory processes and in international exchange, where most of the available learning currently sits.

Implementation process

Stage 1

Mandate definition. Establish the role by executive decision, with a written mandate specifying convening authority, the departments in scope, and the decisions the Conductor can take alone versus escalate.

Reporting line. Place the role outside the technology department, such as, in the mayor's office, the chief executive's office or the strategy function, to prevent robotics being treated as an IT procurement.

Recruitment profile. Recruit for integrative capability rather than domain depth: candidates who have delivered complex projects across planning, infrastructure and technology. Accept that the ideal candidate is scarce and plan to develop rather than only hire.

Cross-departmental working group. Constitute a standing group with a named deputy from each department in scope, meeting on a fixed cycle with the Conductor in the chair.

GTF Policy Ideas on Robotics — Appointing a Physical AI Conductor

Stage 2

City robotics register. Establish and maintain a register of every physical AI deployment in the city: operator, area, conditions, teleoperation arrangements, incident history.

Single-door intake process. Publish one route by which an organisation proposes a deployment, with stated response times and criteria.

Incident protocol and emergency-services channel. Agree a standing channel with police, fire and ambulance services, and a protocol for who is called, by whom, within what time.

Annual public report. Report annually to the council and the public on deployments, incidents, benefits and costs, the mechanism by which the role stays accountable rather than becoming an advocate.

Peer network. Join or form a network of equivalent officials in other cities, so that evidence and incident learning cross municipal boundaries.

Evaluation Criteria

Time from proposal to decision. Elapsed time between a deployment proposal and a clear decision, compared with the baseline before the role existed.

Cross-departmental coherence. Number of deployments proceeding with all relevant departments aligned, versus those encountering late-stage objections.

Incident response performance. Time to identify a responsible official and issue a public response after a robotics incident.

Institutional capability growth. Number of officials across departments able to assess a safety case, a teleoperation arrangement or a deployment proposal without external advice.

Public and council confidence. Satisfaction of elected members and residents with the clarity and accessibility of the city's handling of robotics.

Deployment durability. Proportion of deployments still operating as services twelve and twenty-four months after launch.

GTF Comment

The hardest objection to this recommendation is that the ideal candidate does not exist. That objection is correct, and it is the reason to create the role rather than a reason not to.

GTF's Artificial Intelligence: Government's Handbook made a related argument about AI referents: the adoption and controlled implementation of a complex technology can only be done by knowledgeable human beings, and such people must be deliberately created where they do not already exist. Physical AI sharpens the point, because it crosses not only departments but professions with different training, different vocabulary and different conceptions of risk.

Participants in Busan described the difficulty of finding individuals capable of understanding the whole system. This is a labour-market fact, not a temporary gap. No university currently produces this person. They are assembled from career paths that happen to have crossed planning, infrastructure delivery and technology, and they are, correctly, in demand.

Cities should therefore plan to grow the role as much as to fill it. A reasonable first appointment is an experienced delivery official with strong convening ability and no robotics background, supported by technical advisers. The alternative : appointing a roboticist and hoping they learn municipal government, generally fails, because the binding constraint is institutional rather than technical.

The scale question matters. For a metropolis, this is a full-time senior post. For a mid-sized city, it may be a defined part of an existing strategy director's role. For small municipalities, the function is best shared across a region, in the way the Tampere Handbook proposed regional consortiums for AI, pooling a capability none of them could justify alone.

One word of caution. The role must not become an advocate for robotics. A Conductor whose success is measured by the number of robots deployed will approve deployments that should be refused, and will spend the public acceptance the city cannot easily rebuild. The evaluation criteria above deliberately measure coherence, durability and confidence rather than volume.

There is at least one precedent worth studying. Barcelona appointed Francesca Bria as Chief Digital Technology and Innovation Officer from 2016 to 2020, a cross-cutting role sitting with the mayor rather than inside an IT department, with a remit spanning procurement, data policy and digital services. The subject matter was digital rather than physical, but the structural question was identical: who in a city government is accountable for a technology that crosses every department and belongs to none. Cities considering a Conductor should look at how that role was mandated and what happened to its work after the appointment ended, which is the real test of whether such a function outlives the person holding i

gtf policy recommendations

Robot-Ready Neighbour-hoods

Robotics policy is usually written by technology departments and lands in documents that bind nobody. Urban plans, zoning instruments and design codes are written by planners and bind everybody who builds. The Lab's least expected finding was that planning, far from restraining robotics, is what makes it deployable, because planning converts uncertainty into known conditions, and known conditions can be priced, financed and insured.

Summary

GTF recommends that cities designate neighbourhood-scale Physical AI districts within their statutory spatial planning, with published operating conditions, and that they embed robot-readiness requirements into design codes for new development and major refurbishment, moving robotics from strategy documents into the instruments that actually govern the built environment.

Objectives

Make deployment conditions predictable. Publish in advance which areas permit autonomous operation, under what conditions, with which authority deciding, so that organisations can plan and finance deployments instead of negotiating each site from scratch.

Work at the scale where Physical AI is experienced. Use the neighbourhood, not the metropolis, as the planning unit, because that is where mobility, logistics, care and everyday services intersect in people's lives.

Build readiness in at the cheap moment. Set kerb, crossing, surface, charging, storage, service-access and lift requirements at the design stage, where they cost very little, rather than retrofitting them later at a higher expense.

Make deployments investable. Give private operators and public agencies the predictability they need to commit capital, which is the practical precondition for services that outlast grant funding.

Concentrate learning geographically. Allow a city to accumulate operational experience, incident data and public familiarity in defined areas rather than dispersing thin experience across the whole territory.

Protect the rest of the city. Make explicit where autonomous operation is not permitted, which is as important for public confidence as where it is.

Implementation process

Stage 1

Spatial diagnostic. Assess the city for candidate districts against the criteria that actually determine feasibility: pavement width and surface, crossing density, gradient, building access, service entrances, power availability, existing logistics patterns and demographic profile.

District designation. Designate two to four neighbourhood-scale districts through the statutory planning instrument available locally : supplementary planning guidance, district plan, area action plan or equivalent, so that designation carries legal weight.

Published operating conditions. For each district, publish the conditions: permitted machine classes, speed and mass limits, operating hours, insurance and incident-reporting requirements, data-retention limits, and accessibility obligations.

Design code amendment. Amend the city's design code so that new development and major refurbishment within designated districts must provide the physical preconditions: dropped kerbs that machines can read, charging and storage provision, service access, and lift dimensions.

GTF Policy Ideas on Robotics — Robot-Ready Neighbourhoods

Stage 2

Resident engagement before operation. Run structured engagement in each designated district before the first deployment, including the groups most affected: people with mobility aids, parents with young children, older residents and people who work on the street.

Digital twin provision. Make an accurate digital model of the district's public realm available to operators, maintained as the physical environment changes.

Monitoring and review. Monitor pavement conflicts, incident rates, service performance and resident sentiment on a fixed cycle, and review designation at each planning cycle.

Extension or withdrawal. Extend designation to further districts where evidence supports it, and withdraw it where it does not, the credibility of the instrument depends on both being real possibilities.

Codification. Once conditions have proven stable across several districts, migrate the requirements from district designation into the city-wide design code.

Evaluation Criteria

Deployment lead time. Time from an operator's decision to deploy to live operation within a designated district, compared with undesignated areas.

Capital commitment. Volume of private and public investment committed to robotics services within designated districts.

Pavement conflict and accessibility. Reported conflicts between machines and pedestrians, disaggregated for people using mobility aids, pushchairs and assistance animals.

Design code compliance. Proportion of new development in designated districts delivering the required physical provisions at first inspection.

Resident sentiment. Changes in neighbourhood-level acceptance before, during and after deployment, measured consistently.

Service continuity. Proportion of services still operating twenty-four months after launch, and whether they have extended beyond the original district.

GTF Comment

Cities already know how to do this. They have done it for cycling, for low-emission zones, for pedestrianisation and for heritage protection. The instrument is familiar; only the subject is new.

Seoul's Physical AI Belt is the clearest current example of robot-readiness written into spatial strategy rather than technology strategy. The city has linked its Yangjae AI cluster with its Suseo robot cluster as a designated corridor, with construction beginning in 2028 and completion targeted for 2030, alongside a testbed demonstration centre and committed investment for real-world trials. What makes this significant is not the money. It is that a robotics ambition has been given a location, a timetable and a planning instrument, which means it will outlive the administration that announced it.

The counter-example is equally instructive. Where sidewalk robots have been deployed without spatial designation, the result has frequently been retrospective prohibition. Toronto, Knoxville and Jackson have banned delivery robots from sidewalks or bike lanes, and the Chicago backlash described on page 18 followed the same pattern. None of those cities decided against robotics. They were never asked. Deployment happened to them, and prohibition was the only instrument left.

This is the practical argument for designation: a city that designates can set conditions, monitor, and adjust. A city that does not designate has only two options, permission and prohibition, and will eventually be pushed to the second.

Two cautions. First, designation must not become an enclave. If a district is treated as a permanent exception rather than a first step, the city learns nothing transferable and residents reasonably conclude they were used as a test population. Second, the physical requirements must be proportionate. A design code that specifies robot provisions in extravagant detail will raise development costs for buildings that may never host a robot. The provisions worth mandating are those that serve people anyway: level access, generous door widths, reliable surfaces, clear service routes. Robot-readiness and accessibility point in almost exactly the same direction, and the overlap is the most defensible place to start.

gtf policy recommendations

The Robotics Learning Sandbox

Regulatory sandboxes are among the most widely copied instruments in technology policy and among the least productive. Most grant an exemption, run a trial, and end. The evidence the trial generated stays with the company that generated it. The permanent regulation the sandbox was supposed to inform remains unchanged, and the next applicant starts again. A sandbox that does not systematically harvest and feed back evidence is not a regulatory institution. It is a favour, granted case by case.

Summary

GTF recommends that governments attach a standard evidence protocol to every robotics sandbox exemption, publish a register of deployments and incidents, and legislate a review point at which accumulated evidence must be formally considered for incorporation into permanent regulation, converting sandboxes from one-off permissions into a mechanism by which law improves.

Objectives

Make exemptions generate public knowledge. Require every exemption to produce specified operational data as a condition of being granted, so that the public interest in the experiment is served, not only the applicant's.

Close the feedback loop into permanent law. Create a statutory obligation to review accumulated sandbox evidence at fixed intervals and to state publicly what will and will not be codified, and why.

End the serial-exemption trap. Prevent the condition in which the same exemption is granted repeatedly to successive applicants because nobody is required to turn the pattern into a rule.

Reduce cumulative regulatory burden deliberately. Use evidence to retire requirements that have proven unnecessary, rather than only to add new ones, the direction of travel almost all regulatory systems lack.

Allow evidence to cross borders. Standardise what is collected so that findings from one city or country are usable in another, and so that mutual recognition becomes technically possible.

Make the regulator a learner rather than a gatekeeper. Build the institutional habit of treating each deployment as a source of information about whether the rules are right.

Implementation process

Stage 1

Standard evidence protocol. Define, once, what every robotics exemption must record: operating hours and distance, intervention and teleoperation rates, incidents by severity and category, near-misses, accessibility conflicts, maintenance failures and complaint volumes.

Condition of grant. Make submission of the protocol data a binding condition of the exemption, with the exemption lapsing on non-submission, not a reporting request that can be quietly dropped.

Public register. Establish a register showing every active exemption, its holder, its area, its conditions and its incident record, with commercially sensitive detail withheld but safety-relevant information public.

Independent assessment capability. Resource the regulator to read and challenge what is submitted. An evidence protocol that nobody is competent to analyse produces compliance, not learning.

GTF Policy Ideas on Robotics — Robotics Learning Sandbox

Stage 2

Statutory review point. Legislate a fixed review , annual or biannual, at which the accumulated evidence must be assessed and a public statement issued on what will be codified, what will be relaxed, and what requires further evidence.

Codification and retirement. Carry proven conditions into permanent regulation, and retire requirements the evidence shows to be unnecessary. Publish both.

Shared incident taxonomy. Adopt a common classification for robotics incidents, so that data from different operators, cities and countries can be compared rather than merely collected.

Mutual recognition. Negotiate recognition of equivalent evidence and certification with other jurisdictions, beginning with the specific friction points : ISO certificates, component substitution, recertification triggers.

Fleet-level requirements. Extend the protocol beyond individual machines to fleets: resilience obligations, minimum remote-operator staffing, and behaviour under infrastructure failure.

Evaluation Criteria

Evidence completeness. Proportion of active exemptions submitting complete protocol data on time.

Codification rate. Number of sandbox findings carried into permanent regulation, and number of requirements retired, per review cycle.

Serial exemption reduction. Decline in repeat exemptions granted for substantially identical cases.

Time and cost to authorisation. Change in the time and cost for a new operator to reach authorised operation.

Incident trend. Incidents per operating hour across the sandbox population over time, by category and severity.

Cross-jurisdiction usability. Number of findings cited or recognised by other cities or national regulators.

GTF Comment

Korea has demonstrated both what a sandbox can do and what it cannot do on its own, which makes it the most instructive case available.

The capability is real. In October 2026, one month after our Lab meeting, the Industrial Convergence Regulatory Sandbox Review Committee granted a demonstration exemption permitting twenty AI-powered bipedal humanoid robots to work alongside humans at four industrial sites, semiconductor packaging, automotive assembly, shipbuilding and refrigerated logistics, by lifting fence-and-separation requirements written for stationary industrial robots, conditional on risk assessment and safety measures. The stated intention was that the data gathered would inform future safety standards. That intention is exactly right, and it is the part most sandboxes omit.

The limitation is equally visible, and so is the remedy. **An outdoor mobile robot in Korea originally had to satisfy sixteen assessment criteria**. As operational experience accumulated, these were consolidated into eight and the certification period was halved from 60 days to 30, which is precisely the feedback loop this recommendation argues for. Replacing a component can still require recertification; adding an arm to a robot for park service rendered it inoperable until separately verified. ISO certificates are not recognised, so international products begin again from zero. Each requirement was adopted for a reason. Together they constitute what Korean industry has described as a wall of regulation, and no institution is responsible for assessing the cumulative burden, because each rule belongs to a different authority acting correctly within its own remit.

Sandboxes relieve pressure at the margin while the underlying regulatory stock keeps growing. Only a mandatory review point, at which evidence must be converted into codification or retirement, reverses the ratchet. Korean industry representatives have proposed metropolitan-level mega-sandboxes and a pan-government control tower to resolve regulation in one place; both proposals are responses to the same diagnosis.

For cities and countries beginning now, three design choices matter most. Define the evidence protocol before granting the first exemption, because retrofitting data requirements onto live deployments is nearly impossible. Resource the capacity to analyse what arrives, or the protocol produces filing rather than learning. And legislate the review point, because a review that depends on political attention will not survive the first change of administration.

The international standards work now emerging : including the draft ISO 4448 series covering stand-aside behaviour, separation distance from pedestrians, communication with vulnerable road users and incident reporting, gives regulators a vocabulary they did not have two years ago. Referencing it in permit conditions is the fastest route to evidence that other jurisdictions can actually use.



GTF Robotics Lab Pilot Projects

gtf pilot projects

Beyond the Demo, a Deployment Readiness Review

A successful demonstration does not automatically mean successful real-world deployment. The Lab returned to this sentence repeatedly, and it names the single most expensive failure mode in urban robotics: the pilot that neither scales nor stops. It keeps running on diminishing attention, absorbs staff time, produces no decision, and quietly ends when its funding does, leaving no evidence and no conclusion.

Summary

GTF suggests that cities adopt a Deployment Readiness Review: a published, standard gate applied to every robotics pilot at a fixed point, assessing readiness across five dimensions and producing one of three outcomes: proceed to service, extend with specified conditions, or stop. The outcome and its reasoning are then published and made publicly available.

Objectives

Force a decision. Replace indefinite pilot drift with a scheduled decision point that someone is accountable for making.

Assess what actually determines success. Evaluate infrastructure, regulatory status, business model, operational performance and public acceptance together, rather than judging a technology on whether it worked on the day.

Make stopping respectable. Establish that a well-run pilot ending with a decision not to proceed is a success of the process, not a failure of the participants, the precondition for honest evaluation.

Create comparable evidence. Apply the same five dimensions across pilots so that a city can compare robotics proposals against one another and against non-robotic alternatives.

Protect public money. Prevent the pattern in which a city funds the same category of pilot three times because each one ended without a recorded conclusion.

Implementation process

Stage 1

Define the five dimensions. Infrastructure readiness; regulatory and insurance status; business model and whole-life cost including maintenance; operational performance against the pilot's own stated targets; public acceptance measured at neighbourhood level.

Set the gate in advance. Fix the review date and criteria at the point the pilot is approved, not afterwards, a gate designed after results are known is not a gate.

Assign the reviewers. Constitute a review panel including the Conductor or equivalent, a finance representative, an accessibility representative and at least one person independent of the sponsoring department.

Baseline measurement. Record the starting position on each dimension, including the cost and performance of whatever the robot would replace.

GTF Robotics Pilot Projects — Deployment Readiness Review

Stage 2

Run the review. Assess against the five dimensions at the scheduled date and issue one of the three outcomes with written reasoning.

Publish. Publish the outcome and the reasoning, including for pilots that are stopped. This is the step most likely to be dropped and the one that makes the mechanism worth having.

Feed the sandbox. Route the operational evidence into the regulatory evidence protocol described in the third policy recommendation.

Share externally. Contribute findings to the peer network, so that other cities do not repeat a pilot that has already been concluded elsewhere.

Evaluation Criteria

Decision rate. Proportion of pilots reaching a recorded decision at the scheduled gate rather than lapsing.

Stop rate. Proportion of pilots stopped : a rate near zero indicates the gate is not functioning.

Forecast accuracy. Difference between whole-life cost and performance as projected at the gate and as observed in service twelve months later.

Avoidance of repetition. Reduction in pilots duplicating work already concluded in the city or by peers.

Transition success. Proportion of pilots passing the gate that are still operating as services after twenty-four months.

Publication compliance. Proportion of review outcomes published within the committed period.

GTF Comment, and Examples

The hardest part of this pilot is not the criteria. It is making a negative decision survivable for the people who made the positive one.

Every pilot has a sponsor who argues for it. If stopping a pilot is treated as that person's failure, reviews will be shaped to avoid it, and the gate will approve everything. Cities that have made this work in other domains, major project review, capital programme gateways, did so by separating the sponsor from the reviewer and by publishing stop decisions as routine, not exceptional.

Example 1

The UK Gateway Review process.

Major UK government projects pass through a sequence of independent gate reviews, from Gate 0 Strategic Assessment to Gate 3 Investment Decision and Gate 5 Operations Review and Benefits Realisation. Reviews are conducted by teams independent of the project, and for projects on the Government Major Projects Portfolio the outcome goes to the Accounting Officer and the Treasury. The model transfers to robotics almost unchanged. What is new is the inclusion of public acceptance as a gate dimension rather than a communications afterthought.

Example 2

Korea's sandbox exemptions with evidence conditions.

The October 2026 humanoid exemption was granted on condition of risk assessment and safety measures, with the stated purpose that the resulting data would inform future standards. That is a gate logic applied at national level , permission conditional on evidence, and the municipal version is its natural complement.

gtf pilot projects

Robots, An Infrastructure For People

As one participant put it during the Lab, large autonomous systems such as buses are infrastructure for the city, while another category of machines can become "infrastructure for human beings, individual human beings." The distinction is the most useful thing the Lab produced about what robots are for. A city bus serves everyone a little. A mobility-support device serves one person enormously — and can be shared.

Summary

GTF suggests a pilot placing assistive and mobility-support robotics in a designated neighbourhood as shared, bookable public infrastructure, maintained by the city or its partner, available to older and disabled residents without individual purchase, and designed with care services and residents from the outset.

Objectives

Expand individual autonomy. Enable residents to stand, move, carry, work and participate more fully, the Lab's test for whether a robotics application is worth deploying at all.

Break the affordability barrier through sharing. Treat assistive robotics as shared infrastructure like a library or a public gym, rather than as a private purchase only a minority can make.

Demonstrate the human case for physical AI. Give citizens a first encounter with robotics that visibly helps a neighbour, which is a materially different experience from a delivery robot on a pavement.

Generate care-sector evidence. Produce operational data on reliability, training needs, maintenance load and actual usage patterns in a domain where claims substantially exceed evidence.

Design with users, not for them. Involve the residents who will use the equipment, and the care workers who will work alongside it, in selection and deployment.

Implementation process

Stage 1

Needs assessment with residents. Work with older and disabled residents and their representative organisations to establish what would actually help, before any equipment is selected. The most common failure in assistive technology is solving a problem the user does not have.

Care service partnership. Partner with the existing care provider, whether municipal or contracted, so the pilot is embedded in care delivery rather than running alongside it.

Equipment selection and location. Select a small number of equipment types and locate them where residents already go, a community centre, a care facility, a housing block — not in a new facility nobody visits.

Training. Train care workers and residents together, and budget for retraining as staff turn over, which is routinely underestimated.

GTF Robotics Pilot Projects — Robots as Infrastructure for People

Stage 2

Booking and access system. Operate a simple booking mechanism with a non-digital route, since the user group most likely to benefit is the one least likely to use an app.

Maintenance and reliability regime. Establish response times for faults. Shared equipment that is unavailable when needed stops being used, permanently, after very few failures.

Usage and outcome measurement. Record usage, user-reported outcomes, care-worker time effects, and incidents.

Review and extension. Assess against the Deployment Readiness Review in Pilot 1 and decide whether to extend to further neighbourhoods.

Evaluation Criteria

User-reported autonomy. Change in what users report being able to do independently.

Utilisation. Booking and usage rates against capacity, and repeat usage by individuals.

Availability. Proportion of booked sessions fulfilled; mean time to repair.

Care-worker effect. Change in care-worker time allocation and task burden, and staff-reported experience.

Equity of access. Whether users reflect the neighbourhood's older and disabled population or a self-selecting subset.

Whole-life cost per user-hour. Total cost including maintenance and training, compared with alternatives.

GTF Comment, and Examples

This is the pilot that is the most likely to change how a city's residents feel about robotics, and the one least likely to be proposed, because it is harder than delivery and generates no commercial excitement.

Delivery robots arrive with a business model and a vendor. Assistive robotics arrives with a care budget under pressure, a regulated workforce and users who cannot be inconvenienced by a trial that fails. Those are real reasons for caution, and they are also the reasons this domain stays stuck at the demonstration stage while logistics moves ahead.

The shared-infrastructure framing is what makes it tractable. Individual purchase excludes most of the people who would benefit. Institutional provision confines the equipment to facilities. Neighbourhood-level sharing, maintained publicly, sits between the two, and it is a model cities already operate for bicycles, tools and sports equipment.

Example 1

Japan's nursing homes, and the best evidence we have.

A study by Eggleston, Iizuka, Lee and Xi examined roughly 860 Japanese nursing homes, using the varying timing and generosity of prefectural care-robot subsidies from 2015 as a natural experiment. Facilities that adopted transfer aids, mobility robots and monitoring systems had significantly fewer staff retention problems, and employment rose rather than fell: 28 per cent more care workers, 39 per cent more nurses, and about 26 per cent higher facility employment overall, concentrated in flexible and part-time contracts. It is the strongest available evidence that assistive robotics complements caregivers rather than replacing them, and it is the finding most likely to persuade a finance director.

Example 2

Seoul's welfare robotics strand.

It includes rehabilitation robots and wearable assistive exoskeletons within the city's wider physical AI programme, places assistive applications inside a mainstream technology strategy rather than in a separate welfare silo — a structural choice worth copying.

gtf pilot projects

The Robots Incident Register With Single Contact Point

When a robot blocks a wheelchair, obstructs an ambulance or frightens a child, the question a resident asks is not philosophical. It is: who do I call? In most cities there is no answer. The operator's support line is designed for customers, the council switchboard does not know the deployment exists, and the resident's third option is a petition. This pilot builds the answer before it is needed, which is the only time it is cheap.

Summary

GTF suggests that cities establish, ahead of significant robotics deployment, three linked instruments: a public register of all authorised deployments; a single contact point for residents and emergency services; and a standing incident protocol agreed with police, fire and ambulance services.

Objectives

Give residents somewhere to go. Provide one visible, non-technical route for reporting problems, which is the single most effective defence against organised opposition.

Give emergency services a known interlocutor. Ensure that police, fire and ambulance crews encountering an immobilised or obstructing machine can reach someone able to move it, at any hour.

Make deployments visible. Publish what is operating where, under whose authority and on what conditions, so that residents are not required to discover this by encountering it.

Generate the evidence the regulator needs. Produce the incident data that feeds the Learning Sandbox and the Deployment Readiness Review, from the public's side rather than only the operator's.

Detect patterns early. Identify a recurring accessibility conflict or a failing operator while it is still a correctable problem rather than a news story.

Implementation process

Stage 1

Register design and population. Build a simple public register: operator, machine type, area, hours, conditions, contact details, incident history. Populate it with every existing deployment, including those nobody formally authorised.

Single contact point. Establish one phone number and one online form, publicised locally in the districts where machines operate, with a non-digital route and a stated response time.

Incident taxonomy. Adopt a classification covering collision, injury, obstruction, accessibility conflict, near-miss, immobilisation, privacy concern and nuisance, aligned where possible with emerging international standards so the data is comparable.

Emergency services protocol. Agree with each emergency service who is called, by whom, within what time, and who has authority to require a machine's removal.

GTF Robotics Pilot Projects — Robots Incidents Register

Stage 2

Operator obligations. Make register entry, contact-point participation and incident reporting binding conditions of authorisation, with suspension available for non-compliance.

Publication cycle. Publish incident data on a fixed cycle, disaggregated by operator and category, with resident-reported and operator-reported incidents distinguished.

Pattern review. Review the data at each cycle with the Conductor and accessibility representatives, and act on recurring issues.

Escalation path. Define what happens when an operator repeatedly fails: additional conditions, area restriction, suspension of authorisation.

Evaluation Criteria

Register completeness. Proportion of known deployments listed, and accuracy of their details at audit.

Contact-point reach. Resident awareness of how to report, measured in the districts where machines operate.

Response performance. Time from report to acknowledgement, and to resolution, by category.

Reporting balance. Ratio of resident-reported to operator-reported incidents — a strong imbalance indicates under-reporting by one side.

Accessibility conflict trends. Conflicts involving mobility aids, pushchairs and assistance animals, over time.

Escalation effectiveness. Whether identified patterns produced changes in operator behaviour within the following cycle.

GTF Comment, and Examples

Every city that has had a robotics backlash has built some version of this afterwards. Building it first costs very little and changes the politics entirely.

The Chicago case described on page 18 is the clearest illustration, and its most revealing detail is easy to miss. The petition mentioned in the Lab discussion became the reporting mechanism, because no other existed. People who wanted to report one specific problem had to join a campaign against the whole category in order to be heard.

The emergency-services dimension is equally concrete. In the San Francisco blackout, roughly 1,600 robotaxis stopped and a 911 dispatcher reportedly waited on hold for nearly an hour. A standing protocol with a named contact would not have prevented the stoppages. It would have changed how the city got through the following six hours.

Example 1

Los Angeles's personal delivery device rules.

The rules set speed limits, weight caps, accessible signage requirements and data-sharing obligations, show that the register-and-conditions approach is already operating at municipal level in a large city. There is a specific register that collects data on these rules not being respected.

Example 2

The draft ISO 4448 series.

The draft covers stand-aside behaviour, separation distance from pedestrians, communication with vulnerable road users and incident reporting, gives cities a ready-made vocabulary for permit conditions and for the incident taxonomy, and adopting it makes a city's data usable by others. While it does not suggest creating a register such as GTF preconizes, it allows to see what a basis for incident analysis would be.

Research Agenda for 2027

The Korea meeting launched a broader international research process. Having begun with the question of what robots will be able to do, the Lab ends its first season with a harder one:

How can governments design cities, institutions and cultures capable of absorbing physical AI while ensuring that technology remains an instrument of human flourishing?

The GTF Robotics & Smart City Lab will now examine:

- how governments can build societal readiness for Physical AI;
- what institutional capabilities are required to govern robotics;
- how cities should design robot-ready neighbourhoods;
- how regulatory sandboxes can become mechanisms for continuous learning;
- how to move from robotics pilots to scalable urban services;
- how robots, autonomous vehicles, digital twins and city systems may converge by 2030;
- and which elements of Korea's robotics and smart-city experience can be adapted internationally.

The second edition of the Lab will test the 4R Framework against a different governance culture and a different urban fabric. GTF welcomes expressions of interest from cities, ministries, universities and companies willing to host, contribute evidence, or open a deployment to independent examination, including deployments that did not work, which remain the scarcest and most valuable material in this field.



Conclusion

The Government Tomorrow Forum's Robotics & Smart City Lab was created on the judgement that the governance of artificial intelligence was about to change category. For a decade, governing AI has largely meant governing information. It is now also going to mean governing objects that move through public space, under a named authority, in front of witnesses.

The first edition in Busan confirmed the judgement and corrected its emphasis. We expected to spend the day discussing capability and timelines. We spent it discussing culture, professional boundaries, zoning instruments and who answers the telephone. That was the more useful conversation, and this Handbook is its result.

The argument it leaves behind is simple enough to state in one paragraph. Robot-readiness is not bought. It is built in four kinds at once : cultural, institutional, spatial and regulatory, and a city that builds three of them will not get the fourth for free. Korea is the proof of the proposition rather than the exception to it: world-leading capability, held up for years by categories written for a different world, and now moving because institutions, not machines, changed.

For these results to be as useful as possible, governments of all levels should be involved in the ideation process. The Forum is open to contributions from any part of the world, as long as they aim at improving global stability and quality of life through better government services. We are particularly interested in hearing from cities that have stopped a robotics pilot and are willing to say why.

This Handbook is the product of the our Lab's first edititon. It is also a request. The next edition will be better if governments tell us what actually happened when they deployed a disruptive technology: which ideas and projects are worth testing, what worked, and, more usefully, what did not.

GTF Robotics Lab 2026



Building a better world for everyone around embodied AI, better national and municipal policies, and new generation of public-private partnerships.

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