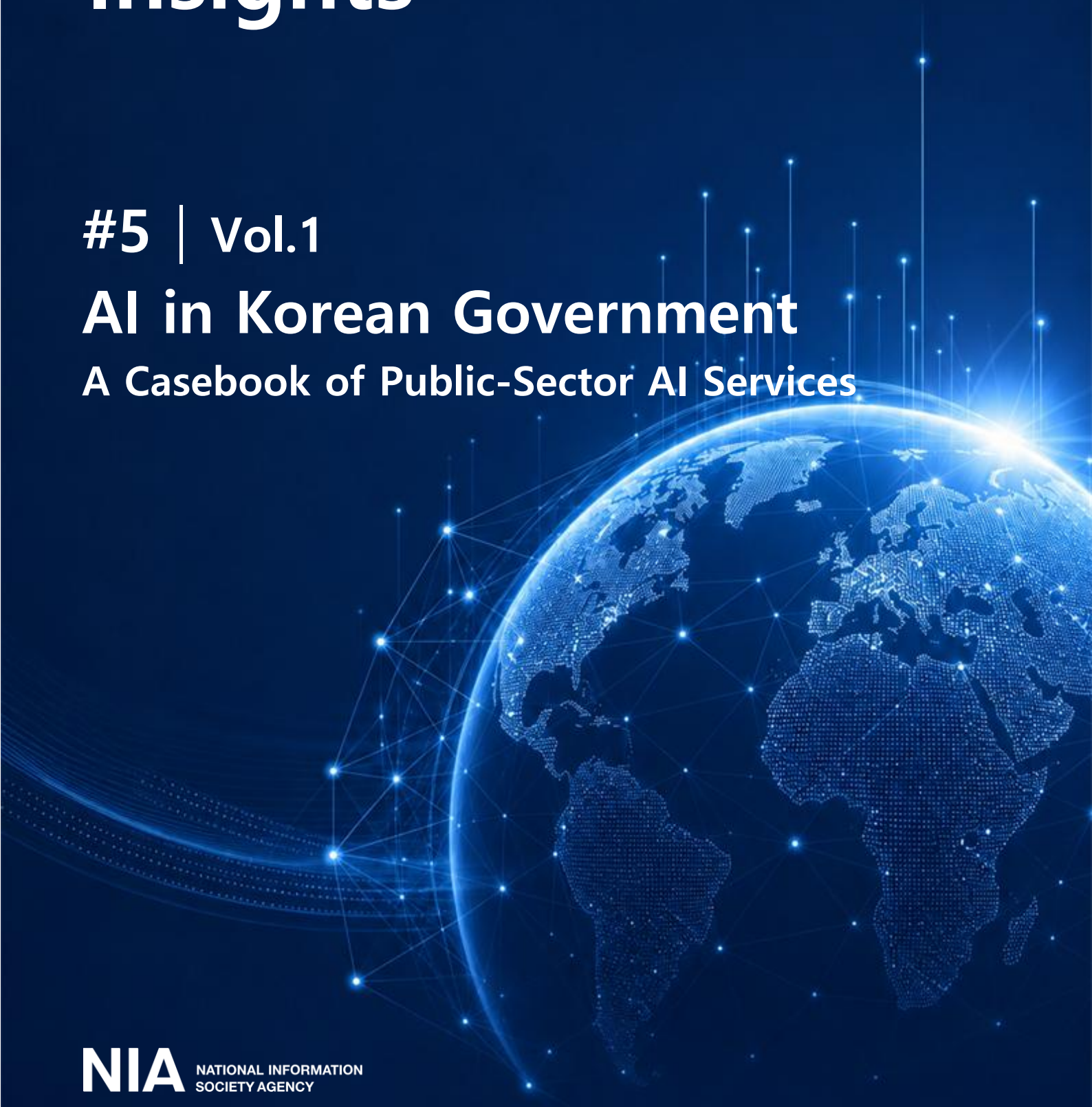
NIA Digital & AI Insights

#5 | Vol.1

AI in Korean Government

A Casebook of Public-Sector AI Services



NIA NATIONAL INFORMATION SOCIETY AGENCY

Overview

Why This Casebook

Across the Korean public sector, interest in artificial intelligence has moved quickly from “whether” to “how.” Yet for the officials who must actually plan an AI initiative, the first step is often the hardest: deciding which problem to solve, what data is needed, how to select a model, how to secure a budget, and how to keep the service running after launch. Policy documents and technical guidelines rarely answer these questions in the concrete terms that planners need.

This casebook was produced to fill that gap. Compiled by the Ministry of the Interior and Safety (MOIS) and the National Information Society Agency (NIA), it documents 16 AI services that central ministries, local governments, and public institutions in Korea have actually built and operated. Rather than presenting success stories alone, each case records the problems that prompted the project, the choices made along the way, the obstacles encountered in the field, and the measures taken to overcome them.

What the Cases Cover

The 16 cases span six areas of government function and a wide range of AI technologies, from deep learning–based forecasting and computer vision to large language models, retrieval-augmented generation (RAG), and speech recognition.

Area	Cases
Environment	AI flood forecasting; AI-based smart water treatment plant
Employment and Labor	AI classification of industrial accident investigations; AI support for labor inspectors
Social Welfare	AI initial consultation for households in welfare crisis; AI-enabled care services
Public Order and Safety	AI driver qualification verification; AI detection and analysis of illegal deepfake content
General Administration	Generative AI–based public data search; hyperscale AI research support; AI night duty system; AI multilingual interpretation for civil requests; AI parking control; AI passenger flow management at Incheon International Airport
Legislation	AI-based patent examination support; generative AI legal information service

How Each Case Is Organized

Each case follows a common structure so that readers can compare cases and find the information they need quickly:

- **Case opening and key functions:** The case number and field, a short tagline, the case title, and a one-page summary of what the service does
- **Background:** The field problem and policy context that led to the project
- **Key features and implementation process:** How the service works, the models and data used, and how the project progressed step by step
- **Outcomes and future plans:** Measurable outcomes and the agency’s plans for advancement and expansion

- **Service profile and summary table:** The implementing organization, launch date, budget, and the key points on model selection, data, and operation at a glance
- **Expert recommendations:** Assessments and suggestions from experts in law, academia, and industry
- **Interview with the project officer:** First-hand accounts of the difficulties faced in planning, budgeting, securing data, selecting models, and addressing security

Lessons Across the Cases

Although the services differ widely in purpose and scale, several common lessons emerge:

- **Start from the field problem:** The most successful projects began with a clearly defined operational bottleneck, such as delayed flood warnings, repetitive document screening, or recurring civil complaints, rather than with the technology itself.
- **Data quality comes before model choice:** Many agencies found that standardizing, cleaning, and enriching their data, including metadata and field-specific training data, mattered more to performance than the choice of model.
- **Keep people in the loop:** Across the cases, AI handles detection, search, and analysis, while officials retain final judgment and accountability, supported by clear procedures for escalation and human review.
- **Build in phases:** Pilot projects and proofs of concept, followed by gradual expansion, allowed agencies to validate results, gain internal support, and secure budgets step by step.
- **Plan for operation, not just development:** Continuous retraining, monitoring, security review, and dedicated staff and budget are needed long after launch.
- **Leverage partnerships:** Collaboration with private companies, research institutes, and other agencies helped overcome limitations in technology, data, and resources.

Note on the English Edition

This English edition is part of the NIA Digital & AI Insights Series, which makes Korean digital government and AI policy publications available to international partners. The content follows the Korean original published in March 2026. It is published in two volumes: Volume 1 contains Cases 1–8 (Environment; Employment and Labor; Social Welfare; Public Order and Safety), and Volume 2 contains Cases 9–16 (General Administration; Legislation). Both volumes include this Overview and the full Table of Contents. Details specific to domestic administrative procedures have been kept to a minimum, while budget figures and department names are retained for reference. Official English names are used for government organizations where available; otherwise, names have been translated by meaning. Figures, diagrams, and screen captures have been translated or adapted for English-speaking readers.

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CASE 1 | ENVIRONMENT

When the first raindrop falls, a sharper forecast is already on its way

Closing the Gaps in the Flood Safety Net with AI

Ministry of Climate, Energy and Environment: AI Flood Forecasting System

The AI Flood Forecasting System is an AI-based disaster response platform that detects and predicts flood risks—not only from localized torrential rainfall but also in tributaries and small streams—and promptly alerts the public. Moving away from the previous forecasting system, which focused on major rivers and relied on manual analysis, the system was designed to close forecasting gaps and enable automated analysis and flood warning issuance at 223 locations nationwide.

AI Flood Forecasting System – Key Functions

- **Real-time prediction:** Automated analysis based on rainfall, water level, flow rate, dam and weir discharge, and tide level data collected at 10-minute intervals
- **Elimination of blind spots:** Forecast coverage expanded to 223 flood warning points nationwide, including tributaries and small streams
- **Integrated alerts:** A unified warning process covering everything from risk detection to warning issuance and dissemination
- **Public notification:** GPS-based emergency text alerts, maps of flood-prone areas, and voice guidance through in-car navigation services
- **Operational efficiency:** Forecast analysis time reduced from 30 minutes to 10 minutes, with decision support for forecasters

Background

New Threats Brought by Climate Change

Citizen A: *"They said it was just a passing shower, but the road in front of my house turned into a river in no time!"*

Forecaster B: *"Major rivers are managed fairly systematically, but forecasting for tributaries and small streams is still not adequately in place."*

Intense rainfall concentrated over small areas in a short time can engulf cities and villages in moments, causing flood damage that is difficult to predict even along small and medium-sized rivers.

Over the past decade, flood warnings averaged only 34 per year. As climate change accelerates, however, flood damage is becoming more frequent and more complex.

Yet the existing flood forecasting system remained dependent on forecasters' manual analysis and centered on major rivers, leaving tributaries and small streams in a de facto forecasting blind spot. With an average of more than 30 minutes needed to issue a warning, the public had far too little time to recognize the danger and evacuate.

To protect public safety, forecasting methods also had to evolve. Rather than interpreting the situation after the rain had fallen, the country needed a system that would complete its analysis

before the first raindrop fell and deliver detailed warnings anywhere in the country. Against this backdrop, the emergence of the AI Flood Forecasting System was not a matter of choice but of necessity.

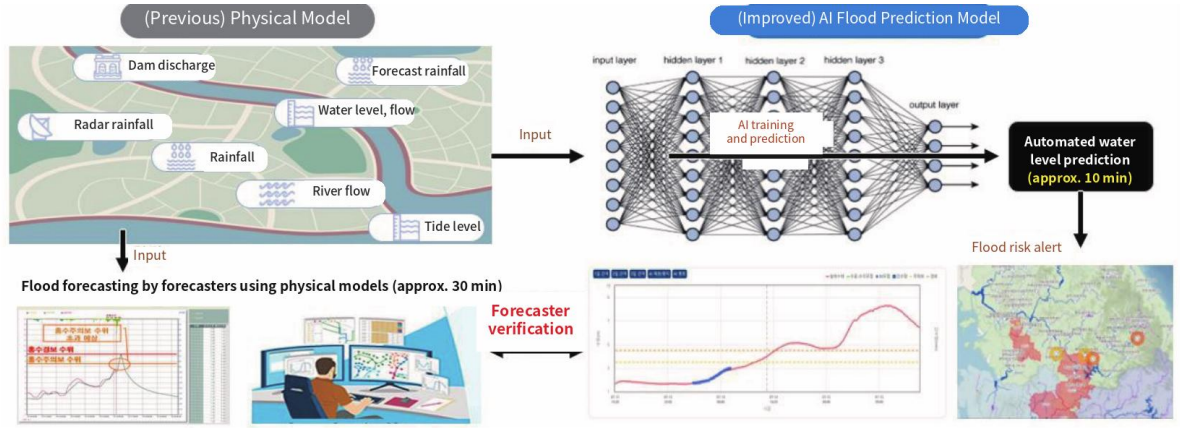
Key Features and System Development

AI That Reads the Waterways of Sky and Land

The AI Flood Forecasting System simultaneously reads the rain falling from the sky and the water flowing across the land. It collects and refines a wide range of hydrological and meteorological data at 10-minute intervals—including upstream water levels, rainfall, mean areal rainfall, flow rates, dam and weir inflows and discharges, and tide levels—and analyzes correlations between upstream and downstream observations to improve the precision of its prediction signals.

At the core of the system is a deep learning time-series prediction model based on Long Short-Term Memory (LSTM). The model learns the hydrological and watershed characteristics of each location, and for locations with insufficient observation data, results from physical models are used to supplement the training data. Refined through repeated retraining, the AI is designed to detect signs of flood risk more quickly through short-term lead-time forecasting.

< Previous Physical Model vs. Improved AI Flood Prediction Model >



Source: Provided by the Ministry of Climate, Energy and Environment

Before and After

Before: Forecasters ran physical models manually and checked results location by location → analysis took more than 30 minutes

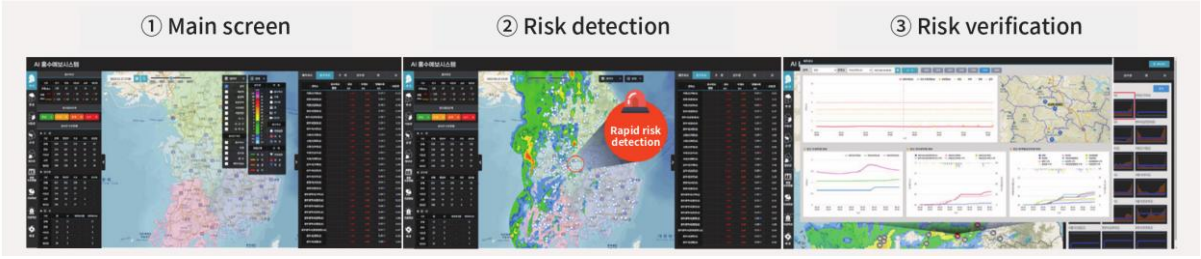
After: AI calculates hundreds of locations simultaneously and detects risk signs → results produced within 10 minutes

Prediction results generated by the AI are presented to forecasters through a Geographic Information System (GIS) interface. Key indicators such as upstream and downstream water levels and rainfall are visualized together, allowing forecasters to verify and adjust their assessment before deciding whether to issue a warning. Once a warning is issued, text alerts, map services, and navigation voice guidance are activated immediately, helping people recognize and avoid flood-prone areas in advance, even while on the move.

The system is continuously enhanced through operation. After each flood event, prediction errors are analyzed and data gaps are filled for retraining; performance is monitored throughout the flood

season, and the model is improved after each season using the accumulated data. As a result, a forecasting system once centered on major rivers now extends to tributaries and small streams, and warning issuance and dissemination have been unified—creating a forecasting system closely tied to people's daily lives.

< AI Flood Forecasting Platform Interface >



① (Main screen) Displays GIS-based information, with left and right search panels

② (Risk detection) Triggers an alarm for a location when the water level is expected to reach the flood warning threshold

③ (Risk verification) Displays predicted water levels, flow rates, and other forecast results for locations expected to reach the threshold

Source: Provided by the Ministry of Climate, Energy and Environment

▶ Automated Delivery of Flood Forecasts (Changes in How Warnings Reach the Public)

Previously, flood warnings were disseminated by drafting a warning notice and manually entering it into the system. This process has now been integrated and automated into an automatic notification system, enabling flood warnings to reach the public and relevant agencies nationwide more quickly.

Emergency text alerts sent to the public now go beyond plain text. Using smartphone location data (Global Positioning System, GPS), they display the warning location, flood-prone areas, and the user's current location together on a map. This allows people to intuitively check where they are in relation to hazardous areas and to avoid approaching flood-risk zones.

In addition, since July 2024, a service has been in place that displays relevant information on the navigation screen and provides voice alerts when drivers approach flood-risk areas (dam discharge points and flood warning locations). This service was introduced in collaboration with the Ministry of Climate, Energy and Environment, the Ministry of Science and ICT, NIA, and six private navigation service providers.

As a result, people can recognize and respond to flood risks even while traveling, further strengthening the prevention of flood-related accidents.

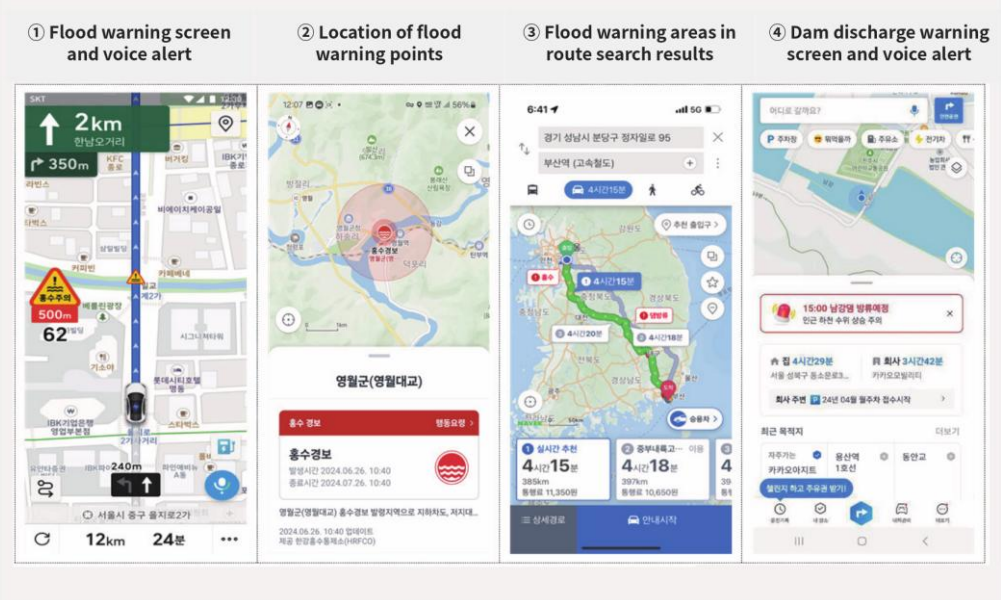
< Example of an Emergency Text Alert >



Alert received **Information page** **My location and flood-prone areas**

Alert text on screen: “[Emergency Alert] Flood advisory issued at 08:00 today for the Mokdo Bridge station on Dalcheon Stream, Goesan-gun. Please prepare for possible damage. Check your location and flood-prone areas: vo.la/UbJqF [Han River Flood Control Office]”

< Navigation Guidance Service >



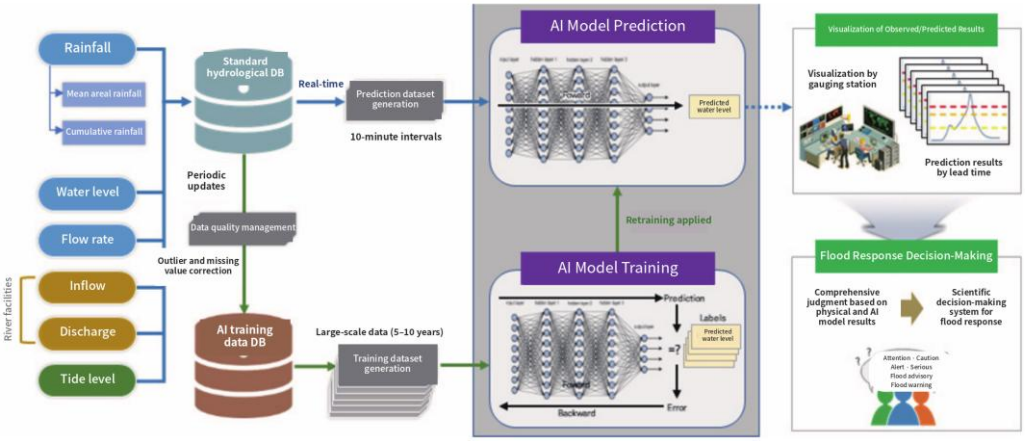
Source: Provided by the Ministry of Climate, Energy and Environment

Models and Data

What Models and Data Were Used to Build the AI Flood Forecasting System?

The system uses LSTM, a recurrent neural network (RNN) model widely used for time-series forecasting, together with the TensorFlow library (version 2.14.0) on Python (version 3.11).

< AI-Based Flood Prediction Workflow >



Source: Provided by the Ministry of Climate, Energy and Environment

To improve the accuracy of flood prediction, a variety of hydrological and meteorological factors affecting water levels at target locations were used as training data.

Specifically, key variables included upstream water levels, rainfall, mean areal rainfall, flow rates, dam and weir inflows and discharges, and tide levels. The training dataset was built from historical observations of these variables at 10-minute intervals.

Implementation Progress

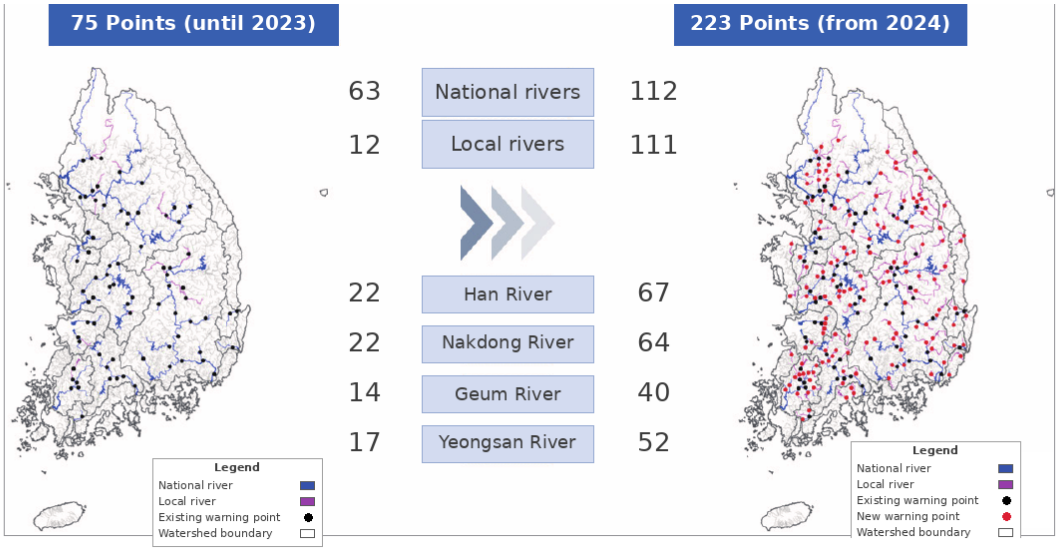
First Year of the AI Flood Forecasting System: Flood Warnings Up Fivefold

The AI Flood Forecasting System has expanded in stages—not merely as a technology deployment, but through the establishment of a legal and institutional foundation and through field operations. The platform development project, launched in 2022, progressed through data collection, model development, and pilot operation. In 2024, the system was formally institutionalized and fully transitioned into a public service.

Key Milestones

- **2022–2024:** Development of the AI flood forecasting platform, dataset preparation, and system design
- **April 2024:** Amendment of the Enforcement Rules of the Water Resources Act → flood warning points expanded from 75 to 223 (including local rivers, from 12 to 111)
- **May 2024:** Full-scale launch of the AI Flood Forecasting System
- **July 2024:** Launch of the navigation voice guidance service

< Expansion of Flood Warning Points >



Source: Provided by the Ministry of Climate, Energy and Environment

Results of the AI Flood Forecasting System

- **Average flood warnings over the past 10 years:** 34 per year
- **Flood warnings issued in 2024:** 170 in total (approximately a fivefold increase)
- **Warnings issued at newly added points:** 133 (78% of the total)
- **Warnings for local rivers:** 11 times more than in the past

These changes went beyond a mere increase in the number of warnings, leading to a substantive improvement in public safety. People could become aware of flood risks earlier and gained more time to evacuate, while GPS-based emergency alerts and map services helped keep them away from flood-risk areas. A public opinion survey also showed a positive rating of 55%, and these achievements were officially recognized with the Presidential Award (Grand Prize) at the 2024 Government Innovation Best of the Best Competition.

Future Plans

Another Leap Forward for the Flood Safety Net of the Future

The AI Flood Forecasting System has only just taken its first step. Going forward, it will become a safety net closer to the public through more precise predictions and broader services.

Key Plans

- **Data enhancement:** Supplementing training data and learning from new flood events
- **Operational stability:** Strengthening 24-hour uninterrupted service
- **Expertise development:** Enhancing forecasters' capabilities and field response
- **Expansion of tailored services:** Advancing everyday safety services such as text alerts and navigation guidance

Ultimately, the system aims to deliver "AI alerts that sound before the raindrops fall," evolving beyond a forecasting system into a frontline shield that protects lives in the era of the climate crisis.

Organization	Ministry of Climate, Energy and Environment
Department	Water Disaster Response Division
Service Launch	May 2024
Budget (2024–2026)	KRW 12.2 billion
Application Area	Public Services
Service Type	Analysis and Utilization
Technology Type	Expert Systems

Key Summary: AI Flood Forecasting System

Category	Key Details
AI Model Selection and System Configuration	• (Core model) Uses an LSTM-based deep learning time-series model as the core engine to learn location-specific hydrological characteristics and perform short-term lead-time forecasting • (Automation) Collects and automatically analyzes rainfall, water level, flow rate, and other data at 10-minute intervals, with unified warning issuance and dissemination
Data Acquisition and Utilization	• (Data types) Training data built from historical observations at 10-minute intervals, including upstream water levels, rainfall, flow rates, and dam discharges • (Data augmentation) For locations with insufficient data, physical model results are used to supplement training data, with repeated retraining to improve accuracy
Quality Improvement and Operation/Enhancement Plans	• (Quality management) Continuously enhances the model by reviewing prediction errors after flood events and retraining with supplementary data • (Public delivery) Delivers warnings through everyday channels such as GPS-based emergency alerts, flood-prone area maps, and navigation guidance • (Institutional basis) Amended the Enforcement Rules of the Water Resources Act in April 2024, expanding flood warning points from 75 to 223

Appendix 1: Expert Recommendations

Hwi-woong Jung | Director, 42Maru

Given the deepening uncertainty of the climate crisis and Korea's distinctive topography, with approximately 63% of its land covered by mountains, an advanced strategy is needed that can proactively assess not only the accuracy of flood predictions but also the actual scale of potential damage. I would therefore offer the following two key recommendations for a qualitative leap forward of the AI Flood Forecasting System.

First, the prediction model should be expanded to include topographic variables. Beyond the current model, which centers on rainfall and river water levels, it should be extended to cover topographic and forest variables that critically affect inflow. Linking forest and topographic data held by other ministries—such as the Korea Forest Service's Mountain Area Information System—would allow more precise estimation of the time it takes for rainfall to reach a watershed and the resulting inflow.

Second, beyond forecast accuracy, the system needs to provide greater specificity about potential damage. By combining the AI model with various spatial information systems, such as the Land Cover Map of the Ministry of Environment (now the Ministry of Climate, Energy and Environment), it should go beyond simply identifying areas expected to be flooded and simulate, in a multidimensional way, the social and economic damage expected when flooding actually occurs.

Furthermore, establishing tailored monitoring systems that reflect land-use characteristics—such as farmland, urban areas, and industrial complexes—would not only enable forecasters to assess situations more intuitively but also provide local governments with a decision-support system for allocating resources rationally according to the scale of damage and the level of risk.

Kilkon Ko | Professor, Graduate School of Public Administration, Seoul National University

The Long Short-Term Memory (LSTM) model used in this system is a deep learning model designed to effectively learn long-term dependencies in time-series data. It is considered a theoretically appropriate choice for flood prediction, in which time lags and cumulative effects—such as the "rainfall–runoff–water level" sequence—are critical. Because flooding is a nonlinear and dynamic process that depends heavily on past information such as antecedent rainfall, soil moisture conditions, and earlier water levels, LSTM can be seen as having a potential advantage over simple regression models or traditional statistical techniques in capturing complex temporal patterns.

However, the validity of this model choice amounts only to "potential suitability"; actual predictive performance can vary considerably depending on the composition of the training data and the validation procedures. I would therefore like to offer a few important cautions.

First, purely data-driven models such as LSTM have the limitation of not explicitly reflecting the constraints of physical hydrological processes. Prediction results should therefore be used as reference information to support decision-making rather than regarded as absolute truth. It should be made clear that the AI model serves only as a reference and that final decisions must always prioritize expert human judgment. Decision-makers should not bear the burden of proof merely because their judgment differs from that of the AI.

Second, if at least a minimum level of explainability regarding the relationship between the model's

input variables and its predictions is not ensured, it may be difficult to secure accountability and policy legitimacy in the event of a forecasting failure. It should also be clearly recognized that if extreme rainfall patterns never before observed emerge due to climate change, AI models based on historical data are likely to perform poorly when extrapolating beyond the range of their training data.

Yong-min Park | Team Leader, LG AI Research

The AI Flood Forecasting System is highly significant in that it has extended the previous forecasting system, which was concentrated on major rivers, to tributaries and small streams, thereby establishing an integrated management foundation that reflects the organic connectivity of river systems nationwide.

In particular, data linkage that takes into account the structural characteristics of river networks, together with the automation of analysis and dissemination, represents an important advance. It has effectively overcome the spatial and temporal limitations of the previous manual forecasting system and substantially improved field response capabilities.

To further strengthen the system, the structural advancement of the prediction model should be pursued in stages, drawing on leading international examples such as the European Centre for Medium-Range Weather Forecasts (ECMWF). Going beyond simple numerical prediction, introducing Graph Neural Network (GNN) technology—which can more faithfully reflect spatial characteristics such as river confluences and bifurcations—would enable the model to learn more precisely not only upstream–downstream correlations but also the complex interactions between atmospheric and hydrological systems. This would mark a key technological turning point for improving prediction accuracy amid increasingly frequent extreme rainfall and compound flood events.

In conclusion, rather than resting on its current achievements, the system should continue to evolve through ongoing data accumulation and algorithm improvement. If greater technical maturity is combined with accumulated field experience, the AI Flood Forecasting System can establish itself as a highly reliable national flood response platform that safeguards public safety in the era of the climate crisis.

Appendix 2: Interview with the Project Officer

Sang-geun Park | Senior Researcher, Water Disaster Response Division, Ministry of Climate, Energy and Environment

Q. Compared with other weather or natural disaster prediction and forecasting systems, were there any challenges specific to building a flood forecasting system?

A. Flood warnings issued through the flood forecasting system are delivered directly not only to local governments and related agencies but also to the public. That makes them disaster information with enormous reach and impact. Our greatest concern, therefore, was that if prediction accuracy was not sufficiently ensured, it could cause unnecessary confusion or undermine public trust in the government. Also, because government-level flood forecasting using AI was a world first, we had no international examples to refer to, which was another challenge.

In the end, we had to build our own safeguards. Rather than using AI analysis results as they are, we introduced a dual verification system in which forecasters double-check physical model results and real-time hydrological data. This allowed us to substantially reduce those concerns.

Q. Please tell us about the model used for flood prediction—how it was selected and why.

A. Flooding is a highly continuous process. Rain falls, flows across the land surface, and gathers in rivers; as water levels rise and exceed a certain threshold, flooding occurs. So if hydrological data such as water levels, rainfall, dam discharges, and tide levels are observed well over time, we can predict to some extent what will happen next.

LSTM (Long Short-Term Memory) models are known to be relatively well suited to analyzing this kind of time-series data, which accumulates and changes over time, so we adopted this approach. Fortunately, Korea has been consistently collecting and managing hydrological data for more than 50 years through four flood control offices nationwide, which gives us a relatively favorable environment in terms of data availability.

Q. This project must have required institutional changes, such as amendments to rules and regulations. Were there any difficulties?

A. The biggest institutional change in introducing AI into flood forecasting was revising the flood warning format so that warnings, which had previously been issued one location at a time, could be issued for multiple locations simultaneously. Beyond that, there were no major difficulties in amending other rules or guidelines.

Q. What difficulties did you face during the service planning stage (project launch and initial adoption)?

A. The biggest difficulty was the misconception that “introducing AI will solve every problem.” For natural disasters such as localized torrential rain driven by climate change—events we have never experienced before—there are clear limits to what AI can do with historical training data alone. So we thought it was important to recognize these limitations clearly from the outset and to develop response strategies that distinguish between what AI can and cannot do well.

Q. Is there any budget, organizational, or other support system in place—or needed—to sustain and advance the project?

A. After we built the AI flood forecasting platform from 2022 to 2024 and requested a budget for further enhancement starting in 2025, we were sometimes asked, “It’s already built—isn’t the work

finished?” But AI is not a system you build once and leave. You have to keep accumulating data and repeating training to improve accuracy. Unlike conventional physical models, which are complete once built, AI requires continuous investment, budget, and specialized personnel. I believe greater understanding and support in this regard will be needed going forward.

Q. What efforts have you made to secure data for building an organization-specific AI service?

A. As I mentioned, we have more than 50 years of hydrological data for flood forecasting. However, unlike in the past, recent rainfall and typhoons often bring heavy rain in a short time, and data are still insufficient in some cases—particularly for forecasting on local rivers, where data are scarce. To compensate for this shortage of training data, we are conducting R&D to train models on unstructured data such as satellite and radar imagery and to apply them to flood forecasting. We expect that using information on the spatial distribution of hydrological data will help overcome the limitations of relying only on rainfall observed at existing gauging stations.

Q. Were there particular criteria or reasons for selecting the AI model, and were there any related security issues?

A. All our models are trained on data we have secured ourselves, so there were no particular security issues.

Q. Please describe any other key considerations during implementation, or how you overcame difficulties.

A. Introducing AI does not immediately produce the results you want. But the clear advantage of AI is that it keeps getting better as you secure more data and continue training it. In other words, it is not a system you build once and are done with; the returns grow the more consistently you invest. Fortunately, opportunities for related R&D and collaboration with other ministries have recently been increasing. If this interest and investment continue, I expect that in a few years the public will see AI being used in far more areas of everyday life.

CASE 2 | ENVIRONMENT

K-water, flowing smoothly on AI autopilot

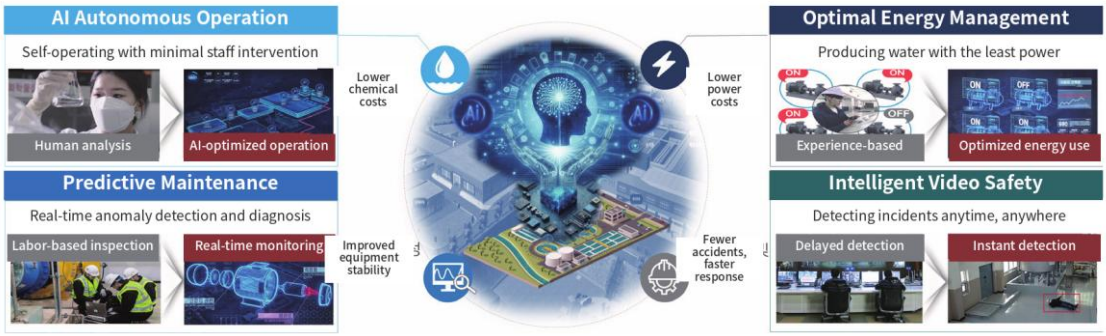
A Self-Operating Water Treatment Plant: A 24-Hour, Uninterrupted Water Safety Net

Ministry of Climate, Energy and Environment (Korea Water Resources Corporation): AI Smart Water Treatment Plant

The AI Smart Water Treatment Plant is a next-generation water management system that autonomously controls and optimizes the water treatment process. Unlike conventional methods that relied on human experience and intuition, AI predicts water quality and demand and automatically controls pumps, valves, and chemical dosing, creating a water safety net that operates without interruption 24 hours a day. The system also optimizes energy consumption through an Energy Management System (EMS), detects equipment failures in advance through a Predictive Maintenance System (PMS), and supports video-based safety and security management—ensuring a stable and efficient water supply even in the era of the climate crisis. A water treatment plant that runs itself: this is the AI Smart Water Treatment Plant pioneered by the Korea Water Resources Corporation (K-water).

AI Smart Water Treatment Plant – Key Functions

- **Autonomous operation of the entire treatment process:** AI independently controls all eight processes—receiving well → chemical dosing → mixing and coagulation → sedimentation → filtration → ozonation → granular activated carbon (GAC) filtration → disinfection
- **Control based on demand and water quality forecasts:** Predicts and automatically adjusts inflow valve opening, coagulant dosing rate, sedimentation basin retention time, residual ozone concentration, and more
- **Smart energy management (EMS):** Analyzes real-time power consumption to control peak loads and reduce electricity costs
- **Predictive maintenance (PMS):** Monitors signs of failure in pumps, valves, and other equipment in real time, supporting root-cause analysis and preventive maintenance
- **Intelligent video surveillance:** Detects safety and security incidents through video, including fire, leaks, intrusion and loitering, falls and electric shock, and failure to wear hard hats



Models used: Built on open-source technology, deployed process by process within an internal closed-network system

Source: Ministry of Climate, Energy and Environment (K-water), Smart Water Treatment Plant materials

Background

From Skilled Experience to the Era of AI Precision Control

Operator A: *"Whenever water quality suddenly changes, I'm always on edge about which chemicals to add and how much."*

Manager B: *"When equipment breaks down, our response is often delayed, and the entire operation can be thrown off."*

The operation of water treatment plants, which manage the lifeblood of citizens, has long depended on human experience and intuition. However, the climate crisis, fluctuating water quality, and rising energy costs have exposed the limits of this approach. Relying solely on the judgment of skilled staff made it difficult to guarantee stable operations, and unintended mistakes—"human error"—translated directly into safety and environmental risks. Water treatment plants are now entering an era in which AI analyzes data and controls operations on its own.

AI now operates processes autonomously, optimizes energy use, and detects equipment failures in advance to prevent them. The precise calculations of AI are replacing operating methods built up through human experience.

Key Features

A Water Treatment Plant of the Future, Driven by AI Algorithms

The AI Smart Water Treatment Plant is a future-oriented system that transforms a plant once dependent on human intuition and experience through AI data analysis and precision control. Big data–based AI runs the processes on its own, saves energy, keeps equipment free of breakdowns, and responds quickly to safety incidents.

In short, four core technologies—"autonomous operation, energy optimization, predictive maintenance, and video-based safety"—are coming together to completely transform how water treatment plants are operated.

▶ Smart Processes Run by AI

- The brain of the smart water treatment plant is its AI model.
- Operational and laboratory data from the field are collected in real time.
- AI analyzes the data and predicts the optimal operating strategy.
- Equipment is controlled automatically according to the predicted values.

* Model development process: Data collection and preprocessing → Identification of key variables → Clustering → Prediction model development → Performance evaluation → Field validation

< Smart (AI) Water Treatment Plant Model Development Process >

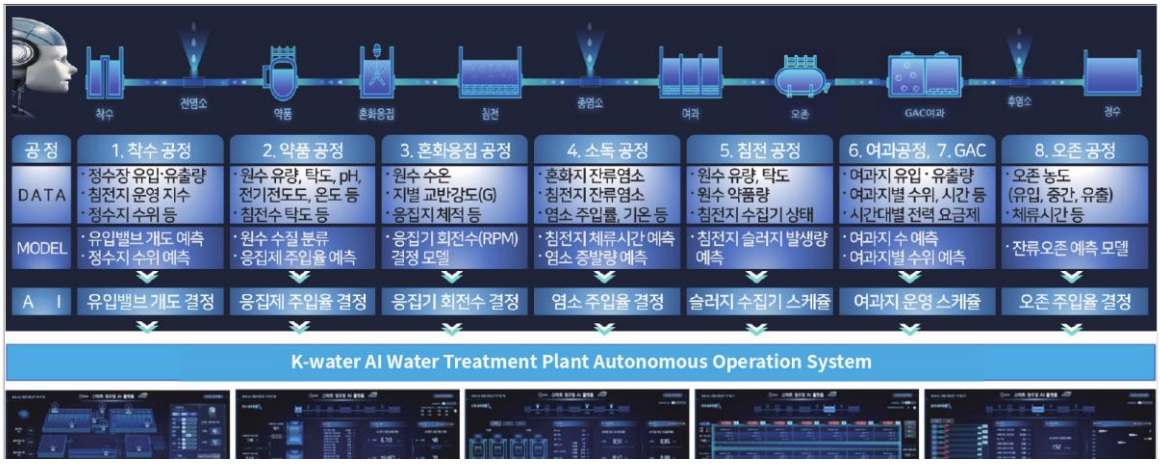
Stage	Key Activities	Core Technology / Methodology	Objective
① Data collection and preprocessing	Collection of historical operational and laboratory data; noise removal and correction of missing values	Extreme value filtering, data normalization	Ensure data reliability

Stage	Key Activities	Core Technology / Methodology	Objective
② Extraction of key influencing factors	Correlation analysis among variables and identification of key variables	Correlation analysis	Identify key variables
③ Clustering	Pattern analysis of key variables and data clustering	K-Means, hierarchical clustering	Improve prediction accuracy
④ Prediction model development	Performance comparison of various AI algorithms and selection of the optimal algorithm	LGBM, EGB, NN, etc.	Develop the optimal AI model
⑤ Performance evaluation	Validation of AI model performance using statistical techniques	Statistical analysis, simulation	Verify performance reliability (95%+ confidence)
⑥ Field validation	Comparison and verification of operator and AI operating results	Comparative analysis under identical conditions	Verify field reliability (95%+ confidence)

Source: Ministry of Climate, Energy and Environment (K-water), Smart Water Treatment Plant materials

A Smart Water Treatment Plant Built on Four Core Technologies

- **AI autonomous operation:** Real-time analysis and control of water quality, production volume, and chemical dosing → stable and efficient operation



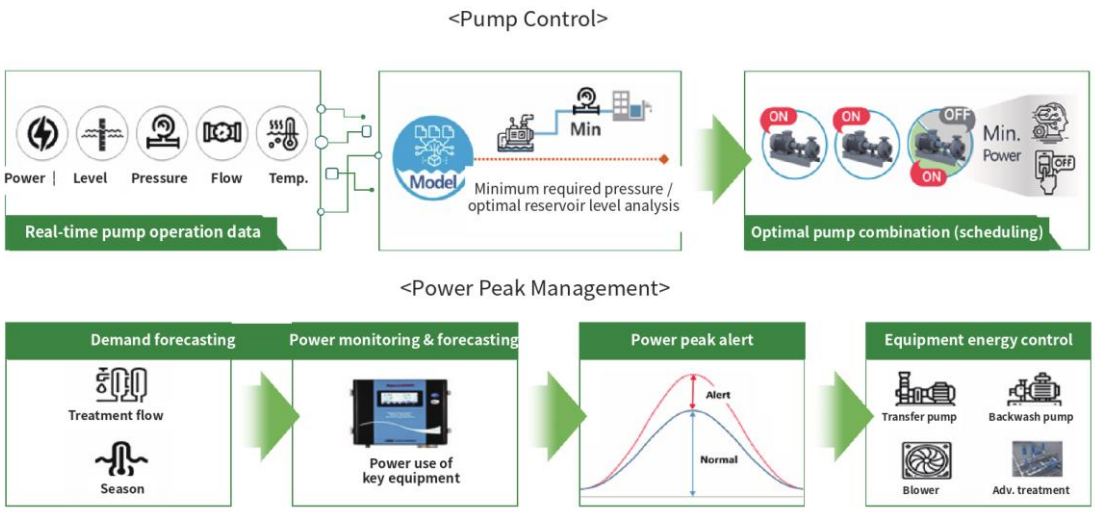
Source: Ministry of Climate, Energy and Environment (K-water), Smart Water Treatment Plant materials

< Process-by-Process Autonomous Operation (translation of the panel shown above) >

Process	DATA	MODEL	AI
1. Receiving well	Plant inflow and outflow; sedimentation basin operating index; clear well water level, etc.	Inflow valve opening prediction; clear well water level prediction	Determines inflow valve opening
2. Chemical dosing	Raw water flow, turbidity, pH, conductivity, temperature, etc.; settled water turbidity, etc.	Raw water quality classification; coagulant dosing rate prediction	Determines coagulant dosing rate

Process	DATA	MODEL	AI
3. Mixing and coagulation	Raw water temperature; mixing intensity by stage (G); coagulation basin volume, etc.	Flocculator speed (RPM) determination model	Determines flocculator speed
4. Disinfection	Residual chlorine in mixing and sedimentation basins; chlorine dosing rate; air temperature, etc.	Sedimentation basin retention time prediction; chlorine evaporation prediction	Determines chlorine dosing rate
5. Sedimentation	Raw water flow and turbidity; raw water chemical dosage; sludge collector status in sedimentation basins	Prediction of sludge generation in sedimentation basins	Schedules sludge collectors
6. Filtration and 7. GAC	Filter inflow and outflow; water level and time by filter, etc.; time-of-use electricity rates	Prediction of the number of filters; prediction of water level by filter	Schedules filter operation
8. Ozonation	Ozone concentration (inflow, intermediate, outflow); retention time, etc.	Residual ozone prediction model	Determines ozone dosing rate

- **Energy management (EMS):** Pump efficiency improvement and power peak distribution → lower electricity costs



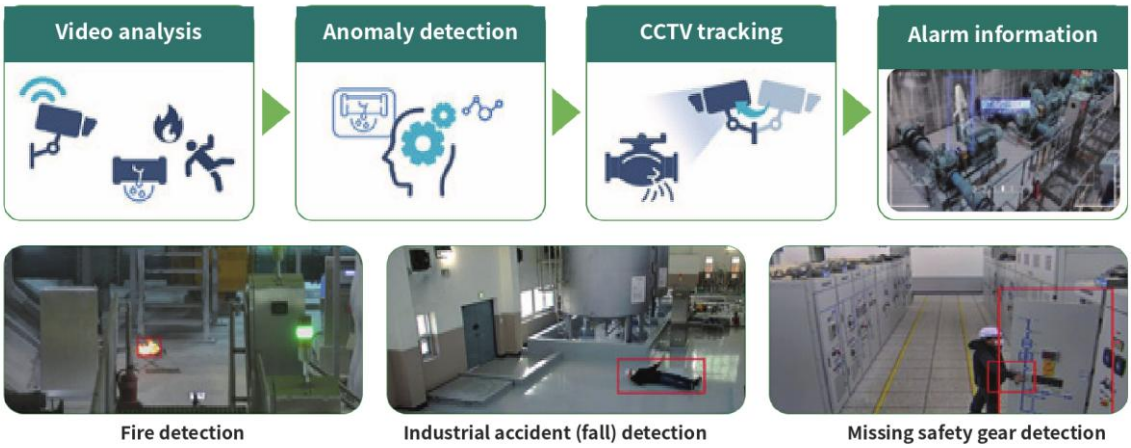
Source: Ministry of Climate, Energy and Environment (K-water), Smart Water Treatment Plant materials

- **Predictive maintenance (PMS):** Early detection of equipment anomalies through sensors → failure prevention and more efficient maintenance



Source: Ministry of Climate, Energy and Environment (K-water), Smart Water Treatment Plant materials

- **Intelligent video safety:** AI video analysis of CCTV footage → immediate detection of fire, leaks, and worker accidents



Source: Ministry of Climate, Energy and Environment (K-water), Smart Water Treatment Plant materials

Models and Data

- (Development tools) Python, Java
- (Models) Built on open-source technology and deployed process by process within an internal closed-network system — AI autonomous operation, EMS, and PMS
- (Prediction models) Regression models (Ridge, Lasso, etc.), time-series models (GRU, LSTM, etc.), ensembles, etc.
- **(Classification models) K-means, etc. — Intelligent video:** YOLOv7 object detection model
- (Data) Plant operational data and CCTV video data

Implementation Process

Smart Waterways Spread Nationwide!

The Smart (AI) Water Treatment Plant was not introduced nationwide from the start. It began as a small pilot, and after its results were verified, it was expanded across the country.

Date	Milestone
July 2020	Launch of the “Smart Network Management Infrastructure for Multi-Regional Water Treatment Plants” project led by the Ministry of Environment
January 2021	Start of the Smart (AI) Water Treatment Plant pilot project at the Hwaseong Water Treatment Plant in Gyeonggi Province
April 2022	Completion of the Hwaseong pilot
November 2022	Based on the verified pilot results, launch of the expansion project to 42 water treatment plants operated by K-water
November 2024	Completion of the expansion to 42 multi-regional water treatment plants nationwide
December 2024	Initial autonomous operation applied at 43 plants, including the Hwaseong pilot → annual savings of KRW 9.4 billion

Challenges and Solutions

- **People-dependent operation → AI autonomous operation:** Human error caused by reliance on experience and intuition minimized through AI real-time analysis and control
- **Limited response to changes in water quality and demand → Forecast-based operation:** Stable production and supply secured through big data and AI forecasting
- **Burden of electricity costs → Energy management (EMS):** Costs reduced through pump efficiency improvements and power peak distribution
- **Vulnerability to equipment failures → Predictive maintenance (PMS):** Early detection of failure signs through sensor-based diagnosis, and a shift to condition-based maintenance (CBM)
- **Blind spots in safety management → Intelligent video safety:** Fire, leaks, and worker accidents detected immediately through AI analysis of CCTV footage, enabling response within the golden time

Outcomes

Smarter Operations, Visible Results

The introduction of the Smart (AI) Water Treatment Plant fundamentally changed how water treatment plants are operated. Before its introduction, operators manually controlled valves, pumps, and chemical dosing, creating a high risk of human error, while power peaks and inefficient pump operation increased costs. Because equipment relied solely on periodic inspections, failures were difficult to prevent in advance, and safety management remained at the level of simple CCTV monitoring, often missing the golden time when accidents occurred. Since AI was introduced, however, the plants have been completely transformed.

- **Operational efficiency:** AI analyzes and forecasts data to control processes autonomously → fewer manual operations, less human error, and greater stability
- **Cost reduction:** Production costs reduced through the application of AI technology

Savings Achieved by the AI Smart Water Treatment Plant

- **Coagulant:** 7.6% reduction; disinfectant: 4.1% reduction
- **Electricity costs:** 1.5% reduction; inspection costs: 35% reduction
- **Losses from industrial accidents:** KRW 350 million reduced per year; total annual savings: KRW 9.4 billion

- **Innovation in equipment management:** PMS detects early signs of failure through real-time sensor diagnosis → shift from time-based maintenance (TBM) to condition-based maintenance (CBM)
- **Stronger safety:** AI video analysis immediately recognizes fire, leaks, and worker accidents → response within the golden time

< Before-and-After Analysis of AI Water Treatment Plant Effects by Process >

① Developing the analysis method	② Effect analysis at representative sites (Gosan, Paldang)	③ Finalizing the analysis method
8 processes, 6 items Processes: coagulation, sedimentation, filtration, chemicals, disinfection, EMS, PMS, intelligent video Items: electricity, production, chemical, disinfection, inspection, and industrial accident costs	Effect analysis of the Gosan (treatment) and Paldang (intake) plants (unit: KRW 100 million/year) Effect analysis of all sites (unit: KRW 100 million/year) * PMS and intelligent video	5 processes, 5 items Processes: chemicals, disinfection, EMS, PMS, intelligent video Items: chemical, disinfection, electricity, inspection, and industrial accident costs

< Paradigm Shift in Water Treatment Plant Operation and Management >

	Approach	Description
As-Is	People-centered operation and management	Plant operation dependent on staff judgment and experience; simple visual inspections (weak response to equipment accidents); equipment inspections by external contractors → “People-centered”
To-Be	“AI + staff” integrated operation and management	Simple, repetitive tasks (chemical dosing, pump on/off, etc.) → “Handled by AI”; crisis response to water supply incidents, water quality deterioration, etc., and on-site equipment inspection → “Handled by staff”

< Effects of Expansion to 43 Multi-Regional Water Treatment Plants >

Area	Effect
High-quality tap water production	Production and supply of tap water the public can drink with confidence
Operational stability	Stable, 24-hour autonomous plant operation
Economic impact	Reduction in production and recovery costs (KRW 9.4 billion/year): electricity KRW 1.99 billion/year; chemicals KRW 2.72 billion/year; maintenance KRW 4.38 billion/year; industrial accident prevention KRW 350 million/year

Source: Ministry of Climate, Energy and Environment (K-water), Smart Water Treatment Plant main materials

Having achieved notable results in operational efficiency, cost reduction, and safety management, the smart water treatment plant has also gained international recognition for its technology: the Hwaseong Water Treatment Plant was selected as a “Global Lighthouse” by the World Economic Forum (WEF). Expanded to 42 multi-regional water treatment plants nationwide at the end of 2024, it has become the standard Korean model for smart water treatment plants, combining operational stability and efficiency. Furthermore, through cooperation such as technology transfer to small but strong domestic ICT companies, and building on its experience at international exhibitions such as CES and ACE, it is expected to strengthen its competitiveness in the global water industry market.

Future Plans

The Challenge of Fully Autonomous Operation

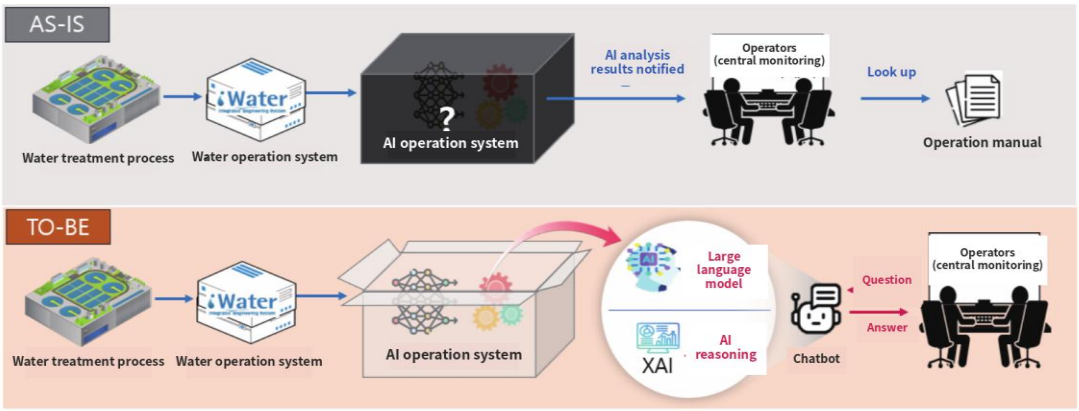
While the AI Smart Water Treatment Plant has demonstrated savings in chemical use, electricity, and inspection and maintenance costs, results have varied depending on each site's operational level and raw water quality. Going forward, K-water plans to strengthen the system's ability to respond to abnormal situations through AI advancement and to achieve site-specific optimization, thereby maximizing the technical, economic, and environmental benefits.

As of December 2024, Phase 1 initial autonomous operation has been applied at 43 multi-regional water treatment plants nationwide, including the Hwaseong plant, with verified annual savings of KRW 9.4 billion in chemical, electricity, and maintenance costs. However, while the initial AI performs well in routine operations based on historical data, its ability to respond to changes in operating conditions and abnormal situations is limited. Advancement strategies are being pursued to overcome these limitations.

The planned directions are as follows:

- **Fully autonomous operation:** Achieve fully autonomous water treatment plants by 2030 by integrating the latest ICT and AI
- **AI model advancement:** Strengthen real-time data analysis and autonomous decision-making by introducing generative AI

< Example of Generative AI-Based Operation >



- **Transformation of the inspection system:** Replace simple, repetitive, and standardized inspections and diagnoses, as well as high-risk work, with Physical AI (robots, drones, etc.) to improve workforce efficiency and safety

< Inspection Robots >



* Use of inspection robots: Performing repetitive and hazardous tasks in place of workers (safety, diagnosis, supervision, etc.)

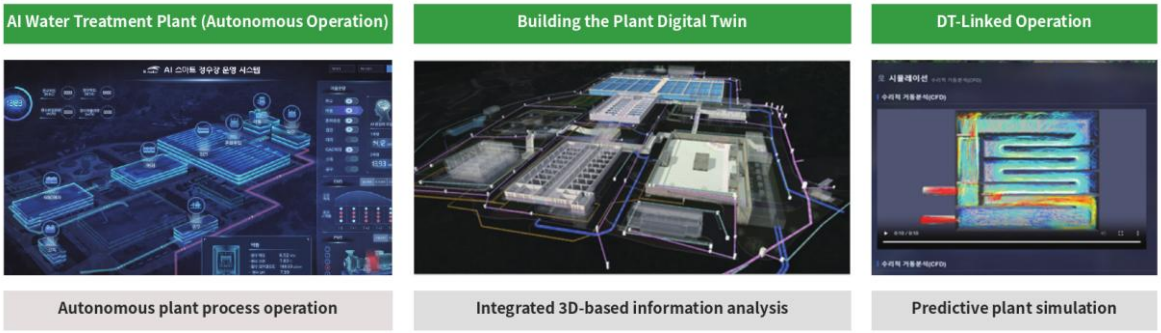
< Inspection Drones >



* Use of inspection drones: Maximizing inspection efficiency and improving safety for dispersed water facilities and hard-to-inspect facilities (pipelines, solar panels at water treatment plants, etc.)

- **Digital twin:** Build a virtual model identical to the actual water treatment plant → create a comprehensive decision-support system that improves efficiency through simulation and predicts potential risks in advance

< AI and Digital Twin (DT)-Based Integrated Plant Operation >



- **Green transition:** Introduce technologies that improve energy efficiency and reduce carbon emissions → complete a sustainable water management system
- **International certification:** Pursue the establishment of an ISO international standard for AI water treatment plants (by 2027) and international standard patent applications (10 in total, by 2030) — * Obtained OECD BDN certification (Blue Dot Network, a global certification for infrastructure investment) in November 2025

< ISO International Standard Development Process >

Stage	Timing	Activities
(Preliminary) PWI – Preliminary Work Item	Nov. 2023	Review of preparatory work; proposal of the work item
(Proposal) NP – New Proposal	Nov. 2024	Presentation at the plenary meeting; approval of the proposal (approved by majority vote)
(Preparation) WD – Working Draft	Jun. 2025	Development, presentation, and agreement on detailed document content (approved by vote)
(Committee) CD – Committee Draft	Feb. 2026	Technical committee agreement; finalization of comments circulated (unanimous agreement) — in progress

Stage	Timing	Activities
(Enquiry) DIS – Draft International Standard	Dec. 2026	Document distribution and comment collection led by the Central Secretariat (unanimous agreement)
(Approval) FDIS – Final DIS	Jun. 2027	Final approval and publication of the standard (approved by a two-thirds vote)

- **Technology diffusion:** (1) Diagnosis and implementation projects to apply AI technology to water treatment processes operated by local governments (Busan, Suwon) and institutions (Korea Mine Rehabilitation and Mineral Resources Corporation); and (2) starting with an AI pilot for the chemical dosing process at a water treatment plant in Ho Chi Minh City, Viet Nam (through December 2025), follow-up projects such as at the Guluchapa water treatment plant in El Salvador

Through these plans, the Smart (AI) Water Treatment Plant will move beyond pilot results to evolve into a future-oriented water management system, establishing itself as the next-generation standard that combines stability, efficiency, and environmental sustainability.

Organization	K-water (Korea Water Resources Corporation)
Department	Water Supply Management Office
Service Launch	November 2024
Budget (2024–2026)	Phase 1 deployment (through 2024): KRW 48.1 billion; Phase 2 advancement (2026): KRW 8.0 billion
Application Area	Internal Administrative Innovation
Service Type	Other
Technology Type	Other

Key Summary: Smart Water Treatment Plant

Category	Key Details
AI Model Selection and System Configuration	• (Function-specific models) Selects the most suitable AI model for each function to maximize performance—time-series forecasting (LSTM, GRU) for precise process control, regression analysis for equipment diagnosis, and object detection (YOLOv7) for safety monitoring • (Robust security) Builds an independent, open-source-based AI system within a closed network isolated from external networks to secure water treatment plants as critical national facilities
Data Acquisition and Utilization	• (Full data lifecycle management) Collects and preprocesses large volumes of on-site operational data and CCTV video data, removing noise before use
Quality Improvement and Operation/Enhancement	• (Leading global standards) Building on the Hwaseong plant's selection as a WEF Global Lighthouse, pursues ISO international standard

Category	Key Details
Plans	development and OECD certification to spread K-water's technology as a global standard for water management • (Service advancement) Introduces digital twin technology capable of virtual simulation and generative AI to achieve, by 2030, fully autonomous water treatment plants that respond on their own even in emergencies

Appendix 1: Expert Recommendations

Jeong-hee Kang | Attorney, Bae, Kim & Lee LLC

K-water's AI Smart Water Treatment Plant is an exemplary case that has demonstrated the public value of AI technology in water management—a core infrastructure area directly linked to people's lives and safety.

In particular, the introduction of an autonomous control system using big data–based water quality and demand forecasting, together with predictive maintenance technology that detects equipment failures in advance, offers important lessons. These technologies structurally minimize human error that can occur during operations and technically compensate for the limitations of a conventional operating method that relied solely on the experience of skilled staff. As a result, by establishing a stable, 24-hour uninterrupted water supply system, the project has dramatically strengthened the continuity and reliability of public services and marked an important milestone in the digital transformation (DX) of public infrastructure.

However, to further improve the system's maturity, the safeguards required as the scope of autonomous operation expands should be reviewed more closely. As process control becomes more autonomous, the division of roles between AI and operators may become unclear in unpredictable abnormal situations, such as sudden changes in water quality, unexpected equipment failures, or external hacking.

Accordingly, while AI should lead operations at optimal efficiency under normal conditions, a structure should be in place that allows operators to intervene immediately and take manual control when data thresholds are exceeded or exceptional situations are detected. Once such emergency response protocols are established, the system can be expanded as a standard model for public infrastructure that combines stability and reliability.

Kyung-jin Cha | Professor, Hanyang University

I consider the AI Smart Water Treatment Plant a leading example of AI Transformation (AX) that has fundamentally transformed the conventional operating paradigm of water treatment plants, which faced structural limitations in the form of the climate crisis, fluctuating water quality, and rising energy costs. The previous approach, which relied on the experience and intuition of skilled personnel, had limited scalability and reproducibility, leading to risks in safety, cost, and quality. Against this backdrop, the project appears to have strategically pursued a transition to a data-centered, AI-based autonomous operation system.

In terms of the technologies applied, AI autonomous operation, demand and water quality forecasting models, energy management (EMS), predictive maintenance (PMS), and intelligent

video analysis are significant in that they were designed not as isolated technologies but as an AI orchestration structure spanning the entire process. In particular, the closed-loop structure of prediction, control, and learning can be regarded as a key foundation for evolving the water treatment plant into a single “autonomous system.”

Going forward, generative AI and digital twin technology should be combined to improve the ability to respond to sudden abnormal situations and to further strengthen optimization tailored to the characteristics of each site. In addition, it is essential to ensure explainability so that operators can understand how AI reaches its decisions, and to institutionally guarantee (internalize) the reliability of the system.

Jung-soo Kang | Director, AI Research Center, BLUEDOT AI

This project is regarded as a case with a highly ideal structure that comes close to the textbook approach for introducing AI in the public sector. The approach of technically addressing limitations that were difficult to overcome through on-site experience alone—such as fluctuating water quality, rising energy costs, and equipment failures—in a plant environment directly linked to people’s lives and safety was highly appropriate. In particular, the project’s greatest strength is that it did not stop at simply introducing AI but clearly broke the task down into “autonomous operation of eight processes, predictive maintenance (PMS), video safety, and energy optimization (EMS),” directly linking them to practical operational efficiency. This shows that AI was precisely defined not as a means of showcasing technology but as a tool for solving specific problems in the field.

The project is also highly persuasive in terms of data use and technology choices. It combined operational data and CCTV footage and selectively applied models suited to each purpose—such as time-series forecasting and regression analysis—according to process characteristics. Above all, setting a clear performance standard of “95% or higher confidence in field validation” and adopting a phased approach, from the pilot (2021–2022) to nationwide expansion (2022–2024), demonstrates how the project secured both the risk management and stability essential to public infrastructure innovation. Concrete results, such as annual cost savings of KRW 9.4 billion and a 42% reduction in manual operations by operators, support the validity of this strategy.

However, since the essence of this project lies in “autonomous operation,” future efforts should focus not merely on improving performance but on “designing for safe trust.” First, “control handover rules” and “safety thresholds (upper and lower limits)” should be formalized so that AI operates conservatively and protects the system in abnormal situations such as sudden water quality deterioration, abrupt equipment failures, or cyber incidents. Second, since performance differences due to variations in raw water quality across sites have been confirmed, a system is needed to monitor “model drift” caused by seasonal and climate changes and to continuously manage models optimized for each site.

Overall, this project is an excellent model case that balances public value, technical coherence, a diffusion strategy, and quantitative results. Going forward, rather than simply adding functions, it should also advance its safety, audit, and accountability systems. The true condition for the success of “fully autonomous operation” lies not only in building more sophisticated AI, but in completing a robust operating system that can function safely even when AI makes errors in judgment.

Appendix 2: Interview with the Project Officer

Young-guk Kang | Deputy General Manager, Water Supply Management Office, K-water

Q. What difficulties did you face during the service planning stage (project launch and initial adoption)?

A. An AI water treatment plant is not simply an IT system; it is an integrated service that requires consideration of on-site equipment, operating methods, and the entire data system, so there were several difficulties in the early planning stage. In particular, because each plant has a different equipment configuration and operating method, it took time to define a standardized service model, and reaching technical and operational agreement on how to link AI with the existing SCADA-based operating system was an important task. In addition, establishing a shared understanding within the organization—on changes in operators' roles resulting from AI adoption, trust in automation, and the scope of responsibility—was another issue we had to address from the early stages.

Q. Is there any budget, organizational, or other support system in place—or needed—to sustain and advance the project?

A. To establish the AI water treatment plant not as a one-off construction project but as an operational service that is continuously advanced, I believe a support system with a medium- to long-term perspective is important. To this end, we are working to create a budget structure that allows phased advancement rather than single-year projects, and to build a dedicated organization or a collaboration system among related units in which operations, ICT, and AI specialists can work together. We also see cooperation with external specialized agencies and research institutions—to respond flexibly to technological change—and improving internal staff's understanding of AI and their ability to use it as important elements of support.

Q. What efforts have you made to secure data for building an organization-specific AI service?

A. I believe the key to an AI water treatment plant lies in systematically organizing the operational data and field know-how that the organization has accumulated over many years and applying them appropriately. To this end, we are restructuring previously dispersed water quality, operational, and equipment data into a standardized structure and strengthening preprocessing and quality management systems to make the data suitable for AI. We are also improving data collection and management processes so that data continue to accumulate even when new equipment is introduced or operating environments change, and we are working to connect the judgment and experience of field experts with data.

Q. Were there particular criteria or reasons for selecting the AI model, and were there any related security issues?

A. Rather than whether a model represents the latest technology, our most important criteria for selecting AI models are whether they suit the operational purpose of the water treatment plant and whether explainability and stability are ensured. Depending on the purpose—such as water quality prediction, optimization of chemical dosing, or anomaly detection—we use an appropriate combination of statistical models, machine learning, and deep learning, and when applying them on site, we place great importance on a structure that allows operators to understand the results and make their own judgments. In terms of security, considering the nature of water treatment

plant operations, we designed the system so that data and AI operate in an environment separated from external networks, and we apply basic information security measures such as access rights management and log management.

Q. Please describe any other key considerations during implementation, or how you overcame difficulties.

A. Our top priority during implementation was to establish AI not as a replacement for field staff but as a tool that supports operators' judgment. To this end, from the outset we adopted a phased approach centered on analysis, prediction, and recommendation rather than fully automatic control, and we have continuously improved the reliability of AI results by reflecting operator feedback. We also recognized that securing acceptance in the field, establishing operating standards, and building a performance verification system are just as important as technology development, and we have been overcoming difficulties by advancing technology and operations together.

CASE 3 | EMPLOYMENT

An express AI service driving innovation in industrial accident investigations

AI Handles Repetitive Analysis, Officers Make the Final Decision

Ministry of Employment and Labor (Korea Workers' Compensation and Welfare Service): AI-Based Accident Investigation Support Model

The AI-Based Accident Investigation Support Model is an administrative innovation service that applies AI to the industrial accident investigation process to automatically classify and analyze accident types. By proactively supporting the investigation tasks that officers previously performed repeatedly, it improves the speed and accuracy of investigations and ensures consistent results. Using AI trained on accumulated industrial accident case data, the Korea Workers' Compensation and Welfare Service (COMWEL) helps officers focus on more detailed analysis and on determining whether an accident is work-related.

AI-Based Accident Investigation Support Model – Key Functions

- **Automatic classification of processing types:** Quickly identifies the type of processing required for an accident investigation
- **Reduced workload for officers:** AI handles simple, repetitive analysis and classification, while officers focus on determining whether an accident is work-related
- **Consistent results:** Reduces variation among officers and provides standardized classification results
- **Continuous learning and enhancement:** Improves precision and accuracy by learning from accumulated industrial accident data

Background

Workers' Rights Depend on the Speed of Investigations

Officer A: *"Accident causes are so diverse that it takes a long time to apply the criteria."*

Worker B: *"The hardest part was waiting for compensation because the investigation was delayed."*

Previously, once an application was received, officers had to review vast amounts of documents and statements themselves to investigate whether an accident was work-related. With workloads soaring and staff limited, investigation delays led directly to delays in compensation for workers. In addition, the heavy workload caused by surging applications and processing delays affected employees' mental health: the incidence of depression among staff was found to be about 2.2 times that of the general population.

To protect workers' rights through prompt decisions on whether accidents are work-related, a new solution was needed that could simultaneously improve the speed, accuracy, and consistency of investigation administration. COMWEL therefore launched the "AI-Based Accident Investigation Support Model," which uses AI trained on accumulated data to separately classify cases that can be processed quickly, helping officers focus on core analysis and on determining whether accidents are work-related.

Key Features

AI That Improves the Consistency and Efficiency of Industrial Accident Investigations

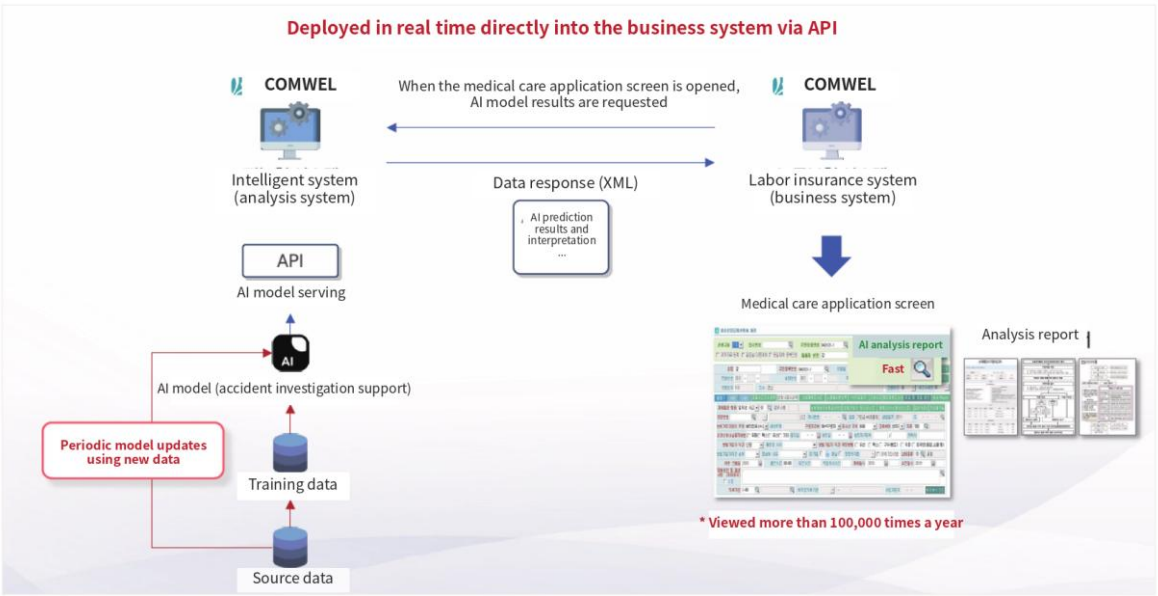
When the information entered in an industrial accident application is saved in the business system, the AI-Based Accident Investigation Support Model automatically classifies the processing type and quickly provides officers with the information they need. Its usefulness was enhanced by linking classification logic trained on historical data with an AI medical advisory model, and officers can begin investigations immediately based on the AI analysis report, greatly improving efficiency and accuracy.

- **Automatic classification of processing types:** AI automatically classifies the processing type and immediately provides officers with the information they need
- **Data-based detailed logic:** Classifies some 2,700 similar groups based on historical processing data and determines fast-track or general processing through seven-step logic, including insurance coverage, consistency of accident dates, and receipt of other compensation

* (1) Industrial accident insurance coverage; (2) date of hire; (3) consistency between the accident date and the first medical examination date (report date); (4) whether the accident was reported to the police or an auto insurer; (5) whether the accident occurred in Korea; (6) receipt of other compensation; (7) suitability of the type

- **AI analysis report:** Delivers investigation type classification results, big data analysis, AI medical advisory support, similar cases, and customized guidance to officers
- **Model linkage and greater usability:** Expands the scope of investigation support by linking with the existing AI medical advisory model

< Service Concept >



< Development Process >

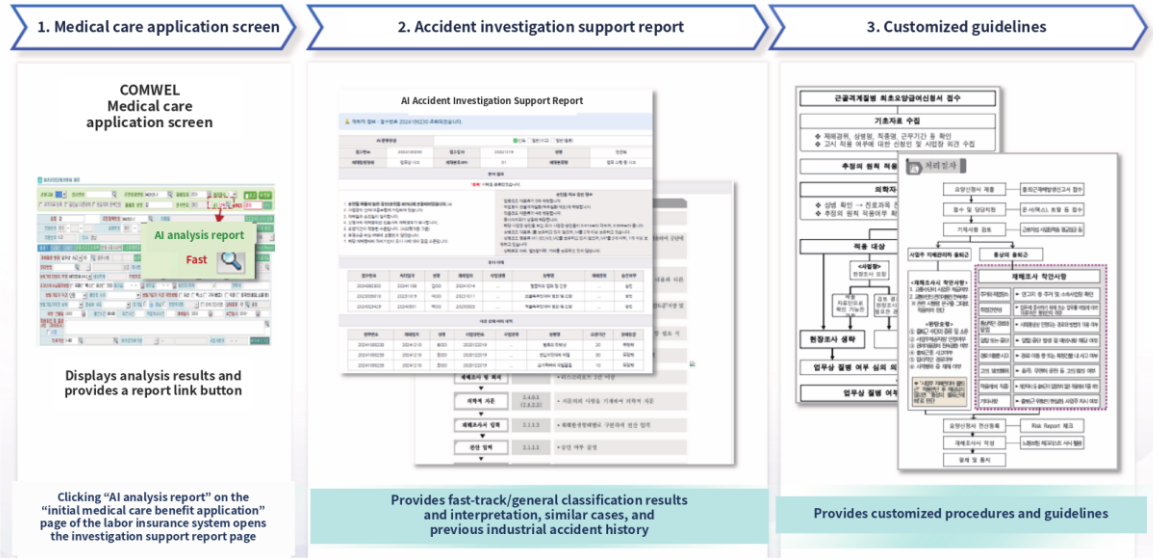


< Development Process (translation of the figure above) >

Stage	Details
Data Collection	Medical care applications from injured workers over the past 10 years (2014–2024): 1,437,585 records in total (61 variables) Injured worker information: receipt number, age group, gender, occupation/industry, workplace, etc. Claim information: accident circumstances, worker type, processing period, approval status, etc. Injury information: type of injury, diagnosis code, medical institution code, type of accident, etc. Linked data: workplace employment insurance, workplace industrial accident insurance, emergency rescue, witnesses, receipt of damages, etc.
Preprocessing & Analysis	Data exploration (missing values, errors, distribution analysis) New variable development: assessing data status → meeting on variables for model use → developing new derived variables (e.g., admission date minus accident date: was the worker admitted immediately after the accident?) Statistical tests of each variable's effect on approval: chi-square test, ANOVA (e.g., is there a gender difference between approved and rejected groups?) Building training data (37 variables in total)
AI Model Development	Model design: injured worker files a claim → AI models for fast-track/general type classification and type-specific guidelines → provides fast-track results and information, and customized guidelines Model development: hybrid AI model Model enhancement: enhancing the overall fast-track logic and the approval probability inference model

Stage	Details
AI System Development	Model deployment: near real-time generation of prediction results for new injured workers (injured worker data store → prediction data store); annual cycle of building training data → developing the AI model → deploying the AI model, so that new models are automatically developed with the latest data Model delivery: data linkage in near real time (every 10 minutes or 1 hour) from the labor insurance system (business system) to the intelligent system (analysis system), in collaboration with COMWEL's IT department; results displayed on the delivery screen

< User Work Processing Screens >



Source: Development of an AI-Based Industrial Accident Investigation Classification Model (AI-Based Accident Investigation Support Model)

Implementation Process

It May Start with Errors, but Innovation Is Achieved in the End

COMWEL pursued the development of an AI model that automatically classifies processing types based on the information in submitted applications, enabling officers to handle cases quickly. Before full-scale development, it checked the likelihood of success through an in-house proof of concept (PoC), but discovered discrepancies between initial application data and final processing data. These discrepancies were a limitation that could directly affect prediction results. To address this, COMWEL applied separate analysis time points and restructured the analysis report to include information officers could refer to immediately. Rather than relying solely on AI results, it also improved efficiency by revising work processes and rules in parallel—reflecting its determination to complete an innovative AI system.

Going forward, the AI model and reports will be advanced into user-centered visual information in connection with a new digital business processing system scheduled for introduction in July 2026.

Step	Description
PoC pre-validation	Confirmed model applicability and data usability through an in-house PoC analysis before development
Discovery of data discrepancies	Inconsistencies between initial application data and final processing data affected prediction accuracy
Separation of time points and report improvement	Applied separate analysis time points and restructured the AI analysis report to include reference information
Work process transformation	Revised rules in parallel so that AI results are used as an efficient processing tool rather than mere reference
Link to digital transformation	To be linked with the new business processing system scheduled for July 2026 and advanced with a focus on visual information

Future Plans

Beyond Perfect: Toward Flawless Industrial Accident Investigations!

COMWEL plans to continuously review analysis results and classification performance through the optimization of its AI model and to make prompt institutional improvements in parallel. At the same time, it is preparing new challenges to expand the use of AI and aims to further improve processing accuracy by introducing an advanced fraud detection system (FDS) model. Furthermore, as the public institution responsible for Korea's industrial accident compensation insurance, COMWEL will focus its organization-wide capabilities on strengthening the social safety net that protects people's lives and on delivering services that meet public expectations through public administration innovation.

- **Continuous monitoring:** Regular review of AI analysis results and classification performance, with institutional improvements in parallel
- **Model enhancement:** Preparing to strengthen the accuracy of investigation classification by applying fraud detection system (FDS) techniques
- **Expanded use:** Reviewing expansion from classification to determining whether accidents are work-related and to simplified procedures
- **Stronger social safety net:** Reinforcing the role of Korea's industrial accident compensation insurance to protect workers' lives and workplace safety
- **Public service innovation:** Focusing organization-wide capabilities on delivering services that meet public expectations

Organization	Korea Workers' Compensation and Welfare Service (COMWEL)
Department	Occupational Injury & Disease Criteria Department
Service Launch	August 2025
Budget (2024–2026)	Supported through a competitive call for the development of AI-based data analysis models to address pressing issues
Application Area	Social Problem-Solving / Internal Administrative Innovation

Service Type	Analysis and Utilization / Service Processing
Technology Type	Expert Systems / Other (big data analysis)

Key Summary: AI-Based Industrial Accident Investigation Classification

Category	Key Details
Budget and Efficiency Strategy	• (Securing the budget) Secured funding through a competitive call for the development of AI-based data analysis models to address pressing issues • (Crisis-responsive workforce strategy) Amid worsening processing delays caused by a surge in claims, made the strategic decision to resolve bottlenecks through digital transformation rather than simply adding staff
AI Model Selection and System Configuration	• (PoC) Tested various models through a PoC before full deployment and selected the algorithm best suited to processing accident investigation data • (Intelligent classification system) The validated AI model identifies the accident type upon receipt and automatically assigns the case to the responsible unit
Data Acquisition and Utilization	• (Use of existing data) Converted hundreds of thousands of past industrial accident applications and investigation reports accumulated within the organization into AI training data • (Training dataset) Refined and labeled unstructured text such as “accident circumstances” to build a high-quality training dataset that AI can understand • (Continuous learning pipeline) Rather than one-off training, the AI retrains on new case data received every day
Quality Improvement and Operation/Enhancement Plans	• (Technology enhancement) Evolving into a more precise investigation support model by applying fraud detection system (FDS) techniques used in the financial sector to maximize accuracy • (System enhancement) Linking with the next-generation system in 2026 and introducing FDS techniques, while reviewing long-term expansion to determinations and simplified procedures

Appendix 1: Expert Recommendations

Myung-ok Lee | Executive Director, Technical Support Division, Okestro

The AI-based industrial accident investigation and classification service is an example of public-sector AI use that can simultaneously improve speed, consistency, and explainability—the core challenges of industrial accident insurance administration—by embedding an "AI analysis → human review → administrative decision" structure into the workflow.

Its strengths lie in reducing the burden on investigators and improving processing efficiency: AI summarizes and organizes unstructured documents such as applications, statements, investigation reports, and medical records; structures case types, issues, and the evidence required; and presents similar cases and relevant guidelines along with their grounds. In addition, by operating on the premise of "human confirmation" rather than treating AI results as final, the service can secure the accountability and procedural legitimacy required for sensitive administrative decisions.

Going forward, explainability should be strengthened by providing, as default features, requirement–fact mapping (checking whether specific facts satisfy legal requirements) and automatic citation of grounds (relevant provisions and similar decisions), moving beyond simple classification and summarization. Investigation quality can also be improved by generating follow-up questions about missing or conflicting information (additional facts or documents needed). Furthermore, reliability will increase if a field feedback loop is established that accumulates the reasons for rejections, re-examinations, and appeals as data and reflects them in the model, and if bias is managed by checking error rates across groups such as industry, employment type, and age.

Moreover, by designing the system so that the structured information and decision grounds generated during investigations are linked to the business system and the entire case-handling process is traceable, COMWEL can lay the foundation for overall service improvements, including shorter processing times, fewer rejections and re-examinations, and better handling of civil requests.

Beyond this, because the AI-based investigation service model has a reusable standard framework—"interpreting unstructured documents → structuring issues → presenting grounds → human review → administrative decision"—it has ample potential for horizontal expansion beyond industrial accidents to similar social insurance and labor administration reviews, such as unemployment benefits, employment subsidies, substitute payments for unpaid wages, and vocational training.

Chang-seop Lee | Senior Advisor, AI & IT System Center, Kim & Chang

COMWEL's "AI-Based Accident Investigation Support Model" is an innovative attempt to address staff shortages caused by surging industrial accident claims through "AI–human collaboration." It deserves high praise for improving both administrative efficiency and service quality by automating simple, repetitive tasks with AI while allowing investigators to focus on in-depth analysis.

However, strengthening AI accountability requires a clearly established dual verification system. Because discrepancies between initial and final data can arise at any time during service operations, procedures should be designed so that cases with significant legal and administrative implications always undergo a final review by an investigator. In addition, the reliability of the

system should be ensured through continuous monitoring of AI responses and a retraining process.

Furthermore, the current model appears to focus on the benefits for workers seeking prompt compensation and for investigators seeking a lighter workload. However, since the approval of industrial accident claims is also a serious matter for employers—directly affecting insurance premium increases and administrative sanctions—future enhancements should provide objective supporting data to improve acceptance among all stakeholders. If employers are also provided with similar accident cases and prevention guidance, COMWEL can be expected to establish itself not merely as a regulatory body but as a balanced “safety partner.”

Chan-soo Kim | Professor, Department of AI Robotics, University of Science and Technology (UST)

This project can be regarded as a public administration innovation model that seeks to improve investigation speed, accuracy, and consistency by applying AI to the industrial accident investigation process to automatically classify and analyze accident types and by proactively supporting the determination and classification tasks that investigators previously performed repeatedly. In particular, by putting forward a clear division of roles—“AI handles repetitive work, investigators handle analysis”—it presents a scalable model in which AI supports work efficiency and quality rather than replacing people, which aligns closely with the goal of spreading AI in the public sector.

In addition, against the real-world backdrop of surging claims and investigation delays leading to delayed compensation for workers, designing the system to ease investigators’ mental burden (excessive workload) so that they can focus on analyzing causes and preventing recurrence is a sound approach that addresses both “better public service quality and reduced burden on staff.” In terms of methodology, the flow from the intake stage—“automatic classification → detailed logic → AI analysis report → linkage with the medical advisory model”—is concrete. In particular, the “business rules + AI” approach, which uses historical processing data to classify similar groups and determines types through step-by-step logic, offers a highly useful reference for other institutions.

However, since industrial accident determinations directly affect people’s rights and interests, future system operations should be improved to clearly reflect the principles for using the “AI analysis report” and a structure in which humans make the final decision. In addition, considering the impact of classification results on stakeholders, I recommend presenting fairness-related operational elements—such as appeal and review channels and bias checks—as checkpoints for wider adoption.

Appendix 2: Interview with the Project Officer

Hyang-a Lee | Team Leader, Occupational Injury & Disease Criteria Department, COMWEL

Q. What difficulties did you face during the service planning stage (project launch and initial adoption), and how did you overcome them?

A. Our main goal in designing the model was to help officers process industrial accident cases quickly by checking the AI analysis results and conducting additional investigation only where necessary. To this end, we interviewed staff at our regional offices to gather their views on key elements such as type classification criteria, standardization of investigation checklists, how analysis reports are provided, and similar-case search. Because we actively incorporated this feedback from the field into the design, I believe the model has become a well-developed tool that provides real help in carrying out the work.

Q. Is there any budget, organizational, or other support system in place—or needed—to sustain and advance the project?

A. The AI-Based Accident Investigation Support Model classifies investigation types and provides similar cases and relevant guidelines, making investigation work more efficient for officers at our regional offices. Securing a stable budget is essential to advance the model further and expand it to approval and simplified procedures. In addition, I believe the model can become even more useful on the front lines if a dedicated AI unit is established within COMWEL to work closely with operational departments and if its expertise is strengthened through continued attention and support.

Q. What efforts have you made to secure data for building an organization-specific AI service?

A. We divided industrial accident claims processed over the past five years into some 2,700 groups, analyzed the approval rate of each group, and derived approval predictions for new injured workers. We also analyzed classification factors for determining fast-track or general processing based on the information entered at the time of application and the data collected during the investigation stage, and presented the resulting types. In addition, we provide information for deciding whether a medical advisory review can be omitted, taking into account the analysis of past claimants' injuries and periods of medical care together with medical advisory guidelines, to enable faster processing.

Q. In introducing AI into your work, was there anything you found lacking or think is needed?

A. I expect that using AI at work will reduce simple, routine tasks and greatly improve accuracy and efficiency. However, since AI has only recently been introduced in the public sector and is still unfamiliar, ethics training as well as security and data protection training are needed so that public officials and public institution employees can use AI responsibly and safely. Once this foundation is in place, AI can become a key tool for raising the quality of public administration as a whole.

CASE 4 | EMPLOYMENT

Smart labor administration with a single tap!

An AI Labor Inspector That Protects Your Rights, 365 Days a Year

Ministry of Employment and Labor: AI Labor Law Consultation and Labor Inspector AI Support System

The Labor Inspector AI Support System is an AI-powered administrative platform through which workers and employers can receive labor law consultation and information anytime, anywhere. It is a smart administrative innovation model that resolves problems in the workplace quickly and accurately and helps everyone understand the law with ease.

Labor Inspector AI Support System – Key Services

- **AI labor law consultation:** Available 24 hours a day in 34 languages, linked with the KakaoTalk and Karrot apps (including Karrot's part-time jobs service)
- **Petition filing support:** Preliminary investigation of reported labor cases such as unpaid wages and workplace harassment
- **Conversational reference search:** Search of laws, court precedents, official interpretations, and manuals
- **Labor inspection AI assistant:** An AI agent that labor inspectors can use within the government administrative network

< AI Labor Law Consultation Service Screen (ai.moel.go.kr) >



Text on screen: "Labor law is difficult. Don't worry about it alone anymore. Protect your valuable rights with 24-hour AI-tailored consultation." [Start AI consultation] — "AI Labor Law Consultation | Ministry of Employment and Labor × Korea Association of Certified Public Labor Attorneys (KCPLA)" — Chat window: "Hello. I am your AI labor law consultation assistant. Feel free to ask any questions about labor law, such as wages, working hours, and unemployment benefits. What would you like to know?"

Background

A Reliable Legal Navigator for Workers and Employers!

Worker A: *"I worked hard, but my wages haven't been paid, and I don't know what to do."*

Employer B: *"Labor law is so complicated. Do I have to provide weekly holiday allowance and annual leave in cases like this?"*

What should they do in situations like these? There is no longer any need to struggle alone—because there is the AI labor law consultation service, a reliable partner that provides labor law consultation and solutions anytime, anywhere, 24 hours a day, 365 days a year!

Legal disputes and concerns arising in the workplace are increasing every year. Yet only about 3,000 labor inspectors handle more than 450,000 labor law violation cases each year. Both workers and employers struggle with complex labor laws and administrative procedures.

To address these problems, the Ministry of Employment and Labor built a smart labor administration platform using AI technology. To create "a world where anyone can easily understand labor law and protect their rights," labor inspectors, certified public labor attorneys, and AI experts worked together to create Korea's first Labor Inspector AI Support System.

Implementation Process

From Idea to Data to System! The Story Behind the Labor Inspector AI Support System

At the outset, the project was difficult to pursue because the ministry had no budget of its own for it. However, the Ministry of Employment and Labor found a breakthrough by participating in the "Hyperscale AI Service Development Support Program" led by the Ministry of Science and ICT and the National Information Society Agency (NIA), securing the necessary funding and infrastructure. The ministry signed a support agreement with NIA in July 2024, and because the support period ran only until December, the service had to be built within four months. To achieve this, the team held more than 40 meetings and worked intensively.

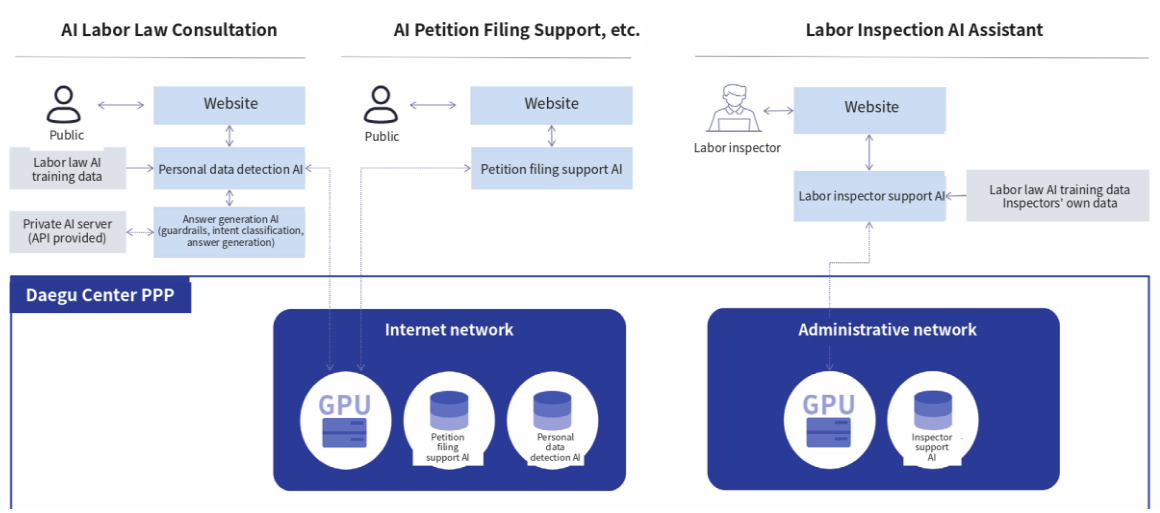
Labor inspectors, certified public labor attorneys, and AI experts then formed a single team to refine vast amounts of data—including labor laws, court precedents, official interpretations, and system manuals—and built training data specialized in labor law. In particular, to assess whether the AI service actually helped users and to improve it, the team conducted expert group evaluations and carried out more than 15,000 tests in collaboration with the Korea Association of Certified Public Labor Attorneys.

In the early stages, the team tested several models and selected them in light of the extremely high accuracy required for labor law consultation. As a result, it used the GPT-4.1 API for the public AI labor law consultation service and the GPT-OSS 120B and Gemma 3 27B models within the government administrative network for the internal labor inspection AI assistant, which requires security—implementing AI optimized for labor administration.

- **Funding:** Participation in the "Hyperscale AI Service Development Support Program" led by the Ministry of Science and ICT and NIA

- **Data development:** Refinement of labor laws, court precedents, official interpretations, manuals, etc. → training data specialized in labor law
- **Model application:** Use of the optimal model for each service, such as OpenAI gpt-oss-120b and GPT-4.1
- **Field collaboration:** Rapid implementation of core functions through collaboration among labor inspectors, certified public labor attorneys, and AI experts

< Service Architecture of the Labor Inspector AI Support System >



As a result, core services—including consultation, case support, policy analysis, and document automation—were completed in just four months, laying the foundation for a smart administrative platform capable of solving complex problems in the workplace.

Key Features

AI Labor Law Consultation: Smarter and Closer Than Ever!

The Labor Inspector AI Support System serves as an easy and convenient consultation channel for the public and as a reliable assistant that lightens the workload of labor inspectors. Accessible anytime and anywhere, the service is widely used from the initial response to a case through to administrative processing.

◦ Petition filing support

- When a labor case such as unpaid wages is filed, AI conducts a preliminary investigation through conversation, gathering facts according to the case type
- Members of the public can submit complete petitions regardless of their knowledge of labor law
- Inspectors conduct in-depth investigations based on the transcript of the conversation between the petitioner and the AI, processing cases quickly and accurately

◦ Reference search

- The public can easily search laws, court precedents, and official interpretations in natural language

- Inspectors can check relevant manuals instantly, improving the efficiency of administrative processing

◦ **Labor inspection AI assistant**

- AI summarizes and analyzes statements taken from petitioners, respondents, witnesses, and others involved in labor cases
- AI helps inspectors quickly identify key issues, recommends questions needed for investigations, and advises on how to proceed with cases
- Even drafting investigation reports can be done efficiently

In this way, AI labor law consultation provides real convenience and efficiency for both the public and inspectors, strengthening the capacity to solve problems in the field.

Outreach Strategy

A Service for the Public! Announcing It to the Nation

Immediately after development, the Labor Inspector AI Support System pursued an active outreach strategy to establish itself as a service the public could experience directly.

Stage	Activity
First unveiling	Generated strong interest through on-site consultation demonstrations at the Government Fair of the Republic of Korea in November 2024
Improved accessibility	Made the service easy for anyone to use through the KakaoTalk channel and the Karrot app's part-time jobs service
Wider awareness	Spread recognition of the service as "immediately helpful in the field" by sharing press releases, card news, and user reviews

As a result, within one month of its launch, 2,528 members of the public used the service for 11,682 consultations, and satisfaction surveys gave it high ratings of 4.3 from the public and 4.4 from labor inspectors (out of 5). In particular, the public responded positively to the convenience of being able to consult anytime by mobile phone without being constrained by time or place, and to the psychological reassurance of being able to freely share concerns that were difficult to raise face to face.

This suggests that the service's original intent—going beyond providing labor law information to ease users' psychological burden and offer a more comfortable consultation environment for protecting workers' rights—has been achieved to a meaningful degree. The AI labor inspector is gradually establishing itself as a trustworthy consultation partner for the public and a reliable colleague that improves work efficiency for labor inspectors.

Differentiators

The Elite of Public-Sector AI: The Labor Inspector AI Support System

The Labor Inspector AI Support System is not a simple chatbot for answering civil requests, but an AI-based support system trained on labor laws, court precedents, and actual case data and

designed to support the entire case-handling process.

Another strength is that it is a field-oriented AI service reflecting actual administrative procedures and workflows, as labor inspectors and certified public labor attorneys participated directly in data refinement and design. In addition, by offering multiple access channels—KakaoTalk, the web, kiosks, and Karrot—it has a distinctive service structure that the public can use regardless of time or place.

Beyond providing labor law information, the system supports labor administration as a whole—improving case-handling efficiency, serving as a reference to prevent legal violations, and supporting policy analysis—establishing itself as a platform that supports the shift from reactive administration to prevention-oriented administration.

Future Plans

A Roadmap for Limitless Growth: The Future of the Labor Inspector AI Support System

The Labor Inspector AI Support System plans to expand its consultation scope to cover the Labor Standards Act as a whole and industrial accident prevention. In addition, under a business agreement with the Korea Association of Certified Public Labor Attorneys (March 2025), it will operate a consultation improvement support group of 173 certified public labor attorneys to improve the accuracy of answers and strengthen expertise.

- **Data and model enhancement:** Improving service quality through ontology-based research and cost-benefit analysis
- **AI model research:** Strengthening the accuracy and sophistication of consultations by applying the latest AI technologies
- **Expanded accessibility:** Strengthening links with kiosks, mobile, call centers, and private platforms
- **Official launch:** Official service launch at the AX Summit in September 2025

To improve the efficiency of the system's infrastructure resources, the ministry is also comprehensively reviewing opportunities for improvement in both technology and administration—such as technical improvements including GPU and AI model optimization, and incorporating best practices in inspectors' online and offline use of the system into training.

Ultimately, the system will develop into data analysis–based, prevention-oriented labor administration and grow into a reliable partner that supports the protection of people's rights.

Organization	Ministry of Employment and Labor
Department	Labor Administration AI Innovation Division
Service Launch	September 2025
Budget (2024–2026)	KRW 930 million (2024)
Application Area	Public Services / Social Problem-Solving / Internal Administrative Innovation

Service Type	Q&A / Analysis and Utilization / Document Drafting / Counseling Support
Technology Type	Language Intelligence / Expert Systems

Key Summary: Labor Inspector AI Support System

Category	Key Details
Budget and Infrastructure	• (Securing the budget) Successfully secured the initial development budget by participating in an external support program • (Resource optimization) Focusing on operational efficiency through GPU and AI model optimization to reduce infrastructure costs
AI Model Selection and System Configuration	• (AI models used) Selectively applies various LLMs according to the purpose of each service • (Development strategy) Establishes model selection and utilization strategies for each service by comprehensively considering technical difficulty and available infrastructure resources
Data Acquisition and Utilization	• (Link to domain expertise) Domain experts such as labor inspectors directly refine and use specialized data, including labor laws, court precedents, and system manuals • (Ensuring reliability) Ensures reliability by having AI answers cite their sources—relevant laws, official interpretations, court precedents, and system manuals
Quality Improvement and Operation/Enhancement Plans	• (Test and training data) Secures specialized labor data and operates a consultation improvement support group through a business agreement with the Korea Association of Certified Public Labor Attorneys • (Greater system use) Promotes practical use through online and offline training and by sharing best practices and prompts • (Expanded service scope) Plans to expand the scope of consultation to the Labor Standards Act as a whole, childcare support systems, industrial accident prevention, and more

Appendix 1: Expert Recommendations

Myung-ok Lee | Executive Director, Technical Support Division, Okestro

Amid a changing environment marked by an increase in unstructured civil requests and the growth of vulnerable worker groups—such as non-regular workers, platform workers, and migrant workers—the AI-based labor inspection support system has high potential value as core infrastructure for fair labor administration and stronger social protection. I would therefore like to offer strategies in the following three areas for building and expanding the system.

1. Advancing the learning model — The accuracy of context-based Q&A should be continuously improved by incorporating not only labor laws and court precedents but also actual labor inspection cases, official interpretations, and field report data into training. In addition, the sources referenced in answers should be clearly indicated so that labor inspectors can more easily understand and verify the basis for judgments. Considering use by vulnerable workers, the service design should also consider converting expressions into plain language suited to users' levels while maintaining expertise, and accommodating multicultural settings.

2. AI service strategy — It is advisable to pursue the AI service through a phased expansion strategy. In Phase 1, the focus should be on "context-based administrative decision support" for labor inspectors and certified public labor attorneys, prioritizing accuracy, safety, and governance in high-trust, high-difficulty internal work. In Phase 2, the service could be gradually expanded to explanatory consultation for general users with limited access to legal services and to more complete administrative support services, including petition filing.

3. Service branding — When rolling out Phase 2 public services, it would be worth considering a shift away from the current service name, which carries a strong "inspection" image, toward more collaborative branding centered on trust, prevention, guidance, assistance, and consulting. This would help the public perceive it as a more approachable administrative support service.

Chang-seop Lee | Senior Advisor, AI & IT System Center, Kim & Chang

The AI labor inspector is an example of public-sector AI that advances both the protection of workers' rights and digital administrative innovation by enabling the public to use consultation services even at night and on holidays and by allowing labor inspectors to focus on higher-priority cases. However, for it to develop into a sustainable and highly reliable administrative service, I believe the following two points need to be reviewed and reflected.

1. Ensuring accuracy and accountability of AI answers — Because generative AI is inherently prone to errors, the limits of accuracy and relevant precautions should be communicated more specifically and clearly than at present to prevent users from being misled. For important matters that may affect legal interpretation or administrative action, it is advisable to design procedures so that final answers are provided after review by a labor inspector or certified public labor attorney. Internally, continuous checks and improvements should be made through an operating system for verifying and improving AI responses (AIOps) so that inaccurate answers are not repeated.

2. A balanced development strategy for both workers and employers — Since the current service focuses on protecting workers' rights, balance in its use by different groups should also be considered in future operations. To improve the service's credibility and use, it needs to develop into an AI assistant that is genuinely helpful to both workers and employers. In particular, since small and medium-sized business owners also struggle with complex labor regulations and

administrative procedures, functions such as AI-based support for managing employment contracts, guidance on wage systems, and administrative procedure guides for employers should be strengthened, alongside guidance and promotion based on actual use cases.

Chan-soo Kim | Professor, Department of AI Robotics, University of Science and Technology (UST)

The Labor Inspector AI Support System can be regarded as a case that has improved the accessibility and convenience of administrative procedures closely tied to people's daily lives by providing 24-hour labor law consultation and information to workers and employers.

1. Alignment with the goals of public AI diffusion and its value — As a public labor administration service targeting both workers and employers, the AI labor inspector system is an appropriate application that fits the purpose of spreading AI in the public sector. In particular, it is notable in terms of social value in that it compensates for the structural limitations of labor inspectors, whose numbers are limited relative to the large volume of labor cases, while functioning as an AI model that helps address national issues. However, given the nature of a service dealing with the law, future operations should strengthen technical consideration of answer accuracy and explainability and sufficiently supplement user guidance and explanations in this regard.

2. High reference value for other institutions — The system presents relatively concrete details on how AI models (such as GPT-OSS 120B) were applied and on data development centered on Korean labor laws and court precedents, and it demonstrates a field-oriented AI service development process involving labor inspectors, certified public labor attorneys, and AI experts. It is therefore likely to serve as a practical reference for other institutions designing administrative services. In addition, since the entire cycle—from securing funds in the development and pilot stages to building and launching the service—is documented relatively systematically, it is an appropriate case to reference as a standard model for similar public AI projects. In particular, the consideration given to both securing expertise and ensuring operational continuity through the agreement with the Korea Association of Certified Public Labor Attorneys could become an important reference point for operating public AI services in the future.

Appendix 2: Interview with the Project Officer

Bo-hyun Park | Senior Deputy Director, Labor Administration AI Innovation Division, Ministry of Employment and Labor

Q. How did you address concerns about conflicts with the existing work of professional groups such as certified public labor attorneys, and how did you secure their cooperation with the system?

A. Rather than encroaching on the existing work of certified public labor attorneys, we pursued cooperation toward building a mutually complementary, “win-win” model. By dividing roles so that AI handles simple questions about work and labor while certified public labor attorneys, as experts, focus on high-value work such as representation in complex and in-depth cases, we presented a structure that maintains and complements the professional ecosystem and worked to build a shared understanding of it. In addition, within the service we provide guidance and links at the end of each consultation—such as “If you need more accurate advice, please consult a certified public labor attorney”—so that users are naturally directed to professional organizations such as the Korea Association of Certified Public Labor Attorneys. Thanks to the association’s open attitude toward this structure and its active cooperation, we were able to establish a collaborative framework in which AI and professional groups can develop in a complementary way.

Q. Do you have any tips on securing a budget or building the system to actually move a project forward?

A. In 2024, NIA’s Hyperscale AI Service Development Support Program helped us launch initial development and secure a budget, and in 2025 we secured follow-up funding to expand the project through the Public AX Support Program of the National IT Industry Promotion Agency (NIPA). In this process, the incubation-style structure of the NIA and NIPA support programs was of considerable help in actually moving the project forward. Previously, it took at least two years from planning a new project to completing development after establishing an Information Strategy Plan (ISP), making it difficult to keep pace with technological change. In contrast, I believe the incubation support programs of the Ministry of Science and ICT, together with the ISP exemption for projects under KRW 2 billion introduced from the 2026 budget cycle, have created conditions for pursuing projects more quickly.

Q. What criteria did you use to select the LLMs, and did you have any concerns about security or other issues?

A. Because labor law consultation requires a high level of accuracy, we comprehensively considered not only performance but also stability, cost, and security when selecting models. We applied the GPT-4.1 API to the external consultation service to ensure response quality, while for services operating on the internal network, we designed a hybrid approach in which open-source models (GPT-OSS, Gemma, etc.) are deployed on our own infrastructure to meet security requirements. API-based external models incur costs according to usage and require consideration of changes in provider policies and security, while deploying open-source models on the internal network involves infrastructure costs such as GPUs. After comparing and reviewing these respective advantages and disadvantages, we selected models in ways suited to the characteristics of each service and its operating environment.

Q. What is the future direction of the system, and what kind of government-level support is needed?

A. I see the future challenge as laying the foundation for public AI services to be operated and developed continuously rather than ending as one-off projects. This requires not only budget support but also a structure in which a permanent, dedicated AI unit within each ministry continuously drives project planning, operation, and advancement. In addition, if the right policy and institutional conditions are in place, I expect a virtuous cycle to become possible in which public officials move between the private and public sectors, building AI experience and capabilities and feeding them back into public administration. I believe the key to spreading public AI services is “building something quickly, even if small, experimenting with many ideas, and dropping what fails to try something new.”

Attention! Your number one way out of a crisis: 1600-2129

A Single Text Message That Offers Hope in a Crisis

Ministry of Health and Welfare (Korea Social Security Information Service): AI-Assisted Initial Counseling for Households in Crisis

The AI initial counseling information system is a proactive welfare counseling service in which AI calls people first to identify their welfare needs, with the aim of closing gaps in the welfare safety net. The Ministry of Health and Welfare and the Korea Social Security Information Service (SSIS) analyze crisis-related data to identify households in crisis, and AI voice counseling identifies their initial welfare needs. Through this new public welfare administration service, people can receive guidance on the welfare services they need with a single phone call, without having to visit their community service center in person.

AI-Assisted Initial Counseling for Households in Crisis – Key Functions

- **Proactive identification of households in crisis:** Identifies households facing welfare crises by analyzing 47 types of crisis-related data, such as utility cutoffs (electricity and water) and payment arrears
- **Automated AI counseling:** After sending an advance notice text, AI calls the person and conducts voice counseling, identifying welfare needs through natural language analysis
- **Automatic transfer of counseling results:** Counseling records are linked to the Haengbok-eum system (Social Security Information System) and delivered to local government officials
- **Greater work efficiency:** Reduces the initial counseling burden on local government officials, allowing them to focus on in-depth counseling such as field visits and on decisions about welfare support
- **Improved accessibility:** Welfare counseling is available with a single phone call, without visiting a community service center

Model used: Based on the SSIS AI counseling platform

Background

One Step Faster, One More Person Helped! AI Finds the Signals of Households in Crisis

Older adult living alone A: *"My electricity had been cut off for days… and then I got a call offering welfare counseling."*

Public official B: *"Now that AI picks up crisis signals for us, we can help even one more person."*

Even when crisis signals such as utility cutoffs and payment arrears were detected, gaps in the welfare safety net persisted, leaving people without appropriate support. Officials had to identify hundreds of thousands of households in crisis, but with limited staff and time, there were clear limits to checking every case in person.

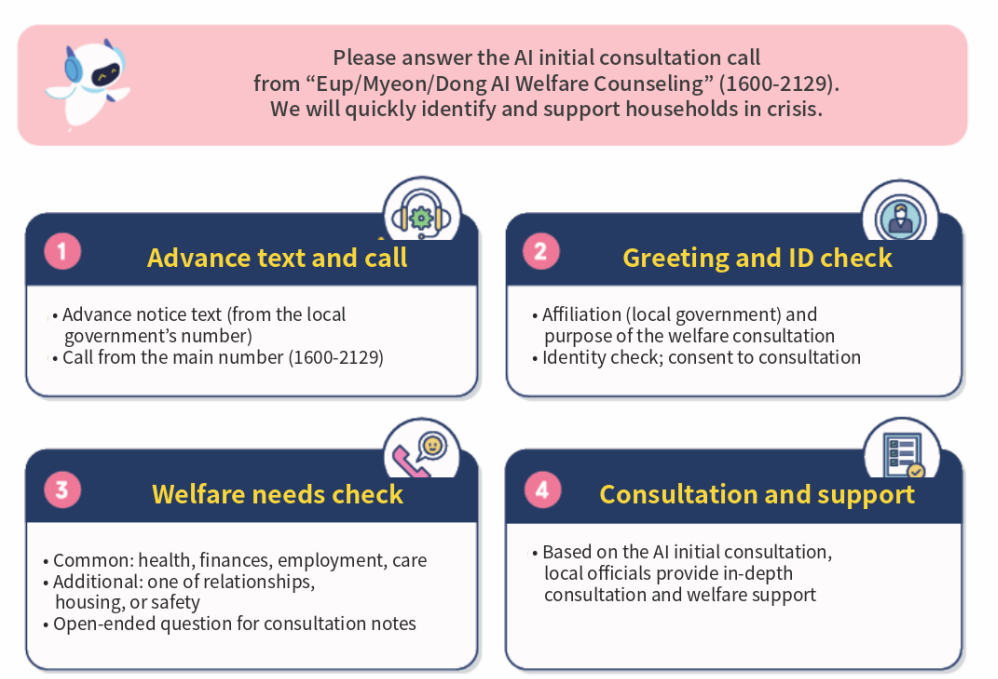
Against this backdrop, the Ministry of Health and Welfare and SSIS built a welfare counseling system that uses AI technology to proactively identify households in crisis. They introduced an AI initial counseling system in which AI calls people first to confirm their welfare needs and then connects them to welfare officials in local governments.

Through this system, welfare is shifting from administration that waits to warm, technology-based welfare that reaches out first.

Key Features

Mission: AI Welfare Radar, Rescue Households in Crisis!

To ensure that no one falls through the gaps in the welfare safety net, the role of AI has evolved beyond simple “detection” to the “counseling” stage. The AI welfare radar proactively identifies people in need by integrating and analyzing crisis-related data from 47 institutions—including the National Tax Service, the Korea Electric Power Corporation, and the National Health Insurance Service—alongside the Haengbok-eum system, which is linked to local governments nationwide.



Source: AI initial counseling information system promotional leaflet (distributed in September 2025)

The defining feature of the system is “welfare in which the government makes the first contact.” When AI detects crisis signals such as utility cutoffs or payment arrears, it sends the person a text message—“If you would like welfare counseling, please call 1600-2129”—and then calls to conduct counseling. When the counseling ends, AI delivers the results to the responsible local government official, supporting smooth follow-up such as field investigations, in-depth counseling, and linkage to welfare support.

[AI Initial Counseling Scenario]

- ① **Collection of crisis data:** Collects 47 types of crisis-related data, such as utility cutoffs and payment arrears, from 21 related institutions and predicts households facing welfare crises based on big data
- ② **AI screening and analysis:** An AI model analyzes the collected data to identify high-risk groups and refines duplicate and false-positive data to improve analytical accuracy

- ③ **Advance text message:** Sends an “AI welfare counseling notice” text to selected individuals → minimizing concerns about misuse of personal information and increasing awareness among recipients
- ④ **AI voice counseling:** AI calls the individual and identifies welfare needs through natural language conversation, conducting counseling based on automatic speech recognition (ASR) and natural language understanding (NLU) technologies
- ⑤ **Analysis and transmission of results:** Counseling results are automatically registered in the Haengbok-eum system → the responsible official prepares field investigations, in-depth counseling, and welfare support based on the AI analysis
- ⑥ **Linkage to welfare services:** After field verification, the official decides on tailored support such as livelihood, medical, housing, and care assistance → proactive welfare administration completed through “AI detection and human linkage”

< AI Initial Counseling Process >

Step	Details
❶ Counseling request and outbound call	Advance text before the call (sent from the local government’s number, stating the recipient’s name and the community service center’s contact information); call from the main number (1600-2129)
❷ Greeting and identity verification	Introduction of the caller’s affiliation (local government) and purpose of the call; asks whether the person wishes to receive initial counseling and verifies identity
❸ Crisis verification	Checks the person’s crisis information through Haengbok-eum
❹ Welfare needs assessment	Common: health, finances, employment, care; Additional: relationships, housing, safety; Open-ended questions (notes for counseling)
❺ End of counseling	Informs the person that a local government official will be in touch, then ends the call
❻ Transmission of counseling results	Sends the counseling results to Haengbok-eum and provides them to local government officials

Source: AI-Assisted Initial Counseling for Households in Welfare Crisis (Welfare Information Planning Division, Ministry of Health and Welfare)

▶ Households eligible for AI initial counseling

Households in crisis identified through the welfare blind spot identification system, and individuals reported through the welfare crisis alert app [※ Legal basis for identifying and supporting households in crisis: Act on the Use and Provision of Social Security Benefits and Search for Eligible Beneficiaries]

▶ Models and Data

- **Model:** SSIS “AI Welfare Counseling Platform”
- **Data sources:** Ministry of Health and Welfare system for identifying households in welfare crisis / Haengbok-eum

Implementation Process

When AI Detects a Signal in the Data, the Voice of Welfare Calls

The Ministry of Health and Welfare and SSIS built a “system for identifying households in welfare crisis” and applied AI technology to take the response speed of welfare administration to the next level.

Period	Milestone
2015–	Development of the system for identifying households in welfare crisis Collection and analysis of 47 types of crisis-related data, such as utility cutoffs and payment arrears: (1) early identification of households in crisis; (2) a foundation for early support by local governments
2024	Introduction of the AI-based initial counseling system and pilot operation in some local governments When welfare crisis signals are detected, AI sends an advance text message and then conducts phone counseling Counseling results are linked to the Haengbok-eum system, enabling local officials to provide in-depth counseling, such as field investigations, and welfare support
2025	Expansion to local governments nationwide (full operation since November 2024) Full-scale operation of AI initial counseling and standardization of procedures for early identification of households in crisis and linkage to welfare

AI initial counseling has completed an integrated process that runs from data-based detection to phone counseling and field linkage, establishing itself as a leading digital welfare model in which welfare administration shifts from “responding after a report” to “proactive administration” in which AI moves first.

Outcomes

Declaring Zero Gaps in the Welfare Safety Net!

Expanded to local governments nationwide in November 2024, the AI initial counseling information system has greatly improved the efficiency of identifying welfare blind spots and of the counseling system. By analyzing crisis-related data to set support priorities and proactively calling people in whom risk signals have been detected, AI has improved both the response speed and the administrative efficiency of local governments.

- **Better detection of households in crisis and higher counseling rates:** In full operation, about 422,000 of some 669,000 AI counseling calls (1600-2129) were answered, a response rate of 63.2%
- **Faster linkage to welfare:** Counseling results for households in crisis detected by AI are linked to the Haengbok-eum system, enabling local officials to promptly carry out in-depth counseling, such as field investigations, and follow-up support
- **Greater administrative efficiency:** Local officials can focus on in-depth counseling, such as field investigations, and tailored welfare support instead of initial counseling, improving both administrative efficiency and response quality

- **More services people can feel:** Welfare counseling is available with a single phone call without visiting a community service center, greatly improving access to welfare for older adults and vulnerable groups

The AI initial counseling system has changed the flow of welfare administration from “responding after a report” to “proactive response by AI.” Through a collaborative system in which AI detects and officials respond, it is reducing gaps in welfare coverage and creating a faster, denser welfare safety net.

Future Plans

Always Ready to Answer! 1600-2129

The Ministry of Health and Welfare is expanding the proactive welfare administration system based on AI initial counseling to local governments and welfare institutions nationwide. In doing so, it aims to ensure that data-based welfare support becomes a permanent national response system rather than a one-off project.

- **Advancing AI technology:** Transitioning from the current scenario-based AI centered on one-way communication to generative AI capable of two-way communication and emotional empathy, improving counseling quality and public satisfaction
- **Improving access to counseling:** Adding non-face-to-face channels such as counseling chatbots in addition to the counseling line (1600-2129)
- **Enhancing welfare counseling services:** Introducing a personalized welfare service recommendation AI system so that AI welfare counseling goes beyond simple guidance to connect people from information on welfare services through to applications

The AI initial counseling system will expand into national digital infrastructure that substantially increases the speed and accessibility of welfare administration. Welfare is no longer a system people must seek out; it is becoming a constant welfare partner in which AI reaches out to people first.

Organization	Ministry of Health and Welfare
Department	Welfare Information Planning Division
Service Launch	November 2024
Budget (2024–2026)	KRW 5.4 billion (2024: KRW 500 million; 2025: KRW 1.6 billion; 2026: KRW 3.3 billion)
Application Area	Social Problem-Solving
Service Type	Counseling Support
Technology Type	Language Intelligence

Key Summary: AI-Assisted Initial Counseling for Households in Crisis

Category	Key Details
AI Model Selection and System Configuration	• (Natural language voice counseling) Applies speech-to-text (STT) and natural language understanding (NLU) technologies so that even digitally vulnerable groups, such as older adults, can easily receive counseling through a simple phone call • (Real-time data linkage) Transmits AI counseling results to local government officials in real time and converts them into data
Data Acquisition and Utilization	• (Big data–based crisis prediction) Precisely detects high-risk households by linking and analyzing crisis-related data from 47 institutions, such as utility cutoffs and payment arrears, with the Haengbok-eum system
Quality Improvement and Operation/Enhancement Plans	• (Evolving into empathetic AI) Plans to introduce generative AI that understands context and empathizes, moving beyond the limits of the existing scenario-based approach • (Service advancement) Builds a permanent response system by introducing a personalized welfare service recommendation AI system that connects counseling through to applications

Appendix 1: Expert Recommendations

Jeong-hee Kang | Attorney, Bae, Kim & Lee LLC

AI initial counseling for identifying households in crisis is a meaningful case that offers a practical solution by applying AI technology to a core public task: closing gaps in the welfare safety net. The approach of proactively analyzing signs of crisis and having AI make the first contact has become an important turning point in shifting from “application-based” administration, which waited for people to apply, to data-based administration centered on prevention and identification.

In practical terms, the system’s usefulness is being confirmed through results such as higher counseling success rates and faster linkage to welfare. In particular, by reducing the initial counseling burden on limited administrative staff while improving service access for digitally vulnerable groups such as older adults through phone-based voice counseling, the system can be regarded as a case that achieves a relatively balanced combination of the social value and administrative efficiency that public AI should deliver.

However, as a system that automatically analyzes individuals’ crisis information and approaches them proactively, it requires more careful management in operation. The legal compliance of data combination and use should be reviewed continuously, and technical and procedural safeguards should be put in place to control the possibility of algorithmic false positives. Considering the limitations of AI counseling, it is also important to establish clear criteria for when officials should intervene.

If the online-offline linkage system is further refined so that AI counseling results lead naturally to in-depth counseling, field verification, and actual support decisions by local officials, this case could become a standard model for national AI welfare services trusted by the public.

Kyung-jin Cha | Professor, Hanyang University

The AI-based initial counseling service for households in crisis is a leading AX case that redefines the starting point of public services as the “citizen experience” rather than “administrative convenience.” Conventional welfare administration, premised on “reporting” and “visiting,” has acted as a psychological and physical barrier for people in crisis, structurally creating welfare blind spots in which people do not receive benefits even though programs exist.

To overcome these passive limitations, this project fundamentally changed the customer journey for welfare services by combining data-based proactive identification with AI voice counseling. Technically, a series of processes—integrated analysis of crisis data from multiple institutions, risk screening, NLU-based counseling, and automatic linkage with administrative systems—are organically combined, connecting previously disconnected welfare touchpoints into a single continuous experience.

In particular, the “AI contacts you first” approach demonstrates a customer experience (CX)–centered design that keeps the technology in the background rather than at the forefront of the service, lowering resistance among people unfamiliar with digital devices and minimizing their psychological burden.

In terms of results, it is important that the project has gone beyond improving call response rates and administrative efficiency to create an environment in which officials can focus on in-depth support and field care rather than administrative processing. Overall, this case shows that AX can

simultaneously improve the public service experience and the efficiency of organizational operations in the public sector.

Jung-soo Kang | Director, AI Research Center, BLUEDOT AI

This project is an innovative case that has shifted the challenging task of identifying households in crisis from an “application-based” approach to one centered on “proactive prevention.” In particular, the work structure in which AI takes on initial counseling so that officials can focus on in-depth support and field intervention is an important strength of the project.

However, for the project to sustain its results and expand, the following three enhancements—centered on “guaranteeing citizens’ rights” and “securing trust”—are essential.

First, a trust process based on transparency should be established. Crisis information is highly sensitive personal data, and recipients may feel anxious or worried about surveillance, asking “Why was I contacted?” The current practice of sending advance notice texts is a positive step, but beyond this, a “Transparency Package” should be introduced that clearly informs people—throughout the text messages and the counseling process—of the legal basis for data use, their right to refuse or end the counseling, and how to verify the caller’s identity through official channels.

Second, algorithmic fairness and substantive performance management should be ensured. Continuous checks are needed on whether the AI model may be biased toward certain groups (such as older adults or single-person households) or, conversely, may miss people in welfare blind spots. To this end, regular bias checks, sampling reviews, and field feedback loops covering both the detection model and NLU should be operated on an ongoing basis. Performance indicators should also shift beyond process indicators such as call response rates to “outcome indicators” focused on actual linkage to welfare and whether crises were resolved after support (e.g., restoration of electricity, medical support).

Third, how AI results are used should be clearly defined. Because counseling deals with sensitive areas such as emotions, relationships, housing, and safety, overly simplified welfare needs identified by AI could distort judgments in the field. AI analysis results should therefore be used not as a “determination” but as reference material for preparing in-depth counseling, and it is important to refine the user interface and work rules so that local officials can flexibly raise objections, make corrections, and conduct additional checks.

In conclusion, for this proactive welfare model to become a sustainable success, transparency, safeguards against being mistaken for phishing, management of algorithmic bias, and an outcome-oriented performance measurement system must come before technical advancement itself. When these safeguards are sufficiently in place, citizens will perceive the service not as “surveillance” but as trustworthy “protection.”

Appendix 2: Interview with the Project Officer

Jin-woo Kim | Deputy Director, Welfare Information Planning Division, Ministry of Health and Welfare

Q. What difficulties did you face during the service planning stage (project launch and initial adoption)?

A. Since there were already many successful examples of scenario-based AI counseling systems in local governments and elsewhere, developing the counseling solution itself was not very difficult.

In actual operation, however, call pickup and response rates were low because people were reluctant to answer AI voice calls rather than calls from a person. To address this, we sought to increase trust in the calls by sending advance notice texts from the numbers of officials at the eup, myeon, and dong (local community) level.

We are also continuously improving the system and counseling scenarios by actively gathering feedback from the field, including through a citizen monitoring group.

Q. What are your future plans for advancing the AI counseling information system?

A. Because the current scenario-based AI counseling can respond only to predetermined questions, we plan to transition to generative AI–based counseling capable of two-way communication and emotional empathy. To this end, we plan to develop a generative AI counseling solution in 2026 and conduct a field demonstration pilot in some local governments, while also pursuing an Information Strategy Plan (ISP) for building a generative AI counseling information system.

Q. What efforts have you made to secure data for building an organization-specific AI service?

A. The current AI counseling system applies AI technology to certain areas, such as speech recognition and natural language understanding. For the development of the generative AI counseling solution planned for 2026, we see data preparation as critical. We therefore plan to build a training database from the voice and text data accumulated through face-to-face counseling in Haengbok-eum and call center counseling, standardizing data management attributes and establishing a mapping system to minimize unstructured data.

We also plan to use the laws, guidelines, and guidebooks of various social welfare programs as AI training data needed for social welfare counseling.

Q. Were there particular criteria or reasons for selecting the AI model, and were there any related security issues?

A. Since the main goal of the project was to identify recipients' basic welfare needs—such as health, finances, and housing—we built a scenario-based initial counseling system after reviewing various cases in which conversational technologies such as chatbots had been applied to counseling.

In terms of security, we also considered using a private cloud with CSAP (Cloud Security Assurance Program) certification, but because counseling content may include sensitive information, we built the system inside SSIS. It is currently managed and operated securely in accordance with internal standards so that there are no security or data protection issues.

Q. Please describe any other key considerations during implementation, or how you

overcame difficulties.

A. To help people in welfare blind spots, we received active suggestions for improvement from the local governments that participated in the 2024 pilot, which allowed us to fully reflect the issues identified at the system's early stage. As a result, we were able to start with improved scenarios and an improved system. The continuous efforts of SSIS, which actually operates the system, to improve and develop it also played a major role. Thanks to these efforts, the system has been operating stably to date, and I believe it is contributing to proactive welfare administration.

Digital welfare: now in the era of AI-tailored care

AI Care Services That Ease Loneliness and Add Peace of Mind

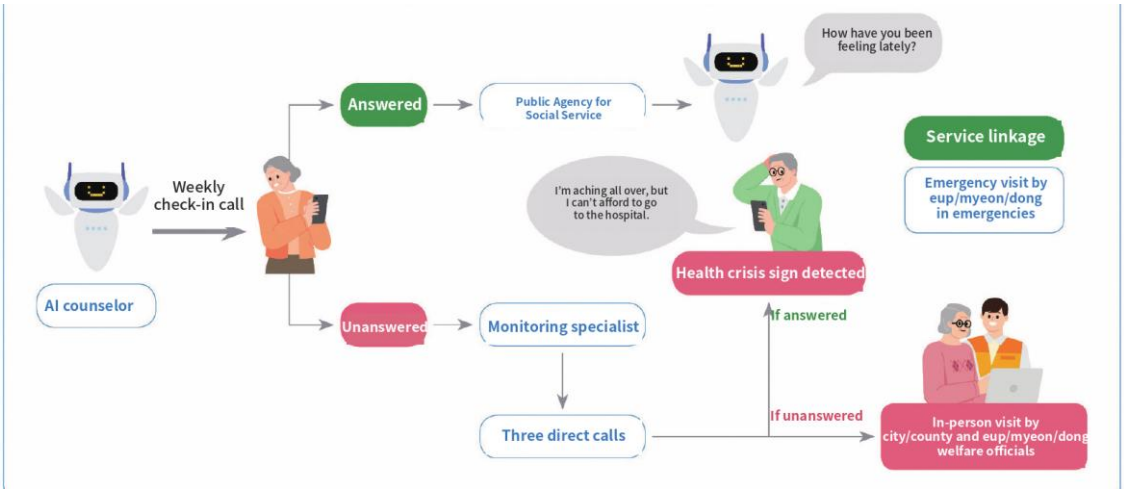
Gyeonggi Province (Gyeonggido Public Agency for Social Service): Customized 360° AI+ Care Service

The Customized 360° AI+ Care Service refers to the “AI Senior Companion Service” and the “AI Senior Safety Guardian” introduced by Gyeonggi Province and the Gyeonggido Public Agency for Social Service. They are AI-based welfare services designed to close gaps in care arising from growing care demand due to population aging and the increasing risk of elder abuse and repeat abuse.

The AI Senior Companion Service went through a seven-month pilot (June–December 2023) before being fully launched in 2024. As a phone service providing emotional support and crisis detection for a large number of older adults across the province, it is available to anyone with a mobile phone and can even link users to welfare services, serving as a flagship model of Gyeonggi-style smart care.

“CLOVA CareCall,” powered by NAVER Cloud’s HyperCLOVA X, makes regular check-in calls, and if there is no answer, a step-by-step safety net follows with additional calls, direct checks, and home visits. When signs of crisis are detected during a conversation, an immediate response is possible through emergency reporting and linkage to welfare services. As a result, AI handles weekly check-ins, while dedicated staff can focus on close monitoring and tailored support.

< Operating Structure of the AI Senior Companion Service >



The AI Senior Safety Guardian is a monitoring-centered protection model in which AI speakers are installed in the homes of older adults at high risk of repeat abuse. The speakers detect crisis signals during everyday conversation and enable emergency response, including voice-based connection to 119 emergency services.

The AI voice recognition–based ICT speaker of the Happy Connect Foundation analyzes the user’s

speech to detect danger, distress calls, and abnormal behavior in real time. Using end-to-end (E2E) speech recognition and a situational context analysis model, it immediately classifies emergency utterances such as “Help me” or “I’m in pain,” and when a potential crisis is confirmed, the information is automatically sent to the monitoring center.

< Operating Structure of the AI Senior Safety Guardian >

Role	Organizations
Overall management	Gyeonggi Province Senior Welfare Division
Public institutions (identifying recipients, monitoring, linkage to professional counseling)	Gyeonggido Public Agency for Social Service; Gyeonggi regional elder protection agencies; Gyeonggi Senior Counseling Center
Technology provision (device installation, emergency alerts)	SK Happy Connect
Crisis response – public	46 police stations; 48 city, county, and district governments; 49 public health centers; 38 mental health welfare centers
Crisis response – private	63 senior welfare centers; 73 community welfare centers

Key Functions – AI Senior Companion Service

- **AI check-in calls:** Once a week, AI holds natural conversations tailored to each older adult’s situation by remembering previous conversations <Model: NAVER Cloud HyperCLOVA X / CLOVA CareCall>
- **Multiple verification system:** A step-by-step safety net in which unanswered calls lead to additional calls, direct checks, and home visits <For those who do not answer: direct check-ins by the Gyeonggido Public Agency for Social Service>

< Follow-up Process of the AI Senior Companion Service >

Situation after the AI call	Follow-up by the Gyeonggido Public Agency for Social Service
Three unanswered calls	Direct phone call or text message; (basic) list of non-respondents sent to the relevant city or county
Signs of crisis detected	Review of the conversation (monitoring) → (emergency) report to 119 or request an emergency visit by the eup/myeon/dong office; otherwise closed or linked to services by the agency itself

Source: AI Senior Companion Service introduction materials

Key Functions – AI Senior Safety Guardian

- **AI-based detection of crisis signs:** Analyzes dangerous utterances and abnormal behavior in real time through voice monitoring <Models: end-to-end (E2E) speech recognition / situational context analysis model>
- **Immediate response system:** When a crisis utterance occurs, the monitoring center checks it first → the monitoring center checks on the person → linkage to 119 and 112 if needed → information shared with elder protection agencies
- **Dangerous situations:** Emergency linkage to 119 / Ordinary situations: Follow-up by elder protection agencies

- **Emotional and daily-life support conversations:** Emotional stability through everyday conversation and device responses; reduced feelings of isolation and anxiety have been reported
- **Step-by-step follow-up and protection:** Step 1 (monitoring) – AI detects a dangerous utterance → immediate check by the monitoring center; Step 2 (linkage) – linkage to 119 and 112 if needed; Step 3 (field) – case passed to the Public Agency for Social Service and elder protection agencies for visits and monitoring
- **Compliance with data protection:** Principle of minimal collection and retention of voice data, with stronger consent procedures for sensitive information

Background

A Key to Opening the Hearts of Older Adults Living Alone: The Customized 360° AI+ Care Service

Older adult A: *"I have no one to talk to, so I just leave the TV on all day."*

Older adult B: *"Whenever I think about what happened before, I worry that something might happen again."*

As of 2024, people aged 65 and over accounted for 19.2% of Korea's population, and the country was expected to become a super-aged society (20% or more aged 65 and over) in 2025. Gyeonggi Province in particular has the largest older population in the country at 2.17 million, of whom about 630,000 live alone or in older couple households. This environment raises the risk of lonely deaths and gaps in care; in fact, there were 1,457 cases of elder abuse in Gyeonggi Province in 2023, accounting for 23% of the national total. It was difficult to check closely on all older adults with care workers alone, and repetitive check-in tasks increased the burden in the field. Gyeonggi Province and the Gyeonggido Public Agency for Social Service therefore launched the Customized 360° AI+ Care Service, which uses AI to enable regular check-ins and early detection of crisis signs.

Key Features

A Reliable Safety Net Hidden in a Short Check-in Call

Gyeonggi-style 360° care consists of two pillars: the AI Senior Companion Service, in which AI calls older adults across the province at least once a week to check on them, and the AI Senior Safety Guardian, which installs AI speakers for those at high risk of repeat abuse to detect crisis signals and supports connection to 119. The AI Senior Companion Service starts with just a phone, without any additional equipment, and enables an immediate response and linkage when signs of crisis are found, delivering "emotional support + safety response" at the same time.

AI Senior Companion Service

- **Identifying and enrolling recipients:** After applications are received and eligibility is confirmed by eup/myeon/dong offices, cities and counties work with the Public Agency for Social Service to start the service

Priority recipients

- ① Older adults registered as single-person households

- ② Those not using existing care services (long-term care insurance, customized care services for older adults, etc.)
- ③ Older adults in economic hardship, such as basic livelihood security recipients and near-poor households
- ④ Other older adults referred by mayors or county heads
- ※ The above are priority recipients; other older adults may also apply if they need the service

- **Multiple verification system:** 1st, AI check-in call → 2nd, check by the monitoring center → 3rd, follow-up by the Public Agency for Social Service
- **Response to crisis signs:** When dangerous utterances or emergencies are detected, immediate reporting to 119 and linkage to eup/myeon/dong offices and welfare services
- **Data protection:** Consent to the processing of personal and sensitive information at the application stage; compliance with retention periods
- **Field collaboration:** Identifying and expanding recipients in cooperation with the Korea Senior Citizens Association, welfare centers, the Korea Housing Management Corporation, the LH Northern Gyeonggi Regional Headquarters, and others
- **Expansion and advancement:** Expanding to patients and caregivers and developing into health management and risk prediction models

AI Senior Safety Guardian — a 24-hour safety guardian that responds to a single word

- Detecting crisis signals in everyday conversation through AI speakers installed for those at high risk of repeat abuse
- An immediate response system running from the monitoring center to the Public Agency for Social Service and 119/112, through automatic recognition of emergency utterances
- Everyday conversation functions for emotional and psychological stability, and linkage to professional counseling for those at high risk of depression or loneliness
- Ongoing case management and risk checks through monthly monitoring and home visits
- A deterrent effect on abuse, reducing verbal and physical threats at home and creating a safe zone
- Stable service operation through compliance with data protection and consent procedures, device checks, and reinstallation
- An integrated response system maintained through collaboration with five elder protection agencies, counseling centers, local governments, and others

▶ Models and Data

Item	AI Senior Companion Service	AI Senior Safety Guardian
AI operator	NAVER CLOVA	Happy Connect Foundation
Technology	Language Intelligence	Language Intelligence / speech recognition

Item	AI Senior Companion Service	AI Senior Safety Guardian
Service Type	Generative AI	Real-time command processing based on end-to-end (E2E) speech recognition
Data used	Check-in conversation scenarios based on the HyperCLOVA hyperscale language model	Users' voice data (used for E2E training)
Data source	Data built by NAVER	–

Implementation Process

Robust Digital Care Built on Lessons from Failure

In the early stages of the AI Senior Companion Service, calls were delayed in connecting. In particular, the call failure rate rose around 9 a.m., when user calls were concentrated. The CareCall server capacity was therefore expanded, and the system has since been improved to make stable calls to more than 1,000 people during that time slot. In addition, beyond the simple check-in scenario, there were no messages suited to particular situations such as seasons or holidays, so conversations felt formulaic and could not convey warmth. Recently, a function was added to set customized check-in messages for seasons and situations, such as heat waves, cold snaps, and holidays, encouraging closer conversations.

	Challenges (AI Senior Companion Service)	Improvements (AI Senior Companion Service)
1	Call errors: Failed calls to many users at the same time	System improvement: Expanded server capacity for stable calling
2	Limited conversation quality: Mechanical speech caused reluctance	Technical improvement: Improved speech recognition and natural conversation through HyperCLOVA X training, with more varied check-in messages
3	Limits in identifying recipients: Need to find those who most need check-ins	Field collaboration: Identifying and expanding recipients with senior associations, welfare centers, the Korea Housing Management Corporation, LH, the Gyeonggi Provincial Medical Center, and others

In building an AI-based model to prevent repeat abuse, Gyeonggi Province and the Gyeonggido Public Agency for Social Service found that constant monitoring using devices installed in the home could face institutional constraints under the Personal Information Protection Act and other laws. Moreover, because the consent of household members was required to install the speakers, participation was restricted in some cases, and some older adults did not keep the device connected due to concerns about higher electricity bills or a lack of understanding of how to use it. In the field, operational burdens were also identified, such as devices being damaged by abusers and increased workloads for staff at elder protection agencies. The following institutional and operational improvements were made to overcome these limitations.

Challenges (AI Senior Safety Guardian)	Improvements (AI Senior Safety Guardian)
Data protection constraints: Processing and retaining sensitive information from constant monitoring at home; need for household members' consent	Institutional improvement: Stronger consent procedures for personal and sensitive information, clearer retention standards, and better guidance
Limited participation: Difficulties in installation and operation due to refusal of consent and concerns about electricity bills	Better understanding of the service: Ongoing education through home visits and guidance on easing the burden of electricity bills
Device stability: AI speakers damaged or switched off during conflicts, interrupting monitoring	Stable device operation: Stronger reinstallation and inspection systems for damage or power-off cases, and expanded user education
Increased burden in the field: Heavier follow-up and home-visit workloads for elder protection agency staff	Easing the burden in the field: Compensation for elder protection agency staff, role adjustments, and improved collaboration
Insufficient follow-up after counseling linkage: Need for continued management after professional psychological counseling	Systematic counseling linkage: A follow-up process after professional psychological counseling and intensive management of high-risk groups

Outcomes

The Warm Comfort Offered by the Customized 360° AI+ Care Service

The Customized 360° AI+ Care Service is producing results in many areas, from emotional stability and crisis response to welfare linkage, administrative efficiency, and policy diffusion.

▶ Before and After (AI Senior Companion Service)

- **Check-in method:** Before, staff relied on direct calls and visits, often leading to delays and omissions → After, regular AI check-in calls at least once a week enable systematic management
- **Crisis response:** Before, confirming and responding to emergencies could be delayed → After, crisis detection allows follow-up action to proceed quickly based on monitoring results
- **Use of field staff:** Before, direct check-in calls and visits created a heavy labor-cost burden → After, AI handles check-ins and companionship, while staff focus on monitoring and tailored support

▶ Before and After (AI Senior Safety Guardian)

- **Crisis signal detection:** Before, it was difficult to identify dangerous utterances or abnormal behavior at home in real time → After, AI speakers constantly detect signs of danger through voice, greatly reducing gaps in response
- **Emergency response speed:** Before, initial responses could be delayed by late reporting or misjudging the situation → After, a single response system running from the monitoring center to the Public Agency for Social Service and 119/112 enables quick action in emergencies
- **Follow-up efficiency:** Before, follow-up centered on visits and calls by elder protection agency staff created a heavy workload → After, AI handles constant monitoring and identifies

high-risk cases, allowing staff to focus on high-value work such as in-depth case management and linkage to professional counseling

▶ Emotional stability and reduced isolation

- **AI Senior Companion Service:** Satisfaction score of 4.8 (out of 5); 94.6% of users want to continue the service; reasons: sense of security (72.8%), not feeling bored (11.2%), feels like talking with family (8.9%); positive comments such as “I feel that I’m not alone” and “Even if it’s a machine, it’s nice to have someone to talk to”
- **AI Senior Safety Guardian:** 108 referrals to psychological counseling → self-efficacy up 30%, anxiety down 59%

▶ Crisis detection and immediate response

- **AI Senior Companion Service:** Automatic detection of crisis signs through real-time conversation analysis; as of 2024, 133 linkages to resources and 5 emergencies detected early; example: the utterance “I’m in pain, help me” → 119 dispatched within 10 minutes; many cases of early recognition and response to suicidal urges, hypoglycemic shock, and more
- **AI Senior Safety Guardian:** A deterrent effect on abuse reported simply from installing the device

▶ Welfare linkage and closing gaps (AI Senior Companion Service)

- Mentions of hardship in daily life → emergency meal boxes and donated goods provided
- Suicidal remarks → linkage to counseling at a mental health center
- Emergency detected → linkage to welfare services → follow-up requested from the eup/myeon/dong office

▶ Reduced administrative workload and budget savings

- **AI Senior Companion Service:** Automated check-ins for more than 1,000 people a day; fewer repetitive tasks for welfare staff and minimal field deployment; service cost of KRW 1,100 per month (20 times lower than KRW 93,430 per month for customized care services for older adults)
- **AI Senior Safety Guardian:** 4 hours saved per case per month; for 110 people, a reduction of 5,280 hours of administrative work per year

▶ Policy diffusion and recognition

Date	Recognition
Apr. 9, 2025	Field study visit by the 4th Grade-5 Promotion Leadership Course of the Local Government Officials Development Institute
Jun. 23, 2025	Selected as an outstanding project of the Gyeonggido Public Agency for Social Service under Gyeonggi Province’s accountability contract (“Gyeonggi Senior AI+ Care” selected among 10 projects)
Jun. 25, 2025	Featured as an innovation case in the Local Public Institutions Magazine (Summer 2025)

Date	Recognition
Jun. 27, 2025	Field visit by the 24th Grade-6 Core Talent Course of the Gyeonggi Provincial Human Resources Development Institute
Jul. 16, 2025	Case presentation at the Ministry of the Interior and Safety's "Government AI Transformation: Present and Future"
Aug. 28, 2025	Grand prize (1st place) in Gyeonggi Province's best practices contest for the use of AI in provincial administration

Future Plans

AI Fills the Gaps in Care Even More Closely

The Customized 360° AI+ Care Service has become a new solution for an aging society, but challenges remain. Issues such as call quality and conversational stability, data management systems, and device limitations must be resolved for the service to become firmly established and to spread more widely. Gyeonggi Province and the Public Agency for Social Service have drawn up concrete action plans to resolve these issues and are preparing for the next evolution of AI care.

Key Issues

- **Call delivery and conversational stability:** Calls flagged as spam, reception conditions, and misrecognition caused by dialects and noise
- **Difficulty with real-time check-ins:** Given the weekly AI call cycle, there are limits to immediately identifying and responding to emergencies
- **Insufficient data management:** Application and cancellation paperwork and spreadsheet-based management reduce scalability and accuracy
- **Data protection and device constraints:** Refusal of consent, device damage, electricity costs, and heavy staff workloads

Future Plans

- **Technology advancement:** More precise speech recognition, reminiscence and association-based conversation algorithms, and expanded cognitive care functions for older adults with mild dementia
- **Service expansion:** Expansion to more than 6,500 older adults, expansion of the AI Senior Safety Guardian to 150 households, and more detailed customized conversation scenarios
- **Welfare and medical linkage:** Management of discharged patients and home nursing recipients in cooperation with medical institutions, and an integrated model for medication guidance and health monitoring
- **Systematic data management:** Transition to online applications and cancellations by linking with the 'Care for Everyone' Platform, and integration of linkage and follow-up management through a redesigned dashboard

Organization	Gyeonggido Public Agency for Social Service
Department	Service Support Team, Facility Support Team

Service Launch	AI Senior Companion Service: June 2023; AI Senior Safety Guardian: July 2024
Budget (2024–2026)	AI Senior Companion Service: KRW 803 million (2023: KRW 3 million for the pilot—six months free of charge and one month budgeted; 2024: KRW 310 million; 2025: KRW 490 million; 2026: KRW 510 million planned) / AI Senior Safety Guardian: KRW 60 million (2024: KRW 20 million; 2025: KRW 40 million; 2026: KRW 40 million planned)
Application Area	Public Services / Social Problem-Solving
Service Type	Q&A / Counseling Support / Service Processing
Technology Type	Language Intelligence / Expert Systems

Key Summary: Customized 360° AI+ Care Service

Category	Key Details
AI Model Selection and System Configuration	• (AI model) Uses NAVER's HyperCLOVA X model to build a conversation system that remembers older adults' past remarks and understands context, rather than mechanical question-and-answer • (Hybrid safety net) An "AI + human" triple safety net in which AI makes the call (1st), the monitoring center checks unanswered calls (2nd), and field staff are dispatched when needed (3rd), preventing gaps in care at the source • (Server stability) Urgently expanded server capacity to resolve call delays, ensuring stable calls to 1,000 people in the same time slot
Data Acquisition and Utilization	• (Unstructured voice analysis) Analyzes unstructured voice data such as "I'm in pain" or "I feel depressed" during calls in real time, immediately capturing signs of suicide risk or emergencies and automatically alerting 119 and welfare officials
Quality Improvement and Operation/Enhancement Plans	• (Resolving field difficulties) Responds to objections to device installation or device damage through active persuasion during visits, and provides real incentives such as higher allowances for staff with heavier workloads, ensuring the project's sustainability • (Automated processes) Introduces an "automatic approval process" in which AI handles simple cases, evolving into a future-oriented model centered on rapid relief and prevention • (Greater convenience for administrators) Improves data processing speed and introduces detailed search functions so that staff can intuitively monitor call results and take prompt follow-up action • (Expanded service scope) Plans to go beyond simple check-ins to health monitoring linked with medical institutions and cognitive care (reminiscence conversations) for older adults with mild dementia, and to expand recipients to middle-aged adults, people with disabilities, and others to achieve universal digital welfare

Appendix 1: Expert Recommendations

Myung-ok Lee | Executive Director, Technical Support Division, Okestro

The AI voice recognition–based care service is an example of public-sector AI with high applicability and scalability in health and welfare settings, embedding an "AI detection → human confirmation → institutional linkage" structure into service operations.

Its strengths lie in automating regular check-ins through conversational voice AI, systematically structuring signs of anomalies such as crisis utterances and unanswered calls, and running phone and speaker channels in parallel to establish an accountable response system that follows the flow of "AI detection → human confirmation → linkage to 119, eup/myeon/dong offices, and welfare resources." In addition, by combining consent-based data protection principles with human confirmation procedures, the service has secured the trust-based governance required for public care. Going forward, by expanding detection from "unanswered calls and crisis utterances" to risk signals in language and conversation patterns, and by refining the context of each recipient through integration with welfare administration data, the AI voice detection and response model can be extended to chronic disease management, including cognitive care for mild dementia and medication reminders.

Furthermore, by pursuing two-way linkage with the National Health Insurance Service's ongoing health management (health checkups, chronic disease management, and medication management) and with public health centers and medical institutions, risk signals found during care could be connected to health counseling and management, while high-risk individuals identified by the NHIS could be added to the 360° care priority queue. This would allow expansion into a prevention-centered integrated model linking "emotional and safety care → everyday health management → emergency response," which could further develop into a model for horizontal expansion to similar public services for groups such as socially isolated young people and people with disabilities.

Chang-seop Lee | Senior Advisor, AI & IT System Center, Kim & Chang

Amid the structural challenges of rapid super-aging and a shortage of care workers, Gyeonggi Province's "Customized 360° AI+ Care Service" can be regarded as a leading model of digital welfare that closes gaps in welfare coverage and maximizes the efficiency of staff operations through human–AI collaboration. I offer the following recommendations so that the project can go beyond short-term results and become a national standard model.

First, personalized conversation functions based on long-term memory should be advanced to increase older adults' acceptance of the service and their emotional satisfaction. If the service architecture is also standardized so that it can easily spread to other local governments, it can become firmly established as robust social infrastructure. This will also help build deep rapport between AI and users and serve as a key mechanism for dramatically increasing service acceptance and continued use.

In addition, strengthening the more accessible mobile phone–based model instead of the AI speaker approach would overcome past limitations in which device and communication costs made continued use difficult. Furthermore, the quantitative efficacy of the service should be demonstrated—showing that AI care contributes not only to preventing lonely deaths but also to reducing social costs, such as lower rates of depression and emergency room use. On this basis,

if an institutional funding structure is established, such as health insurance reimbursement or linkage with long-term care insurance, the service can be expected to become sustainable, nationwide welfare infrastructure.

Chan-soo Kim | Professor, Department of AI Robotics, University of Science and Technology (UST)

This project has established a system that uses AI to supplement emotional support, crisis detection, and welfare linkage in response to pressing social issues such as aging, lonely deaths, and elder abuse, and is therefore highly aligned with the goals of introducing public AI: delivering “services people can feel” and “strengthening the social safety net.” In particular, by presenting concrete performance indicators—such as satisfaction, the number of crises identified, and cost savings—along with examples of policy diffusion, it persuasively demonstrates the project’s effectiveness and potential for wider adoption.

Its appropriateness as a public service also stands out in terms of targeting and approach. The two-track strategy of a “phone-based service” that requires no additional equipment and an “installed service” that enables constant monitoring, tailored to the characteristics of older adults living alone and high-risk groups, is a key strength of this model. Moreover, the detailed description not only of recipient selection criteria and procedures but also of trial and error in actual operations—such as call delays and device management—and the improvements made is highly meaningful, as it provides practical guidelines that other local governments can benchmark immediately.

However, since the service performs functions directly linked to life and safety, such as linkage to 119 and 112, “safe service design principles” specifying how false positives and false negatives are managed, emergency response criteria, and accountability in the event of an incident should be established more systematically. In addition, to improve scalability, I recommend presenting security management measures—such as consent procedures for personal information, retention and access control, and outsourcing structures—in the form of a concrete “standard checklist.”

Appendix 2: Interview with the Project Officer

Jae-eun Jeon | Team Leader, Gyeonggido Public Agency for Social Service

Q. What difficulties did you face during the service planning stage (project launch and initial adoption)?

A. From the early stages, the AI Senior Companion Service faced a number of technical and institutional challenges. In particular, there were greater challenges and uncertainties than expected in many respects, including defining the scope of AI's role in care, data protection and ethics, the conversational stability of generative AI, and acceptance among older adults.

First, we clearly defined AI not as a replacement for people but as an "assistive tool" that helps with check-ins through its companionship function. This definition reflected an approach that treats AI as "a technology that frees up time for care," so that field staff can spend more time on those who need care.

Second, data protection and ethics issues were systematically addressed from the design stage through stronger consent procedures, the principle of minimal data collection, limits on the purpose of use, and a crisis response system. We also continuously collected cases in which the early AI counselor gave older adults inaccurate information beyond its scope and regularly reviewed and improved them together with the vendor.

Third, the early conversations felt mechanical and monotonous, but as conversation data accumulated and improvements continued, the service developed into a more natural and richer companion service.

Finally, there were concerns in the field about whether older adults would actually accept the service. However, after we provided clearer guidance on the purpose of the service and how to use it from the second year and strengthened monitoring by months of use, older adults gradually became familiar with the service and their trust in it grew.

In particular, as cases emerged in which crises were detected early through AI calls, protecting lives and safety, the service expanded its role beyond simple companionship to become "a practical care tool that helps the field."

Q. Is there any budget, organizational, or other support system in place—or needed—to sustain and advance the project?

A. For the stable implementation of the AI Senior Companion Service, it was very important to carefully design the funding and organizational structure from the early stage. First, Gyeonggi Province established and implemented the project as a provincial policy project to respond to the rapidly growing older population. Initially, securing operating costs for the AI calls was the key task, but as the project gained momentum, the importance of dedicated staff who could monitor conversations with older adults in real time and assess signs of crisis became even clearer. In particular, by building a delivery system that can immediately identify crisis signs and link them to local governments, we sought to create a community-based protection system that goes beyond simple care.

Q. What efforts did you make to build the AI service?

A. The core of the AI Senior Companion Service is "natural conversation suited to the situation," including the flow and timing of conversations and the appropriateness of topics. To this end, we put a great deal of effort into managing conversation quality, such as continuously checking the

appropriateness of conversation content and fine-tuning the criteria for judging risk signals.

We also structured crisis signals—such as the content of check-in calls, response patterns, long periods without answering, complaints of health problems, and low mood—developing the service into a data-based system that goes beyond simple call records to enable crisis detection and linkage. In the early stages, the AI's conversations were somewhat monotonous, but the conversation algorithms have been continuously advanced through regular technical consultations and the accumulation of conversation data. In addition, we gathered feedback through user satisfaction surveys and field interviews and steadily improved details such as speaking speed, forms of address, and call times based on the field. I believe this series of efforts played an important role in securing the reliability of the AI service and its stable expansion.

Q. What is the future direction of the service, and what kind of government-level support is needed?

A. The key to the future development of the AI Senior Companion Service is to advance the service in ways that genuinely improve each older adult's quality of life and to expand it beyond a pilot into public infrastructure that can be used reliably anywhere in the country. Going beyond simple check-in calls, it should develop into an integrated care platform that detects complex risk signals—such as emotional isolation, depression, and dementia—early and automatically links them to local resources. From the current service centered on companionship, its functions need to expand to services linked to all aspects of daily life, including health, meals, and illness.

Developing and actually implementing a roadmap for this requires support in the form of national funding, a dedicated organization, and specialized personnel. I hope that a national project will be pursued so that the service does not remain a project of individual local governments but becomes stably established as a nationwide model applicable to everyone in Korea. Only when such a foundation is in place will stable operation and continuous advancement of the service be possible.

In terms of technology and data, common government infrastructure and standards are essential. Currently, different systems are being introduced by each local government, resulting in fragmented data and duplicated costs. I hope that the central government will build a standard platform based on the public cloud and systematically structure the data, making local governments' finances and administration more efficient. In the welfare sector, I also hope for national-level support so that AI technology and care can naturally combine into a new service model based on data protection and AI ethics standards.

Finally, I believe public AI services are more effectively spread by improving and advancing them based on the trials and operating experience of leading regions, rather than by distributing them nationwide all at once after they are perfectly prepared. I hope that our current efforts will serve as a meaningful stepping stone for improving the quality of life of older adults in Korea and for the future society we will face.

CASE 7 | SAFETY

One selfie stops unlicensed driving before the trip begins!

A Smart Gate for Public Safety

Ministry of Land, Infrastructure and Transport (Korea Transportation Safety Authority): Rental Car Information Management System (RIMS)

The Rental Car Information Management System (RIMS) is a next-generation traffic safety service that uses AI facial recognition and selfies to verify whether the driver is the actual license holder—something difficult to confirm with a license alone—and blocks unlicensed driving, identity theft, and driving by someone else in advance. Its scope has now expanded beyond rental cars to delivery motorcycles and personal mobility (PM) devices, establishing it as an integrated traffic safety management system covering the various means of transport on the road.

Rental Car Information Management System (RIMS) – Key Functions

- **Stronger identity verification:** Prevents identity theft by comparing the license photo with a real-time selfie
- **Prevention of forgery and alteration:** Verifies the authenticity of licenses through AI-based hologram analysis and database matching
- **Liveness authentication:** Blocks the use of stolen photos or videos by recognizing eye blinks and facial movements
- **Anytime, anywhere:** Stable 24-hour service through a direct link to the Korean National Police Agency (KNPA) database

Background

Unlicensed Driving Accidents Surge Alongside the Growth of Shared Mobility

Teenager A: *"My brother and I look exactly alike—they'll never notice, right?"*

Rental car operator B: *"Just entering a license number doesn't tell me whether someone is using another person's identity."*

With the spread of shared mobility, unlicensed driving has emerged as a major threat to public safety. Existing driver qualification checks were limited to looking up license numbers and names, making it difficult to confirm accurately whether the actual driver was the license holder.

As a result, as of 2023, 229 (86%) of the 265 unlicensed-driving accidents involving commercial vehicles occurred in rental cars, and 79 of these—36.6% of the total—involved young people aged 20 or under. Road safety was being structurally undermined in a usage environment that prioritized convenience.

In response, the Ministry of Land, Infrastructure and Transport and the Korea Transportation Safety Authority introduced the AI facial recognition–based Rental Car Information Management System (RIMS). By checking license information and a real-time selfie at the same time, a next-generation traffic safety management system was established that determines whether the actual driver is the license holder.

How RIMS Works

A Face Is All It Takes: 99% Verified!

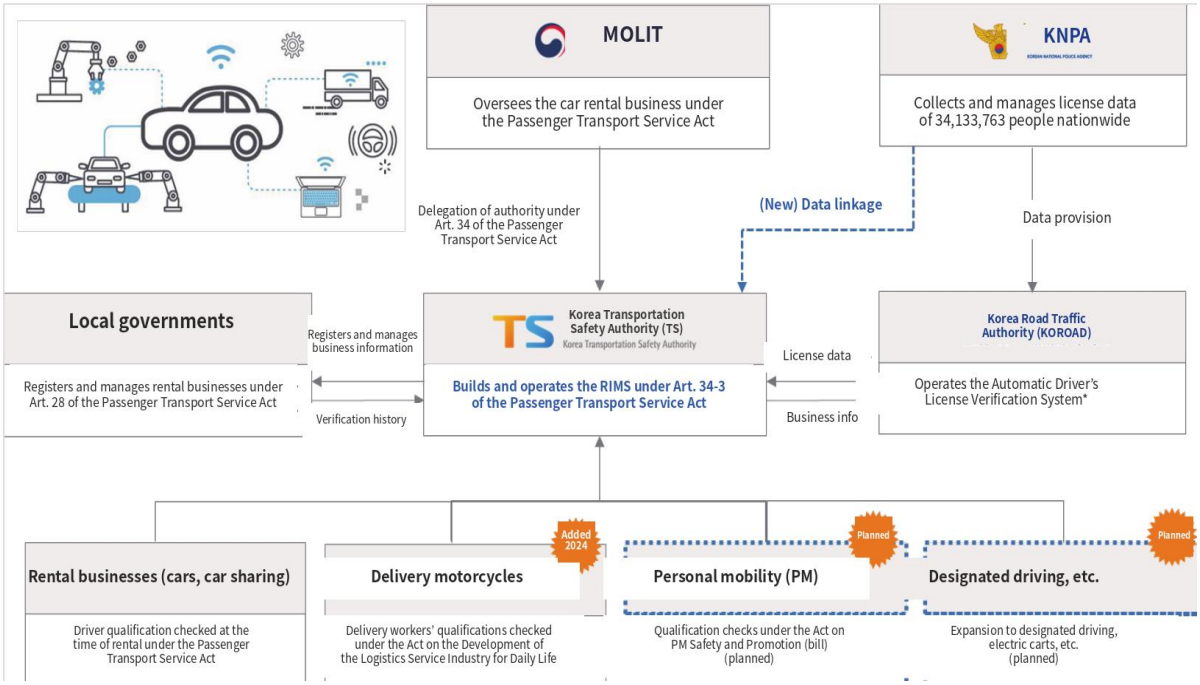
The core function of RIMS is AI facial recognition–based identity verification. The AI extracts hundreds of feature points—such as facial contours, the positions of the eyes, nose, and mouth, and skin texture—to compare the two images precisely, and judges them to be the same person if the similarity is 96% or higher. The technology currently achieves a high accuracy of 99.99%. In addition, liveness technology detects eye blinks, head movements, and changes in facial angle, so that authentication cannot be passed with a simple photo or video.

The system has also been enhanced with license hologram extraction technology (Vision AI) to determine not only whether a license has been forged or altered but also whether the license photo is genuine. By comparing the photo directly with the license photo stored in the KNPA source database at the time of issuance, the system confirms both the validity of the license and whether the actual driver is the license holder. In this way, RIMS has evolved beyond simple qualification checks into a substantive identity verification system.

Models and Data

- **Model:** Vision AI by Alchera Inc.
- **Data:** KNPA license information and photo database, linked directly through the Administrative Information Sharing Center

< Linkage Diagram of the Vision AI Model >



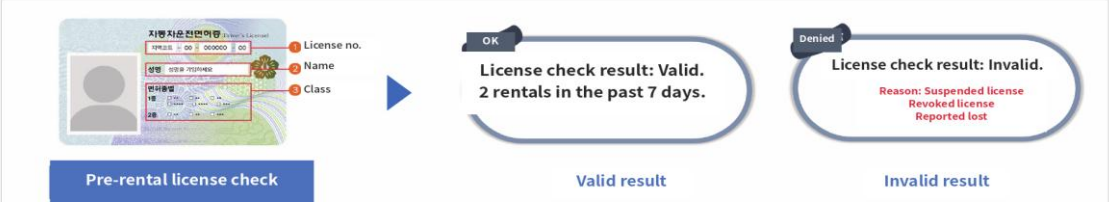
* Automatic Driver's License Verification System: operated by the Korea Road Traffic Authority (KOROAD)

Evolution

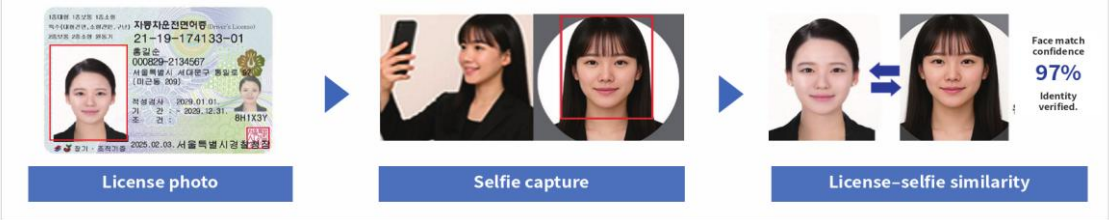
Optimization in Four Stages

- **Stage 1 (2023):** RIMS first built following an amendment to the Passenger Transport Service Act; implemented a function to verify the validity of driver qualifications by entering the license number, name, and license class
- **Stage 2 (2024):** AI facial recognition added through an upgrade project; functions verified in a real service environment through a pilot with five rental car companies
- **Stage 3 (2024–2025):** Field needs reflected through meetings with private companies (SOCAR, Turo Car, etc.), such as priority application to high-risk customers and simplified authentication procedures; meetings also held with delivery agency service operators such as Yogiyo and Coupang Eats to gather views from various sectors
- **Optimization stage:** A stable, uninterrupted service structure secured through a direct link with the KNPA license database, resolving the problem under the previous route via the Korea Road Traffic Authority, in which any failure halted the entire service

< Functions of the Previous RIMS >



< AI Facial Recognition Similarity Verification in RIMS >



Overcoming Challenges — Technical hurdles: AI was the answer

In the early stages, poor data quality led to cases in which the AI could not accurately match selfies to license photos. To address this, the team worked with AI experts to repeatedly refine data and retrain the model, gradually improving performance by linking more than 20,000 training images per day on average with the actual driver's license database.

In addition, considering that privacy regulations make it difficult for private companies to store license photos themselves, the system was designed to allow real-time matching through API calls, resolving legal and technical constraints at the same time. In the field, concerns were raised during initial adoption about increased inconvenience for customers, but agreement was reached to apply the system first to high-risk users, laying the groundwork for gradual expansion.

Through this process of balancing technical limitations with field needs, RIMS quickly evolved beyond a simple qualification lookup service into an AI-based smart identity verification platform.

Outcomes and Expected Effects

Today's Results, Tomorrow's Safety

RIMS delivered visible results from its first year. In 2024 alone, a total of 150 million driver qualification checks were made, and more than 110,000 cases of unlicensed or unqualified driving were blocked in advance. As a result, unlicensed-driving accidents involving rental cars and delivery motorcycles fell by 14% from the previous year, with 3 fewer deaths and 231 fewer injuries, resulting in social cost savings of about KRW 17.3 billion.

The public is also experiencing a shift from "checks based on showing a license" to "identity verification in which AI checks the face as well." As problems that were difficult to address under the previous system—such as unlicensed driving by young people and license trading through brokers—are blocked in advance, RIMS is establishing itself as a traffic safety management system based on digital identity verification that supports safety on the road.

- **Results (2024):** 150 million checks; 110,000 cases of unqualified driving blocked

Category	Rental cars	Delivery motorcycles	Total
Normal results	116,021,873 (93.6%)	31,467,683 (97%)	147,489,556 (94%)
Blocked: reissued licenses	12,307	1,464	13,771
Blocked: licenses reported lost	13,210	1,544	14,754
Blocked: suspended licenses	7,807	5,066	12,873
Blocked: revoked licenses	63,061	8,838	71,899
Total blocked	96,385 (0.08%)	16,912 (0.05%)	113,297 (0.07%)
Errors	7,758,165 (6.2%)	865,349 (2.6%)	8,623,514 (5.5%)
Total checks	123,876,423 (100%)	32,349,944 (100%)	156,226,367 (100%)

- **Fewer accidents:** Unlicensed-driving accidents down 14%; 3 fewer deaths and 231 fewer injuries
- **Economic impact:** Social cost savings of about KRW 17.3 billion

< Unlicensed-Driving Accidents >

Year	Rental cars: accidents	Rental cars: deaths	Rental cars: injuries	Motorcycles: accidents	Motorcycles: deaths	Motorcycles: injuries
2023	229	3	352	1,035	46	1,278
2024	198	2	301	890	44	1,098
Reduction	31	1	51	145	2	180
Reduction rate	14%	33%	14%	14%	4%	14%

Since September 2024, use of the system has also been mandatory for delivery agency services (delivery motorcycles), and if AI facial recognition is used alongside qualification checks, even the use of another person's license can be prevented. However, since the use of AI facial recognition is not yet fully mandatory, further guidance on the system and promotion to expand its use among private operators are needed.

Future Plans

The Challenge of Achieving Zero Unlicensed Driving!

Starting with rental cars and delivery motorcycles, RIMS is gradually expanding its scope, with the ultimate goal of building future-oriented traffic safety infrastructure that eliminates unlicensed driving on the road.

- **Expanded application:** Extending the identity verification system from rental cars and delivery motorcycles to e-scooters (PM), designated driving services, and more
- **Legislation:** Laying the institutional foundation for mandatory use through the passage of related bills such as the Act on PM Safety and Promotion (bill)
- **Integrated platform:** Developing into an all-in-one driver qualification verification system covering all means of mobility — rental businesses (June 2023) → delivery motorcycles (September 2024) → PM (2025–) → integrated mobility driver qualification verification system
- **Stronger outreach and cooperation:** Raising awareness and use of the service through private–public partnerships, press releases, MOUs, and more

< Related Bills >

Act on PM Safety and Promotion (bill)	Partial Amendment to the Road Traffic Act (bill) – Rep. Jeong Dong-man
Article 24 (Obligations of rental businesses) (1) When renting out personal mobility devices for rental business, a rental business shall verify the driving qualification of the lessee … Article 25 (Establishment of the driver qualification verification system) (2) When verifying driving qualifications under Article 24(1), a rental business shall use the driver qualification verification system.	Article 49-2 (Obligations of personal mobility rental businesses) … When renting out a personal mobility device, [the business] shall establish a system necessary to verify the lessee's driving qualification and shall verify the lessee's driving qualification using that system. Article 80(2)2, new item (d): (d) Personal mobility device license

Currently, verifying the driving qualifications of e-scooter (PM) users is not a legal obligation, which places certain constraints on introducing AI facial recognition. However, given strong interest in the National Assembly, bills on verifying the driving qualifications of personal mobility users have been introduced, and if they pass, an institutional response to block unlicensed driving by young people will also become possible for personal mobility devices. The ultimate goal is to complete a future-oriented traffic safety management system in which everyone can travel with peace of mind by achieving "zero unlicensed driving on the road."

Organization	Ministry of Land, Infrastructure and Transport / Korea Transportation Safety Authority
Department	Mobility Policy Division (MOLIT) / Mobility Research Department (TS)
Service Launch	December 2024
Budget (2024–2026)	KRW 2.08 billion (2024: KRW 826 million; 2025: KRW 687 million; 2026: KRW 570 million expected)
Application Area	Public Services / Social Problem-Solving
Service Type	Analysis and Utilization / Service Processing
Technology Type	Visual Intelligence

Key Components and Plans of the Rental Car Information Management System (RIMS)

Category	Key Details
Core Functions and Infrastructure	• (Accuracy) Determines whether the license photo and a real-time selfie show the same person based on AI facial recognition (99.99% accuracy) • (Blocking forgery) Prevents the use of stolen photos or videos and the forgery or alteration of licenses by applying liveness detection (e.g., eye blinks) and hologram extraction technology • (Stable infrastructure) Secures an uninterrupted, stable service by switching from the previous route via the Korea Road Traffic Authority to a direct link with the KNPA database
Data Acquisition and Utilization	• (Securing data) Builds a learning system based on more than 20,000 training images per day on average and matching with the actual driver's license database, through data refinement and retraining • (Privacy protection) Designed so that private operators do not store license photos and matching is done in real time through API calls, resolving privacy and legal constraints
Quality Improvement and Operation/Enhancement Plans	• (Reflecting field needs) Lays the foundation for gradual expansion by reflecting field needs—such as priority application to high-risk customers—through meetings with private companies • (Expanded application) Pursues expansion from rental cars and delivery motorcycles to PM (e-scooters) and designated driving services • (Legislation) Pursues the institutional basis for mandatory use of the system through amendments to related laws such as the Act on PM Safety and Promotion (bill)

Appendix 1: Expert Recommendations

Myung-ok Lee | Executive Director, Technical Support Division, Okestro

Combining AI facial recognition and liveness technology with the existing photo-matching approach in driver qualification checks—a procedure directly linked to people's lives and safety—is an effective, evidence-based means of preventing unlicensed driving, driving with a suspended or revoked license, and misuse of licenses through brokers. The system is regarded as a service with high potential to increase trust across the mobility sector as a whole, including platforms, rental cars, taxis, and delivery services.

Furthermore, since the technology is highly applicable to other areas requiring identity or qualification checks—such as resident registration cards and various certificates—it has the versatility to expand across both the public and private sectors. However, to secure social acceptance in advance with regard to privacy protection in the use of biometric information, algorithmic fairness, and user choice and alternative authentication methods, I would like to offer the following two recommendations.

1. AI service strategy — To respond to various types of misuse, such as forged, altered, or stolen IDs, unlicensed driving, and proxy authentication (brokers), the roles of and relationships between existing qualification verification services—such as smart chip–based electronic licenses, qualification lookups through real-time linkage with license databases and information, and the PAAS app—and AI-based qualification verification need to be clearly defined. In particular, a phased adoption strategy is required that determines whether AI-based verification will replace existing services or be operated in parallel for a certain period. In addition, since app- and web-based non-face-to-face platform environments (e.g., driver recruitment and hiring) involve technical, social, and legal limitations simultaneously, institutional measures premised on parallel operation with existing qualification verification services are needed. It is also advisable to design the service from a customer experience (CX) perspective to secure both the acceptance and effectiveness of the system.

2. Advancing AI technology — In non-face-to-face environments, accuracy may be lower than in person due to network latency, camera quality, and lighting. There is also the possibility of sophisticated attacks in which a proxy performs authentication or manipulated live video is transmitted. Future technical advancement should take into account a wide range of usage environments, such as low-light conditions and older devices.

Chang-seop Lee | Senior Advisor, AI & IT System Center, Kim & Chang

RIMS is a case that compensates for the limitations of existing driver qualification checks and builds a more sophisticated and reliable identity verification system using AI technology. Beyond administrative efficiency, it is meaningful as digital traffic safety infrastructure that people can experience in their daily lives.

However, to continuously improve the system's effectiveness and use and to spread it stably across the field, strategic consideration is needed in the following two areas.

1. A cooperation framework and device distribution strategy to promote private-sector adoption — To expand its effects, the system needs to spread across actual sites, including various businesses (transport companies, logistics companies, car-sharing services, etc.) and roads, so that drivers' qualifications can be verified at all times. This requires policies to support the development and

distribution of small, low-cost portable devices, and it would be effective to form a public–private council involving the transport and mobility industries, device manufacturers, and platform companies to jointly discuss ways to expand use in the field.

2. Improving facial recognition rates and strengthening privacy protection — Facial recognition rates may decline due to environmental factors such as poor lighting or wearing glasses or masks, and excessively relaxing recognition thresholds could undermine trust in the service. With this in mind, the system should prepare for recognition errors in various environments and establish procedures for using supplementary authentication methods when facial recognition does not work smoothly. In addition, since facial images are biometric information classified as sensitive information under the Personal Information Protection Act, strict management is required throughout their collection and use. Users' prior consent should therefore be obtained through clear and specific notice, and collected data should be managed through de-identification and encryption to minimize the risk of privacy infringement.

Chan-soo Kim | Professor, Department of AI Robotics, University of Science and Technology (UST)

This service is a public AI service that combines AI recognition technology with selfies to verify whether the driver is the license holder and to prevent unlicensed driving, identity theft, and driving by others in advance. It is a case that aligns with the government's policy direction of "spreading public AI through the use of AI," and is particularly meaningful as a social safety–oriented AI model aimed at solving unlicensed-driving accidents involving young people and identity theft.

1. Alignment with the goal of spreading public AI — The plans to expand the service to e-scooters and designated driving services, together with efforts to pursue related legislation, show that the system can develop into a continuing vision for spreading public AI rather than ending as a one-off project. In this respect, the service can be regarded as a case that combines potential for future expansion with public value.

2. Appropriateness of the public AI target and contribution to the social safety net — Given the limits of license number lookups alone in effectively preventing identity theft and unlicensed driving by young people, more sophisticated identity verification using public AI is an important public task. The system directly strengthens the social safety net for users of means of transport that require license verification, such as rental cars, delivery motorcycles, and personal mobility devices, and since it can be applied to everyday means of transport in general, it also shows potential to expand into service-type public AI for the entire population. In addition, as it also presents efforts to lay an institutional foundation, such as legal amendments, it offers useful lessons for other institutions designing and introducing similar systems.

Appendix 2: Interview with the Project Officer

Kyung-eun Kim | Assistant Director, Mobility Policy Division, Ministry of Land, Infrastructure and Transport

Q. Why did you choose and advance a Vision AI model for this project?

A. Even after RIMS was introduced in June 2023, unlicensed-driving accidents continued to occur in rental cars and personal mobility (PM) devices, so we began thinking about how to prevent unlicensed driving by young people. There were repeated cases in which people used another person's license even though the license itself was valid, and in that process we recognized that the existing qualification check had limitations in terms of "identity verification."

In particular, since COVID-19, rental car use has shifted to non-face-to-face methods, with more cases of vehicles being used in unmanned environments with online authentication alone, leading to continued identity theft. To address these limitations, we introduced AI facial recognition technology.

Unlike general facial recognition methods, this technology analyzes feature points by vectorizing measurements such as the distance between the eyes and nose. Its strength is that it can recognize faces even after cosmetic surgery or more than 20 years of aging.

Q. Do you have any tips on building the system and securing a budget for a sustainable project?

A. RIMS is currently located at the National Information Resources Service (Daegu Center), so the operation and maintenance of the system hardware are supported in the national cloud environment. This helps us operate the system stably, and the system is continuously monitored for sudden outages and external intrusions.

The Daegu Center, operated by the Ministry of the Interior and Safety, surveys resident institutions at the beginning of each year on their capacity shortfalls and resource needs and reflects them, which I believe helps in carrying out sustainable and flexible information technology projects.

Q. What is the future direction of the system, and what kind of government-level support is needed?

A. Initially, the project targeted rental cars under Article 34-2 of the Passenger Transport Service Act, but its scope has gradually expanded, and it now covers delivery agency services (delivery motorcycles), personal mobility (PM) devices, and designated driving services.

Following an amendment to the Last-Mile Logistics Industry Development Act, the driving qualifications of delivery workers for services such as Baemin and Yogiyo are now verified through this system, and the qualifications of e-scooter riders—an issue that has drawn criticism over reckless riders—will also be managed under the same system.

As such, the system has become important infrastructure directly responsible for public traffic safety, and since its scope will continue to expand, I believe active government support in terms of budget and personnel will be needed for its stable operation and advancement.

Q. Please describe any other key considerations during implementation, or how you overcame difficulties.

A. Driver qualification checks themselves are legally required, but identity verification using AI facial recognition is not yet mandatory, so encouraging private operators to adopt it was difficult.

Applying facial recognition is ideal in terms of safety, but many rental car operators were reluctant to adopt it out of concern that it would increase inconvenience for customers. We therefore approached the goal through gradual rather than full adoption. For example, we reviewed and applied approaches such as replacing the existing phone-based customer service verification with AI facial recognition only for users classified as high-risk, or applying it first to new subscribers.

We considered it important to listen carefully to private operators' practical difficulties and to coordinate with them, and we encouraged adoption by signing MOUs with companies willing to cooperate and carrying out joint activities such as the ""Musa-GO" Safe Driving Campaign." Through this experience, I came to believe that the key to spreading public AI services is building them together through compromise and collaboration rather than applying ideas unilaterally.

CASE 8 | SAFETY

Real-time tracking, instant blocking!

An AI Investigator for Digital Public Safety

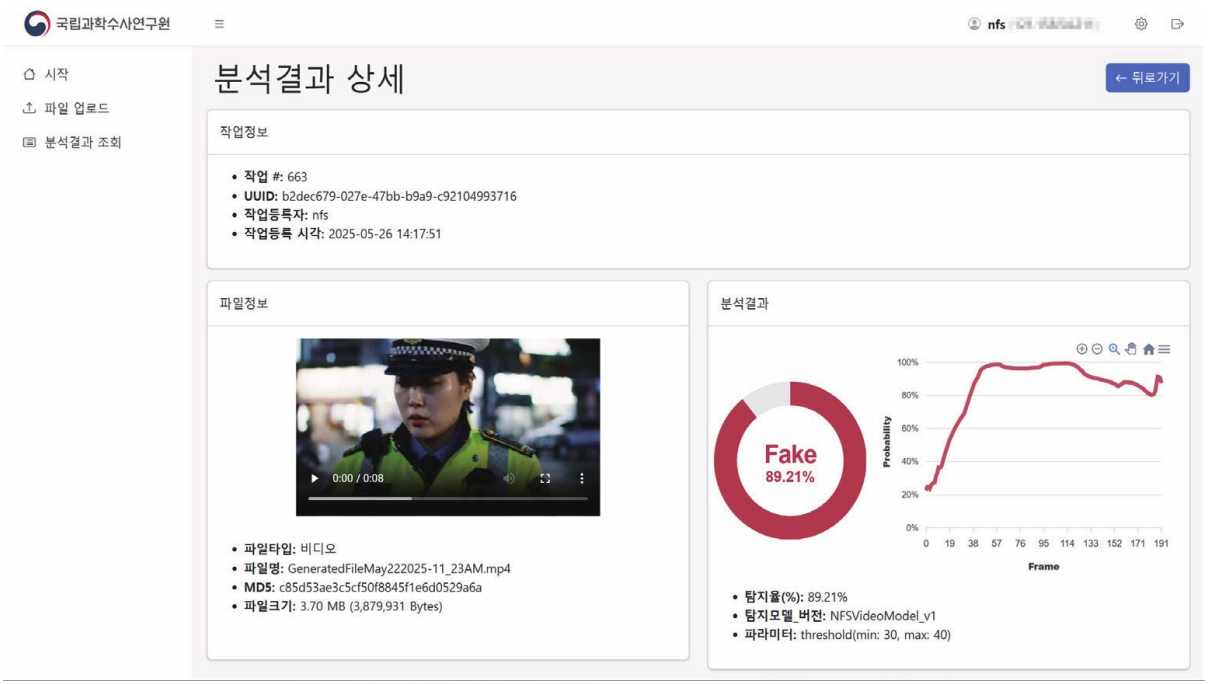
Ministry of the Interior and Safety (National Forensic Service): AI Deepfake Analysis Model

The AI Deepfake Analysis Model is an AI-based investigation support platform that detects and analyzes illegally manipulated videos and images in real time to support responses to digital crime. It is also a key national AI technology developed to protect victims from the rapid rise in digital sex crimes and deepfake crimes, and to strengthen the analytical and response capabilities of investigative agencies.

AI Deepfake Analysis Model – Key Functions

- **Real-time detection:** Automatically identifies illegally manipulated videos and images and flags anomalies
- **In-depth analysis:** Extracts traces of manipulation through deep learning–based analysis and supports authenticity verification
- **Investigation support:** Systematically builds crime-related evidence data for use in investigations
- **Platform integration:** Supports an integrated response to digital sex crimes and cybercrime





Operating screens of the AI-based model for detecting and analyzing illegal deepfake content

Background

Enough with Deepfake Crimes! The AI Digital Crime Forensics Team Steps In

Victim A: *"A video with my face edited into it is apparently spreading online. What should I do?"*

Citizen B: *"Every election season, I can't tell whether the videos circulating online are real or fake."*

How long must we live in fear of deepfake crimes? Worry no more! The AI Deepfake Analysis Model, an AI digital crime forensics team that swiftly detects and analyzes illegally manipulated content to support a timely response, is here to help.

In recent years, deepfake crimes have spread rapidly across society. Requests for corrective action against deepfake sexual content rose sharply from just 473 cases in 2020 to 23,107 cases in 2024, an increase of roughly 50-fold in only five years.

< Requests for Corrective Action against Deepfake Sexual Content, 2020–2024 >

Year	2020	2021	2022	2023	2024
Cases	473	1,913	3,574	7,187	23,107

Source: Korea Media and Communications Commission

The victims of deepfake crimes are no longer limited to celebrities; they now include ordinary citizens, adolescents, and even children. Under the existing investigation system, however, it was difficult even to determine whether a video was authentic when no reference file was available, and it often took several days to resolve a case even after a victim had reported it.

To respond to such deepfake crimes more systematically, the Ministry of the Interior and Safety (MOIS), the National Forensic Service (NFS), and AI experts joined forces. Under the goal of "catching fakes before citizens are harmed," they developed Korea's first AI-based investigation support platform that detects and analyzes illegally manipulated content in real time to support the response.

Key Features

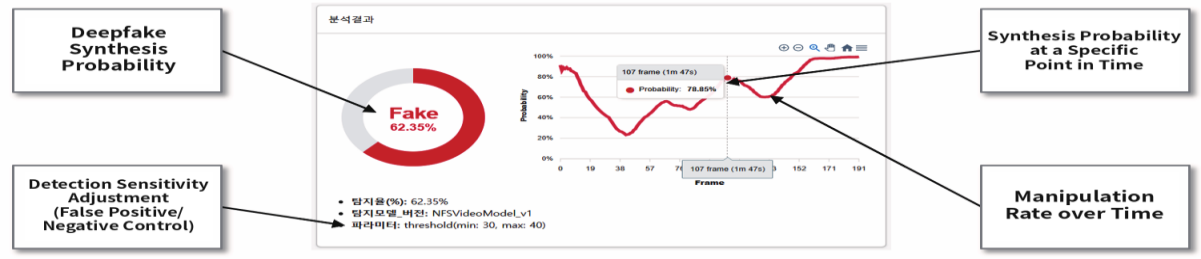
Solving Digital Crimes through a Digital Lens

“Doesn’t this video look suspicious?”

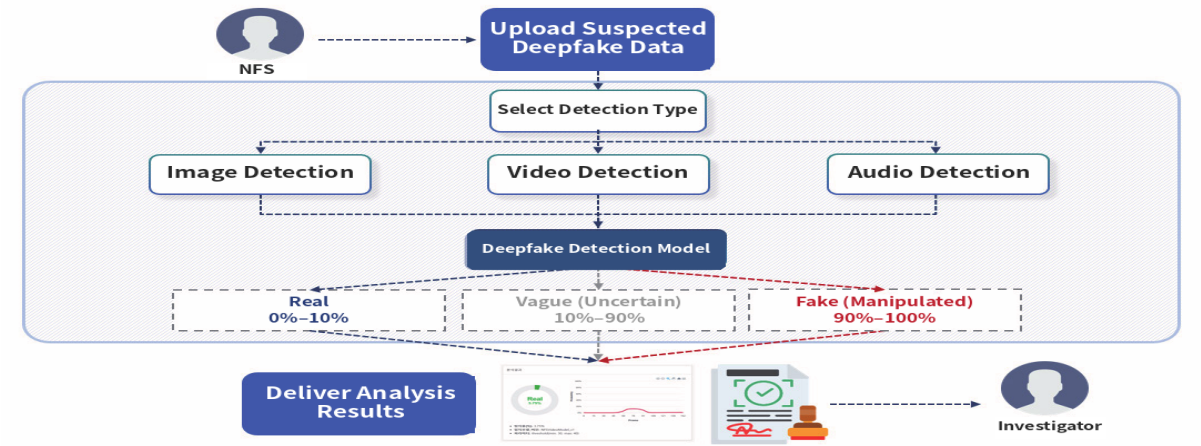
As deepfake technology becomes more sophisticated, it is becoming increasingly difficult to tell real from fake with the human eye alone. To overcome this limitation, the AI Deepfake Analysis Model is equipped with the “eyes and ears” of AI through advanced detection algorithms. It breaks down the faces and backgrounds in a video at the pixel level and precisely traces signs of digital manipulation. Trained on hundreds of thousands of manipulated and original data samples, the deep learning model detects even subtle distortions as well as inconsistencies in lighting and shadows.

The model also precisely analyzes how well speech matches lip movements and detects unnatural motion between frames. Rather than simply judging “similar” or “different” through visual comparison, it presents quantitative evidence, expressed as a synthesis probability percentage, based on the data features the AI model has learned.

These analysis results serve as a powerful indicator for responding swiftly to crimes and information distortion involving deepfakes, and will contribute to building a healthy digital ecosystem.



Example of AI Deepfake Analysis Model detection results



Analysis model usage process

Development Process

Learning from Every Video and Voice

To keep pace with increasingly sophisticated deepfake technology, a deepfake detection solution

was developed in 2024 in collaboration with the National Information Society Agency (NIA) under the “Development of AI-Based Data Analysis Models for Solving Pressing Public Issues” project. The starting point for responding to deepfake crimes was securing reliable data. To overcome the previous limitation that forensic examination was nearly impossible without a reference file, the NFS and AI experts worked together to collect and refine a wide range of data, including public datasets from Korea and abroad as well as in-house content. As a result, a total of 2.31 million data items, including 690,000 videos and 1.62 million audio clips, were secured and used to train the model.

- **Data collection and refinement (2024):** Secured a total of 2.31 million training data items, including 690,000 videos and 1.62 million audio clips
- **Advancement of detection technology (2024–2027):** Continuously improving detection performance through the IITP research project “Development of Self-Evolving Deepfake Detection Technology to Prevent the Adverse Social Effects of Generative AI,” led by the Ministry of Science and ICT
- **Model advancement:** Evolving into a “digital investigator” that precisely identifies traces of manipulation in video and audio through deep learning–based analysis

As synthesis technologies continue to advance, AI experts, investigators, and forensic examiners formed a single team and repeated dozens of rounds of testing, feedback, and performance improvement to ensure detection accuracy and reliability. As a result, forensic examinations that once took several days were reduced to just minutes.

In addition, concerns had been raised about inconsistent examination results due to differing analysis criteria and methods across investigative agencies. To address this, a Standard Operating Procedure (SOP) for deepfake detection and analysis was established in May 2025, creating a standardized analysis framework. The SOP was designed to work in combination with the results of the AI-based solution to provide investigative agencies with more reliable analysis results.

< Comparison before and after Introducing the AI Deepfake Analysis Model >

Category	Conventional Forgery Examination	Deepfake Examination Using the AI Model
Analysis method	Comparison and analysis of file record information (metadata, compression information, etc.) between the examined file and a reference file	AI-based automatic extraction of deepfake features and probability-based assessment; no reference file required
Assessability / time	Low assessability and lengthy analysis time	High assessability and significantly shorter analysis time; accuracy: video 94.98%, audio 86.20%
Scope of work	Examination possible only in limited cases where a reference file is available	Examination possible for virtually all deepfakes, including content circulated online without a reference file

< NFS Forgery and Deepfake Examinations, 2021–2025 >

Year	2021	2022	2023	2024	2025 (H1)
Forgery examinations	83	126	143	103	49
Deepfake examinations	0	0	0	0	15

Results in Solving Crimes

AI Deepfake Analysis Model Enters Full Operation in NFS Forensic Examinations (15 Cases / 60 Items)

The full-scale use of the AI Deepfake Analysis Model in NFS forensic examinations marked a new turning point in the field of digital forensics. In particular, the model enabled rapid examination and analysis of 13 cases involving presidential election candidates and 2 digital sex crime cases, proving its effectiveness in the field of digital investigation.

In addition, related technology based on joint research by the Korea Electronics Technology Institute (KETI) and the NFS (led by the Ministry of Science and ICT) was introduced into the monitoring system of the National Election Commission, where it was used to detect and take action against 10,508 illegal deepfake election posts circulated online.

By proactively detecting and addressing criminal videos before they spread to the public, the investigative response has begun shifting from a reactive approach to a preventive one. Forensic examinations that once took several days are now completed within minutes. As a result, deepfake examination, previously considered nearly impossible, has become an established part of official investigative procedures, laying the foundation for investigative agencies to respond more proactively to digital crimes.

< Requested/Completed Video and Audio Forgery Examinations among All Digital Forensic Examinations, 2021–2025 >

Year		2021	2022	2023	2024	2025 (H1)
Video/audio forgery examinations (deepfake examinations)	Audio	30 (0)	38 (0)	32 (0)	28 (0)	19 (7)
	Video	53 (0)	88 (0)	111 (0)	75 (0)	27 (6)
	Total	83 (0)	126 (0)	143 (0)	103 (0)	46 (13)

Expanding the Scope of Use

Next Stop for the AI Deepfake Analysis Model: The Ministry of Gender Equality and Family and the Korea Media and Communications Commission?!

The AI Deepfake Analysis Model is a core technology expected to expand into a variety of public sectors. While it is currently used for specialized forensic examinations at the NFS, it is ready to gradually broaden its scope of application through further technological advancement.

When related agencies that need to respond to deepfakes, such as in combating digital sex crimes, monitoring illegal and harmful content, and preventing election-related crimes, request support, the NFS plans to actively review and provide technical support to build a national response system.

This is expected to lay the technological foundation for a strong cooperative framework to jointly respond to digital threats across society.

In addition, through integration with the Digital Authentication System (DAS), a two-tier system is planned in which frontline investigators run analyses themselves while the NFS concentrates on complex cases requiring in-depth analysis.

In this way, AI deepfake analysis technology is expanding its use across the public sector as the "eyes and ears of the nation," and continues to evolve into national digital safety infrastructure that supports the response to digital crime.

- **Expansion to other agencies:** Technical support after consultation, upon request from related agencies (e.g., the Ministry of Gender Equality and Family and the Korea Media and Communications Commission)
- **Areas of application:** Blocking digital sex crimes, illegal and harmful content, and election crimes
- **Operating system:** Frontline investigators check analysis results through integration with DAS, while the NFS handles complex cases

< Key Benefits of Integrating the Analysis Model into the System >

Category	Current Standalone Operation	After Integration into DAS
Model accessibility	Accessible only from designated PCs within the NFS	Investigators with NFS DAS access rights can access the model directly within the system
Analysis process	Analyst manually uploads files → runs analysis → checks results → notifies results	(Step 1) Investigators check one-click analysis results in DAS; (Step 2) If necessary, request in-depth examination from the NFS
Work efficiency	Bottlenecks may occur due to limited staff as analysis requests increase	Simple, repetitive analyses are handled by the system, and the NFS focuses on complex cases, easing bottlenecks
Use of results	Results are compiled separately before notifying investigative agencies; additional work needed to prepare examination reports	Results can be checked and used immediately in DAS; if necessary, an in-depth examination report verified by NFS expert analysts is provided

From Face to Full Body: Expanding the Detection Scope

In its initial stage, the AI Deepfake Analysis Model was developed to detect manipulation focusing on the face in videos. However, given the nature of digital sex crime videos, the need to detect body parts other than the face was continually raised. In response, the NFS produced generative deepfake videos in-house and retrained the model. Building on these training results, the model is now being advanced to detect areas beyond the face.

- **Initial scope:** Deepfake analysis focused on the face
- **Need for expansion:** Demand for detecting body parts in sex crime videos and similar content

- **Ongoing advancement:** In-house data + retraining → detection expanded to areas beyond the face

Expected Effects

Changes Brought by the AI Deepfake Analysis Model

The AI Deepfake Analysis Model has shifted digital crime investigation from a reactive response system to a preventive blocking system that enables earlier intervention. Illegal deepfake content is now swiftly detected and analyzed after posting and used for enforcement action, and forensic examinations that once took several days have been reduced to minutes. This has established a proactive response system that can minimize the spread of crime even before victims file a report.

Previously, even when expensive foreign solutions were introduced, it was difficult to achieve sufficient detection performance for East Asian faces. In-house development has improved budget efficiency while laying the foundation for continuous performance improvement. The model is establishing itself not merely as an AI technology but as a forensic science support platform for the public sector, and it helps ease public anxiety by supporting the analysis of and response to crimes with significant social impact, such as election crimes and digital sex crimes.

Going forward, the NFS plans to expand the scope of analysis from face-centered detection to the full body and to continue advancing the model by producing and retraining on generative deepfake data in-house, so that it can keep pace with the latest synthesis technologies. It also plans to expand cooperation with related agencies such as the National Election Commission and establish a consistent analysis framework across investigative agencies by linking the SOP with DAS, thereby strengthening national capabilities to respond to digital crime in stages.

- **Preventive blocking:** Detection and removal immediately upon posting; examination time reduced to minutes
- **Self-reliance:** Replacement of foreign solutions and a structure enabling continuous performance improvement
- **Public trust:** Credibility backed by the state and relief of public anxiety
- **Advanced detection:** Analysis scope expanded from the face to the full body; response to the latest synthesis technologies
- **National cooperation:** Collaboration with related agencies such as the National Election Commission and consistent investigation support through SOP–DAS integration

Organization	Ministry of the Interior and Safety, National Forensic Service
Department	Digital Forensics Division
Service Launch	April 2025
Budget (2024–2026)	KRW 600 million (KRW 300 million in 2024; KRW 300 million in 2025)
Application Area	Social Problem-Solving
Service Type	Analysis and Utilization
Technology Type	Visual Intelligence / Expert Systems / Other

Key Summary: AI Deepfake Analysis Model

Category	Key Details
Budget and Infrastructure	• Budget sourcing: Development and initial deployment funded by the NFS's own budget and NIA's "Development of AI-Based Data Analysis Models for Solving Pressing Public Issues" project
AI Model Selection and System Configuration	• Deep learning–based model: Precise analysis of distortions, patterns, and other features using a deep learning–based analysis model trained on hundreds of thousands of data items • System integration: Scheduled for integration into the NFS Digital Authentication System (DAS) in 2026, creating synergy through linkage with the voice phishing audio analysis model
Data Acquisition and Utilization	• Data acquisition: Secured and used for training a total of 2.31 million data items, including public datasets, web-collected materials, and in-house content • Linking domain expertise: AI experts, investigators, and forensic examiners worked as one team through dozens of rounds of testing, feedback, and performance improvement
Quality Improvement and Operation/Enhancement Plans	• Operational reliability: Established an SOP for deepfake detection and analysis to ensure the credibility of analysis results • Expanded scope of operation: Plans to expand use to related agencies such as the Korean National Police Agency, the National Election Commission, the Korea Media and Communications Commission, and the Ministry of Gender Equality and Family • Expanded detection scope: Ongoing advancement to extend detection beyond the face to other body areas in response to various content types, including sex crime videos

Appendix 1: Expert Recommendations

Myung-ok Lee | Executive Director, Technical Support Division, Okestro

Illegal deepfake content (sexually explicit synthetic material, defamation, and content produced and distributed for threats or extortion) requires scientific verification of the authenticity of evidence and how it was created. In this respect, AI-based audiovisual forensics is highly aligned with the NFS's core competencies. I propose two strategies to expand the system into a service that supports stronger admissibility of evidence in investigations and trials and directly helps minimize secondary harm caused by false detections.

1. Advancing the training model

To continuously improve the AI detection model, the detection scope should be expanded in stages from the face to the full body, backgrounds, objects, and interactions between people. It is also important to make multimodal detection a core development area so that the model can respond to the latest synthesis techniques, including generation and morphing based on video, audio, images, and text. In addition, evidence-based explainability (XAI) should be strengthened to intuitively present areas and segments suspected of manipulation through heatmaps, masks, and frame and timeline markers. These explanation functions should ideally be designed with future extensions in mind, such as the automatic generation of expert examination reports.

2. AI service strategy

If the service is extended to all investigators, the system should be designed in line with the principles of personal data protection and minimizing exposure to sensitive content. Personal data protection can be strengthened by minimizing the storage of original data, encrypting only the necessary segments for storage and viewing, and managing access logs. To ensure the legal admissibility of analysis results, compliance with lawful investigative procedures, verification and cross-validation of tool reliability, and a framework for expert testimony should be considered from the early design stage. Furthermore, data governance should be built systematically through pseudonymized and encrypted storage, access rights management, records of the legal basis for data collection, and the continuous incorporation of the latest synthetic data.

Chang-seop Lee | Senior Advisor, AI & IT System Center, Kim & Chang

The AI investigation support platform based on the AI Deepfake Analysis Model is regarded as a system of high public value, serving as national digital safety infrastructure for effectively countering deepfake crimes, where a rapid response is essential. Compared with conventional examination methods that required a reference file, the system has significantly improved investigative efficiency and helps minimize the spread of harm.

However, given the continuous advancement of deepfake technology, strategic improvements are needed in the following two areas to sustain and expand these results.

1. Continuous model advancement and expansion of training data

Deepfake generation technology is evolving in short cycles, and a growing number of commercial tools allow users to easily create synthetic images and videos. As a result, current detection algorithms are highly likely to be rendered ineffective after a certain point, as detection struggles to keep up with generation technology. To address this, a permanent system for continuous model advancement and data retraining must be established.

2. Establishing and expanding inter-agency cooperation

Illegal deepfake content spreads rapidly online as soon as it is created, and any delay in the initial response causes the scale of damage to grow exponentially, making it difficult for a single agency to respond effectively on its own. Therefore, a cooperation framework among related agencies, including the Korean National Police Agency, the Korea Communications Standards Commission, the Ministry of Gender Equality and Family, and the NFS, should be established promptly under the leadership of MOIS, along with a standard response protocol that clearly defines each agency's role and response procedures.

Furthermore, gradually expanding the range of participating organizations and building a collaboration model with private platform operators would further strengthen the effectiveness of blocking the distribution of illegal content.

Chan-soo Kim | Professor, Department of AI Robotics, University of Science and Technology (UST)

This system aligns with the government's policy direction of "solving social problems through AI" and demonstrates the effectiveness and potential of public-sector AI in addressing serious social problems such as deepfake crimes. In addition, by specifically identifying that commercial solutions have certain limitations in detecting East Asian faces, the case confirms that there are areas the private market alone cannot adequately address. In this respect, the case clearly illustrates the need for and role of public-led AI development and operation.

1. A full life-cycle model for public AI projects

This case presents the entire development process step by step, from project launch and service rollout to subsequent advancement plans, making it a useful reference for other agencies in estimating project timelines and implementation flow. It also covers the full life cycle from the development stage to the operation stage, including data building, establishing the SOP, and integration with the Digital Authentication System (DAS), offering practical lessons for agencies pursuing similar public AI projects.

2. Ease of adoption by other agencies through detailed procedures and visual materials

The case systematically presents the procedure from selecting the detection type through image, video, and audio analysis and AI model processing to the delivery of results, and includes sample screens of actual AI analysis results. It also uses diagrams and structural charts to explain the AI model development and usage process step by step, making it highly useful for other agencies seeking to reference its project design and methodology.

Appendix 2: Interview with the Project Officer

Jong-ju Jeon | Research Officer, Digital Forensics Division, National Forensic Service, Ministry of the Interior and Safety

Q. Data collection appears to play an important role in the model for detecting and analyzing illegal deepfake content. Could you describe in detail how you secured the data and established a data management system?

A. For the illegal deepfake content detection model, data collection has a major impact on model performance. We use some publicly available (open) training data, but new generation models and techniques are now emerging almost every month, so public datasets alone cannot fully reflect the latest technologies. Accordingly, whenever a new deepfake generation technique is identified, we apply that technique ourselves to generate data and add it to our training and validation data. However, because we need to reflect a broad range of generation techniques, there are practical constraints on continuously securing data at such a large scale.

As for data management, we currently do not have a dedicated system. Internally, we classify and organize data based on when it was generated and which generation model (technique) was used.

Q. Do you have any future plans for advancement to improve accuracy or reduce analysis and assessment time?

A. For now, we are prioritizing accuracy over reducing analysis and assessment time. Because the latest deepfake generation technologies are emerging at a very rapid pace, we believe the most important task is securing detection performance that can respond quickly to these changes. To this end, we plan to advance our detection technology by generating and securing data with each new generation technique as it is identified and continuously incorporating it into our training data.

In addition, through the IITP research project “Development of Self-Evolving Deepfake Detection Technology to Prevent the Adverse Social Effects of Generative AI” (2024–2027), led by the Ministry of Science and ICT, we are conducting R&D aimed at securing adaptive detection technology that minimizes performance degradation even as new deepfake techniques emerge.

We also aim to discover and secure excellent new detection techniques from outside through the “AI Detection Model Competition for Combating Deepfake Crimes,” organized by MOIS and NIA and hosted by the NFS. The competition is open to all citizens, and we are working to ensure that high-performing technologies can be transferred to the NFS through technology transfer procedures for use in actual analysis work.

Q. This seems to be an area that requires cooperation with related ministries and agencies. Could you tell us more about that?

A. Responding to illegal deepfake content is beyond the capacity of any single agency, so we consider cooperation among related ministries and agencies essential. In fact, during the 2025 presidential election, the NFS provided technical support using its deepfake detection system to assist the National Election Commission in removing deepfake-related media. We also plan to provide the same level of technical support for the 2026 nationwide local elections based on an enhanced detection system.

In addition, the detection technology is ready to be expanded to and used by related ministries and agencies such as the Korean National Police Agency, the Ministry of Gender Equality and Family,

and the Korea Media and Communications Commission, and we hope for active cooperation from the perspective of the agencies that will actually operate it.

In terms of technology development, we believe we have accumulated a certain level of results through joint research projects led by the Ministry of Science and ICT and through the competition. However, to respond quickly to the latest deepfake techniques, we also need cooperation on the operational foundation, such as infrastructure for data acquisition and additional training, and computing resources (e.g., GPUs). We hope these areas can be strengthened through cooperation with related agencies.

Q. What difficulties and challenges did you face in the service planning stage (project launch and initial adoption)? (For the benefit of other ministries considering AI adoption)

A. In our case, rather than facing any major obstacle at the planning stage, the most practical difficulty during implementation was a shortage of staff and budget. One point worth noting for other ministries considering AI adoption, however, is that how to design the operating model and accountability structure is far more important than the question of whether to adopt AI at all.

- The role of AI must be clearly defined. The required performance and scope of responsibility differ greatly depending on whether AI replaces the final decision or plays a supporting role, such as screening candidates before a human makes a judgment.
- Operational policies must be designed on the premise that accuracy has limits. Because AI can produce false positives and false negatives, the design must build into work procedures how analysis results will be categorized and used and under what conditions human review will be added.
- The faster the technology changes, the more ongoing costs arise from “operation and advancement” rather than “development.” Because data updates, additional training, and performance validation are repeated, dedicated staff, infrastructure, and budget are continuously required, and this was the greatest burden in our actual implementation.

Overall, I believe that a practical success factor for ministries considering AI adoption is not to aim for “development completed” from the initial planning stage, but to define roles that fit field workflows and, at the same time, design staffing, budget, and infrastructure systems that can continuously support operation and advancement.

Q. What support systems, such as budget and organization, are in place for sustainable project advancement?

A. For sustainable project advancement, we secured a budget of KRW 900 million in 2026 for adopting a deepfake detection solution and added one staff member to our organization.

However, deepfake detection is a field where technology changes very quickly and where data acquisition, additional training, performance validation, and operational response are constantly required. Given these characteristics, the current budget is meaningful for “adoption,” but additional funding is needed to sufficiently support continuous advancement and stable operation. Staffing is also still limited, and we believe additional dedicated staff and operating budget are needed for long-term operational stability and performance advancement.

Q. What efforts have you made to secure data for building an agency-specific AI service?

A. To build an agency-specific AI service, we believe public data alone is not enough, and data suited to the actual work environment must be secured directly. Accordingly, whenever the latest

deepfake generation technique is identified, we apply it to create deepfake content ourselves and incorporate it into the training data, aiming to continuously enhance detection performance tailored to our agency's work.

Q. Please describe any other key considerations during implementation or challenges you overcame.

A. Our top priorities during implementation were the ability to respond to changes in the latest deepfake technologies and securing a level of security appropriate to work involving investigative materials. However, although we aimed to advance the detection model quickly in line with the pace of technological change, resource constraints such as staffing and budget clearly limited our ability to carry out development, training, and validation at the desired speed.

In terms of security, budget constraints also made it difficult to secure sufficient additional infrastructure such as security equipment, and we are currently operating the system with the minimum security measures needed for operation. We believe the overall support system, including security infrastructure, needs to be reinforced for stable operation and wider service adoption.

AI in Korean Government : A Casebook of Public-Sector AI Services

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