

# Korea Environmental Policy Bulletin

## Allbaro (Online Waste Disposal Verification System)

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### Summary

In 1999, the Korean Ministry of Environment (MOE) introduced a waste disposal verification system to prevent illegal waste disposal. When the system was first introduced, paper vouchers were used. The system allowed establishing the basis of pursuing legal action against illegal waste management businesses by tracking the disposal process and methods using paper vouchers. However, there were many problems shown in the process. It was inconvenient for waste generators, transporters, and disposers to process them at the site and ended up being overly time consuming because the vouchers were written by hand and mailed. In addition, there were limitations for administrative bodies to prevent illegal treatment, since they were not able to track them during the entire process, and it was also difficult to confirm the 26 million vouchers issued every year.

In response to the abovementioned problems, MOE began devising new techniques and systems to solve the problems and keep track of the waste disposal process in real time. As a result, Allbaro, an online waste disposal verification system was developed.

Allbaro is composed mainly of three parts including waste handover system; waste approval and licensing system; and an analytical processing system. Under the waste handover system, waste generators, transporters, and disposers input information on waste handover (type, amount, and date) on the Internet and are able to monitor the online process in real time. During the early stages of the system implementation, Allbaro faced difficulties due to a low participation rate and the incompatibility of existing systems (e.g. ERP) used by individual waste businesses. In an effort to increase participation, MOE applied various incentives and public relations strategies.

In addition, MOE made the system more compatible with other systems.

Since its adoption in 2001, Allbaro has become widely accepted. While waste generators were recently still able to take advantage of the paper voucher system, the convenience of Allbaro made it more and more popular; resulting in an amendment to the Waste Control Act in 2007 to make the use of the electronic handover statement mandatory. According to MOE's predictions, Allbaro will reduce illegal treatment and abandoned waste by 99% through its efficient management.

## I. Introduction of Allbaro

### 1. Waste disposal verification system using paper vouchers

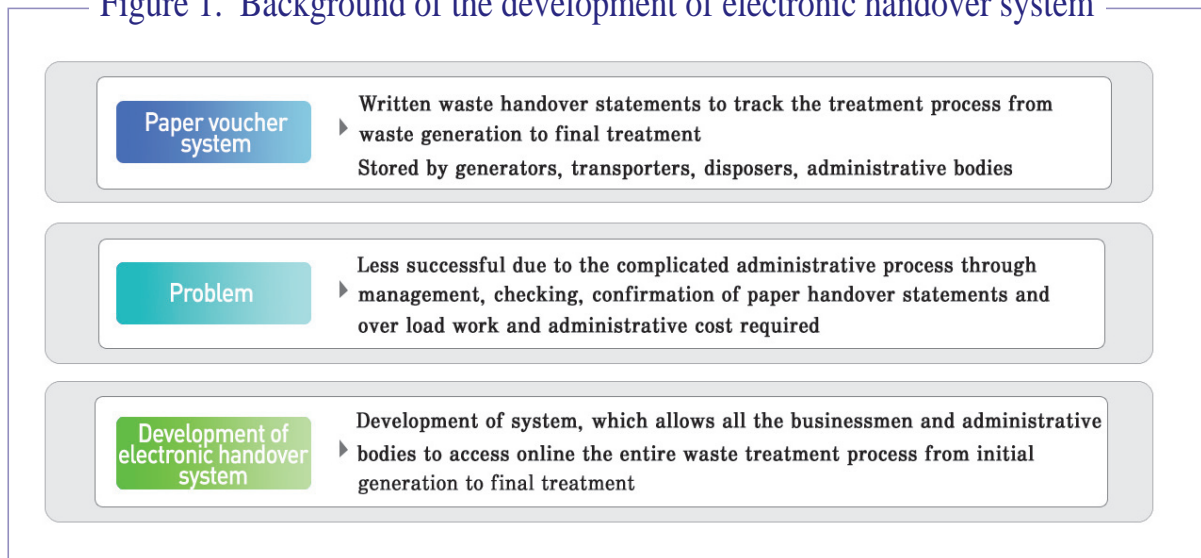
Landfills are not suitable for Korea due to its small territory (2,072 m<sup>2</sup> per person). In addition, landfills cause problems such as environmental damage, loss of usable land, high post-treatment costs, and leachate contaminating the groundwater. Because of these factors, Korean government planned to increase the number of incineration facilities but their construction was delayed due to public fears that the emissions would be hazardous to people's health. Under these circumstances, the cost of waste treatment had risen and concerns regarding illegal waste treatment dramatically increased.

In 1999, to prevent environmental contamination,

MOE launched a waste disposal verification system which was intended for waste generators, transporters, and disposers to report waste treatment status to administrators by preparing and delivering paper handover statements. The process was as follows: First, a waste generator delivered a handover statement to a transporter. After transporting the waste to a waste disposal site, the transporter delivered another handover statement to the disposer. The disposer would then deliver the completed handover statement to an administrator and the waste generator.

The waste disposal verification system allowed establishing the basis of pursuing legal action against illegal waste management by tracking the whole process of waste generation,

Figure 1. Background of the development of electronic handover system



transportation, and disposal using paper vouchers. However, this system faced some problems during its operation. At first, it was time consuming and also expensive because the vouchers were written by hand and mailed. Every year 26 million vouchers (83 tons of mail) were used and it is estimated that they cost 1 billion dollars. Furthermore, it was inconvenient to fill out the handover statements at the site of waste transportation and treatment. Secondly, the handover statements were not the perfect solution to prevent illegal waste treatment, since the administrative body was unable to track the handover statements until the waste treatment process had completed, thereby only post control was possible. Thirdly, there was a lack of manpower to manage, check, and confirm the validity of the handover statements. It was impossible for one or two public officers at each environmental office to check and confirm all the handover statements. Also, there was no place to store the handover statements produced.

Searching the handover statement by hand was also problematic and hampered abilities to confirm whether the treatment had been legally done.

In this regard, MOE started to devise new techniques and systems to solve the limitations of the paper voucher system. As a result, Allbaro was developed. Allbaro is a combination of the words all and barometer, which means the barometer for all wastes. In Korean, it also means that all wastes are treated correctly.

## 2. Allbaro, online waste disposal verification system

MOE introduced Allbaro to replace the hand written paper voucher system. In contrast to the paper voucher system, Allbaro allows for the entire waste disposal process to be accessed online and in real time. The system streamlined the treatment verification process and made it more efficient and less costly.

In 1995, the Korean government began

promoting IT (Information Technology) businesses and the expansion of the electronic government. Even before Allbaro had been designed, MOE was already performing efficient administration practices based on IT. With success in other areas, MOE was interested in constructing an electronic waste management system to prevent the illegal treatment of industrial and abandoned waste. In 2000, MOE organized a team responsible for the system and planned to look for ways to digitize the paper voucher system. At first, a roadmap to build a waste total management system was prepared and analysis of the business, budget, operating personnel, and

status of the users were investigated. According to the basic plan, large waste generating companies, which produce specific waste<sup>1)</sup> in large quantities, were firstly allowed to use the system, with the number of users expanded step by step over five years. In addition, 20 conferences concerning the core issues were conducted and a business plan was drawn up with the help of large, medium, and small businesses, as well as environmental regional offices, resulting in the final development of Allbaro in September 2001. Once developed, the Korea Environment and Resources Corporation (ENVICO), which is an affiliate under MOE, was tasked with operating the system.

## II. Overview of Allbaro

### 1. Structure and functions

Allbaro is an electronic system which helps monitor the entire process of waste disposal, from waste generation to the final treatment process in real time. The system was designed based on the followings:

- Monitoring the waste management in real time should prevent illegal treatment and disposal.
- The reduction of personnel and costs by digitization should boost competitiveness.
- Public awareness, trust, and transparency

regarding waste management should be improved.

- Electronic waste handover statements should be able to check and confirm the process in real time. The electronic waste handover statements show electronic information from the waste generators, transporters, and managers through the waste information system. Preparation of the handover statement is now mandatory by the law.

Allbaro is composed of three parts; a waste handover system with electronic handover statements, waste approval and licensing, and

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<sup>1)</sup>In Korea, type of waste is divided into residential and industrial waste. “Residential waste” includes all household waste. “Industrial waste” includes the waste generated by businesses and industries. Industrial waste is further categorized into general industrial waste, designated waste, infectious waste, and construction waste. Specific waste includes hazardous waste, such as solvents, catalysts, and chemicals.

analytical processing. (Figure 2)

- **Waste handover system** : Waste generators, transporters, and disposers input information regarding the type of waste, amount, and date through the entire process, thereby ensuring that the entire process can be monitored online. When an error is made, they can be confirmed by administrators. When waste is treated in an inappropriate way, administrators can monitor the situation in real time.
- **Waste approval and licensing** : Waste related

approval and licensing can be applied for and provided online. The majority of users are industrial waste generating businesses such as general industrial waste businesses, infectious waste generating businesses (hospitals) and construction waste generating businesses, as well as waste transportation businesses.

- **Analytical processing** : The management of the electronic handover statements and approval and licensing systems can be analyzed using statistical analysis for the drafting of new policies and processes.

Figure 2. Structure of Allbaro



## 2. Waste handover system

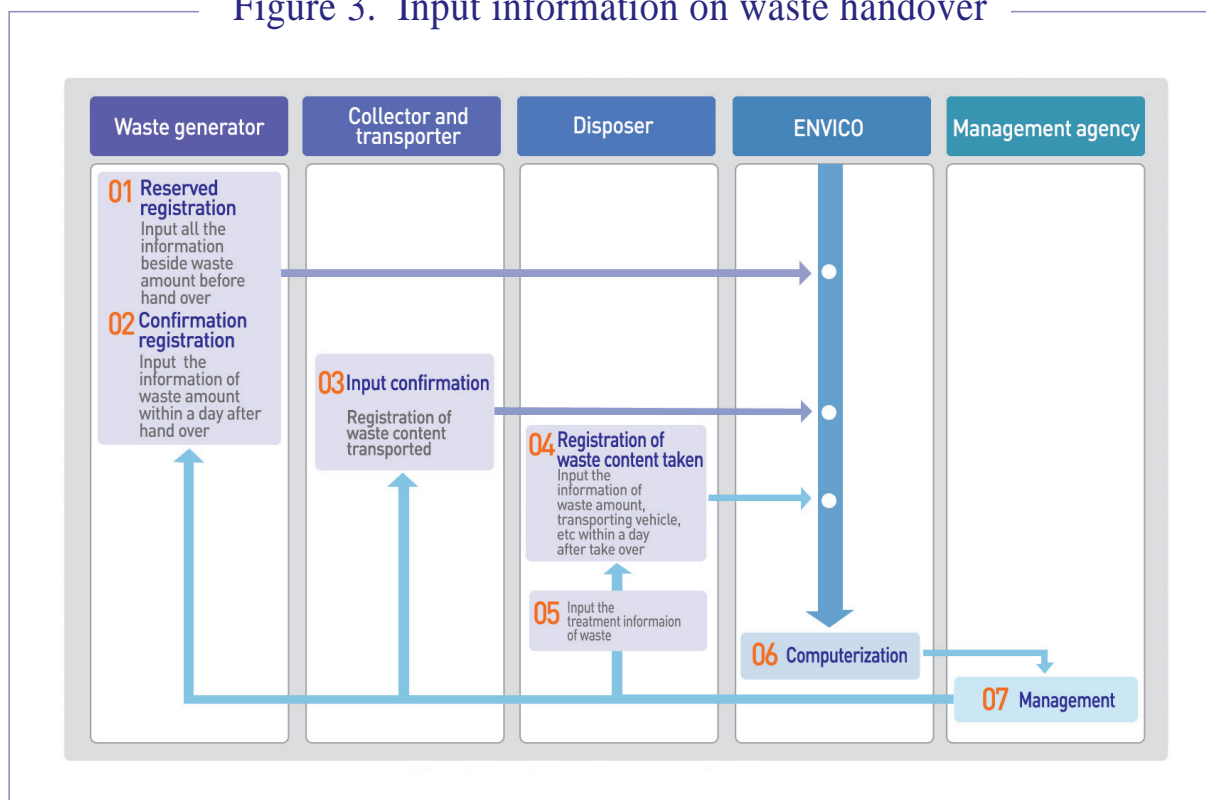
As shown in Figure 3, the preparation of the electronic handover statements is comprised of the following seven steps:

- **1<sup>st</sup> step** : When a waste generator does not have a scale for waste measurement and has to be weighed outside, the waste generator should take a handover-number in advance and input all the estimated information of the waste on the system before transferring it to a waste transporter. Later on, when handing over the waste to the transporter, the generator should check the information on the system and confirm the information. If the reserved information is not confirmed

within a day, it is considered an accidental handover and treated specially.

- **2<sup>nd</sup> step** : A waste generator who does not need to go through the first step can skip the reserved registration step and make a registration at the same time the waste is handed over to the transporter.
- **3<sup>rd</sup> step** : The transporter should register the waste information within a day after takeover from the generator as well as within a day after handover to a disposer. If the transporter does not register within the period, the information is sent as accidental handover information and treated specially.

Figure 3. Input information on waste handover



- **4<sup>th</sup> step** : The disposer should register disposal information within a day after takeover. If that requirement is not met, it is also considered accidental and treated specially.
- **5<sup>th</sup> step** : After treatment, the disposer should register the information of treatment within two days after disposal. If the disposer does not register the information within thirty days after taking general waste (five days for infectious waste), it is considered an accidental handover of information. However, if infectious waste treatment businesses are licensed recyclers and have waste facilities covering large areas, they can register their information within seven days after treatment. On the other hand, if general waste disposers recycle the waste, the disposers can register the information within sixty days.
- **6<sup>th</sup> step** : ENVICO provides the information gathered in steps one through five to MOE.
- **7<sup>th</sup> step** : MOE processes all gathered information including the accidental handover information.

### III. Progress of Allbaro

#### 1. Development

The development of the Allbaro system can be divided into six phases (Figure 4): a. Demonstrative operation; b. Initial operation; c. Establishment of the approval/licensing system and data analysis system; d. Establishment of disaster recovery center and statistical analysis processing system; e. Establishment of the digitized management system for construction and infectious waste; f. the establishment of the ARS (Automated Response System) for compatibility between Allbaro and large waste generating companies, disability management, and SMS (Short Message Service through mobile phones). The six development phases are as follows:

- **Phase One (2000-2001)** : The system, as a

demonstrative operation, was used by a limited number of waste generators, such as large generators and general hospitals.

- **Phase Two (2001-2002)** : The system was applied and enforced. Roughly 1,500 businesses handling waste, including hazardous waste, were encouraged to use the system.
- **Phase Three (2003)** : The system was expanded and used by 8,000 waste related businesses. To provide better service for the increased number of users, the approval and licensing system was developed.
- **Phase Four (2004)** : Approximately 20,000 waste related businesses were encouraged to use the system. During this period,

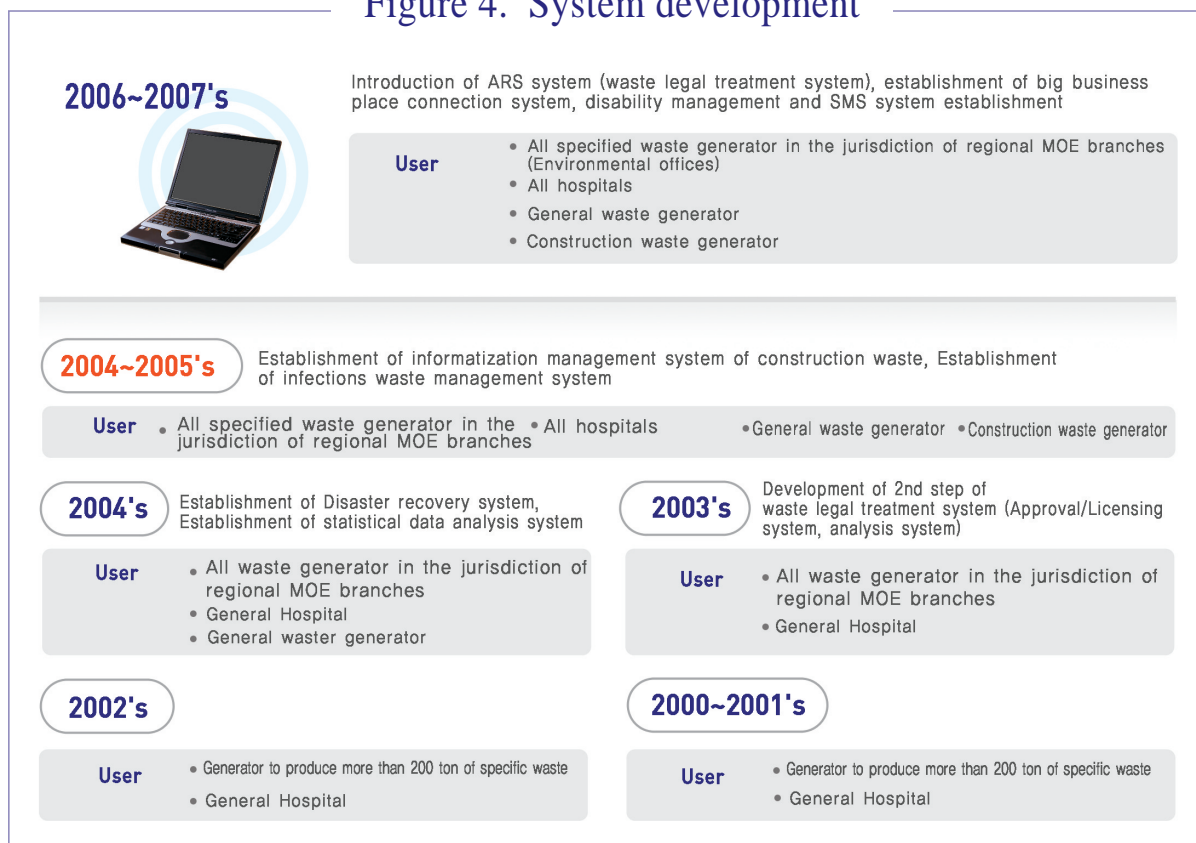
concentrated training courses for new users and personnel in charge of waste management at the local government level were provided. A disaster recovery system was established to ensure uninterrupted service. As well as the approval/licensing system, the data analysis system was also developed.

- **Phase Five (2005)** : 45,000 businesses began using the system. During this phase, the use of Radio Frequency Identification (RFID) technology was developed and operated for the treatment of hospital wastes. The system resulted in higher performance and reliability. The use of RFID tags and readers made the practice of illegal treatment

almost impossible.

- **Phase Six (2006-2007)** : For the users' convenience, the ARS system was introduced so that people could use the telephone and SMS instead of the internet. In addition, the connection system with big business places running their own system like ERP (Enterprise Resource Program) was introduced and this resulted in the improvement of system efficiency and compatibility by eliminating the overlapping of two systems. When the Waste Control Act was amended, the use of electronic handover statements became mandatory for most businesses resulting in a total of 84,000 waste related businesses using the system.

**Figure 4. System development**





## 2. Problems during implementation and Solutions

To reach the goal of Allbaro, active participation was crucial. However, during the early implementation stages, participation was not as high as expected. Early adoption of the system was slow due to mannerisms and the fact that the electronic system was not mandatory. In order to increase the number of users, MOE applied a number of incentives and increased public relations strategies. Most companies did not know about the system and were not interested in it at all. They felt that the new system would complicate the process since they were confident using the paper handover statements. Nevertheless, because Allbaro was cost effective and more efficient, MOE publicized the benefits and advantages with enthusiasm.

The second problem Allbaro faced was that it was incompatible with the systems, such as ERP, which were used at large waste related businesses. As a result, personnel had to input the same data twice into two systems. Businesses began to complain of the added workload. To solve the problem, a conversion system was established so that data input into one system could be automatically input into other systems. Once the different systems were capable of communicating with each other automatically, the use of Allbaro increased significantly.

MOE has been continuously promoting and improving the system, and as a result, the number of users has steadily increased. Modifications to the waste management system were developed using the following key strategies:

Allbaro users were composed of administrative bodies, waste generators, transporters, and disposers. Because of the different processes involved, education for those working in the various fields was different. Customized manuals for each group were prepared and distributed and training videos were made available on the Allbaro homepage for users who could not attend on-the-spot training courses. Furthermore, because waste related businesses are spread out all over Korea, educators toured the country, making education available for administrative bodies, waste generators, transporters, and disposers.

Secondly, a feedback system was established so that users could report problems, recommend improvements, and provide opinions. For the effective collection of opinions and recommendations, a number of features were built into the feedback system.

A call center was established and was available 24 hours a day, and an online customer service center was built into the Allbaro homepage. In addition, a customer consultant committee which was made up of personnel from administrative bodies, waste generators, transporters, disposers, academia, and NGOs was launched to help draw up and revise related laws and policies.

Furthermore, Allbaro was expanded further by adding a feature to automatically complete annual accomplishment reports; which had to be submitted once a year. Mandatory waste management reports could also be completed by the system automatically.

An online approval/licensing system were also

established. For companies that could not access the internet, an ARS system was introduced to

prepare electronic handover statements by phone.

## IV. Domestic and International Cooperation

Allbaro has been recognized as an innovative Korean brand, and has been patented through the Korea Intellectual Property Office (KIPO). The brand has been growing in popularity and has become a global brand with national level support.

The system has been used as a benchmark for improving service quality in the public sector and is being connected with other environment related systems. Strategic cooperation between MOE and the Korea Coast Guard (KCG) to monitor marine waste is a representative example of such cooperation. The two bodies established a comprehensive waste (earth/marine) management system by connecting Allbaro with the KCG's system. The new earth/marine total waste management system is expected to save 120 billion won (about 120 million US dollars)

over the next 10 years.

Internationally, a movement to benchmark Allbaro has been expanding in developing countries currently going through industrialization. Personnel from Vietnam, Egypt, and Iraq have visited Korea in order to study the systems operation and status. Consequently, Vietnam is currently in the process of adopting the Allbaro system to improve its rapidly expanding waste management sector. MOE expects that Vietnam's adoption of Allbaro will act as a bridgehead to future cooperation and strengthened mutual trust. In addition, in August 2008, Korea concluded a Memorandum of Understanding (MOU) with Japan in order to jointly manage exported and imported waste through a standardized waste management system based on Allbaro.

## V. Conclusion

Allbaro was successfully developed thanks to the superb management of MOE and operation of ENVICO. Due to the convenience of Allbaro and the widespread development of IT infrastructure in Korea, the use of electronic handover statements became popular.

Due to its popularity, the Waste Control Act was

amended in August 2007 to make the use of electronic handover statements mandatory; establishing Allbaro as a total waste management system covering 230,000 businesses.

Moreover, the following three trends significantly helped stabilize and entrench the

Allbaro system:

- Korea was ranked 3<sup>rd</sup> in the National Information Index<sup>2)</sup>, 5<sup>th</sup> in the Science and Technology World Competitiveness<sup>3)</sup>, and 1<sup>st</sup> in the Digital Access Index (DAI)<sup>4)</sup>. Because of this, adoption of the Allbaro system was much easier than it would have been if the related IT infrastructure had not been in place.

- Small waste generating companies that lacked experience using digital systems were encouraged and supported to use the system. Through education, public relations, and the implementation of ARS, small businesses became more efficient and competitive.

- Clients played an important role in making Allbaro the world-class system that it is today. By listening to the suggestions, complaints, and recommendations of clients, MOE improved the system and added features that customers wanted and needed.

Expected effects from using the system are as follows:

- Using the system allows one to monitor all waste information, such as waste transportation, regional generation status, and treatment status by type in real time. Statistics can be used as a source for establishing more effective national waste management policies.

- Through the use of Allbaro, industries can maximize cost reducing features, such as the automatic management of waste handover statements. Analysis and research results from the Korea Institute of Public Administration (KIPA) suggest that by using Allbaro 134 billion won (about 134 million US dollars) and 9.8 million hours of time are saved annually.

- Public officials in charge of waste management are able to maximize their business efficiency since they can manage waste in real time and obtain waste statistics automatically.

- Because the system allows one to manage waste generation, transportation, and treatment in real time, the chance that waste will be abandoned or illegally treated is significantly reduced.

2) Korea Information White Paper, Ministry of Information and Communication, Korea, 2006

3) World Competitiveness Yearbook, Institute for Management Development (IMD), Switzerland, 2008

4) World Summit on the information Society, International Telecommunication Union (ITU)

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