

THE COMPREHENSIVE INFORMATION SYSTEM FOR NORM MANAGEMENT IN KOREA

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ABSTRACT

Korea enacted the *Act on Protective Action Guidelines against Radiation in the Natural Environment* in 2011(effective in July 2012) to protect people against exposure to radiation in a daily life. Under the Act, the target is only natural radiation such as NORM, radioactive materials contained in recyclable scrap metal, including cosmic radiation and terrestrial radiation. It is necessary to manage systemically all this information regarding the radiation in the natural environment. To do so, the NSSC and KINS has developed the CISRAN, a comprehensive information system on radiation in the natural environment, for NORM management since 2012. This paper introduces the status of the development and operation of information system for NORM management, which is one of the ways to provide radiation information to the public.

1. Introduction

The social issues have arisen due to the natural radioactive materials usage since 2007. In addition, the public concerns about radiation have been increased after the Fukushima NPP accident in 2011. For these reasons, in Korea, the *Act on Protective Action Guidelines Against Radiation in the Natural Environment* was enacted in 2011(effective in July 2012), to protect people against the radiation exposure from household items, construction materials or recyclable scrap metals.

According to the Act, the raw materials (NORM), residues and products that contain the natural radionuclides were subject to the Nuclear Safety and Security Commission (NSSC)'s safety management. And also, it forced the NSSC to manage systemically all the information regarding the radiation in the natural environment such as the current status of

- Distribution of raw materials and residues/wastes
- Manufacture or export/import of products containing NORM
- Safety management of cosmic radiation for aircrew
- Etc.

Therefore, it was required to establish a national management system about natural radiation.

Finally, the Korea Institute of Nuclear Safety (KINS), designated as a specialized institute for safety management by the act, set up a web-based system, named CISRANⁱ. It is still being developed for everyone involved to be available for various and useful information and furthermore, made with the purpose of providing public safety.

ⁱ Comprehensive Information System on Radiation in the Natural Environment

2. Development & Operation of CISRAN

As mentioned above, the CISRAN has been developed since 2012 and started operating in 2014 by KINS. This system consists of three main sites, which are an electronic authorization application system, a field investigation and analysis system, and a radiation portal monitors (RPMs) operating information system.

The dedicated business flow diagram of CISRAN system is given in Fig 1.

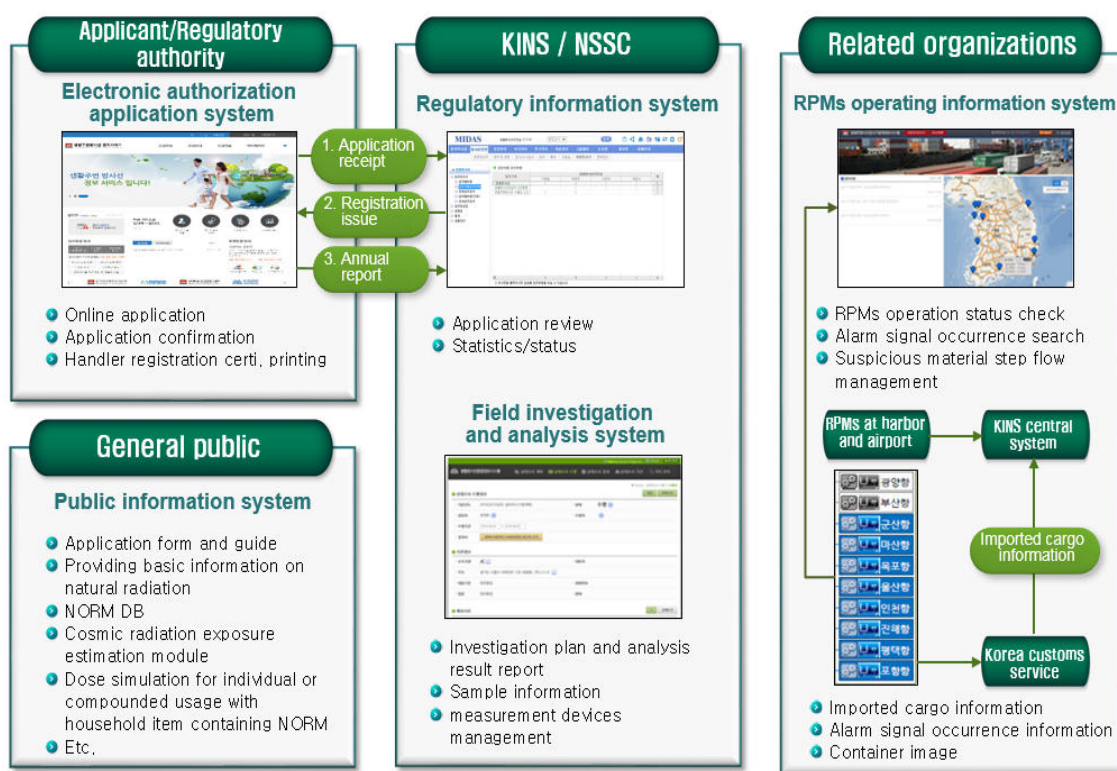


Fig 1. Business flow diagram of CISRAN

Firstly, the electronic authorization application system is a kind of regulatory supporting system to provide the information on regulatory authorization issues regarding handlers using the raw materials (NORMs) or residues. As shown in Fig 1, it can be connected to the regulatory information system (MIDAS) for KINS and NSSC to facilitate the regulatory authority's application review process based on an electronic document and to manage the registration information such as user, handler, materials, certificate and distribution status more efficiently.

Besides the electronic application service, including the public information like basic knowledge, it provides the general public much more useful information related to radiation in the natural environment.

The second is the field investigation and analysis system for KINS, KoFONSⁱⁱ, and NSSC. According to the Act, we have conducted the field investigation for safety management on the facilities using the above materials and the workers handling them. The system is covering the information such as an annual plan and schedule for the field investigation,

ⁱⁱ Korea Foundation of Nuclear Safety

sample, measurement device and its maintenance, analysis method, result report, and so on, which are being managed systemically through the system.

Lastly, for the RPMs operating information system, it is also related to fulfill the Act. By law, the NSSC shall install and operate the RPMs at airports and harbors to detect the radioactive materials in imported goods. As of the end of 2016, the total number of RPMs operating in Korea is 96. In addition, the government plans to establish up to 116 such devices. This system makes it possible to effectively monitor the operation of RPMs installed at each airport and harbor and grasp the status information of alarms that have occurred and recorded.

Likewise, the CISRAN is an integrated management system for natural radiation which is used by government and other related agencies like NSSC, KINS, KoFONS and even the handlers for the raw materials or residues.

The configuration of CISRAN system is shown in Fig 2.

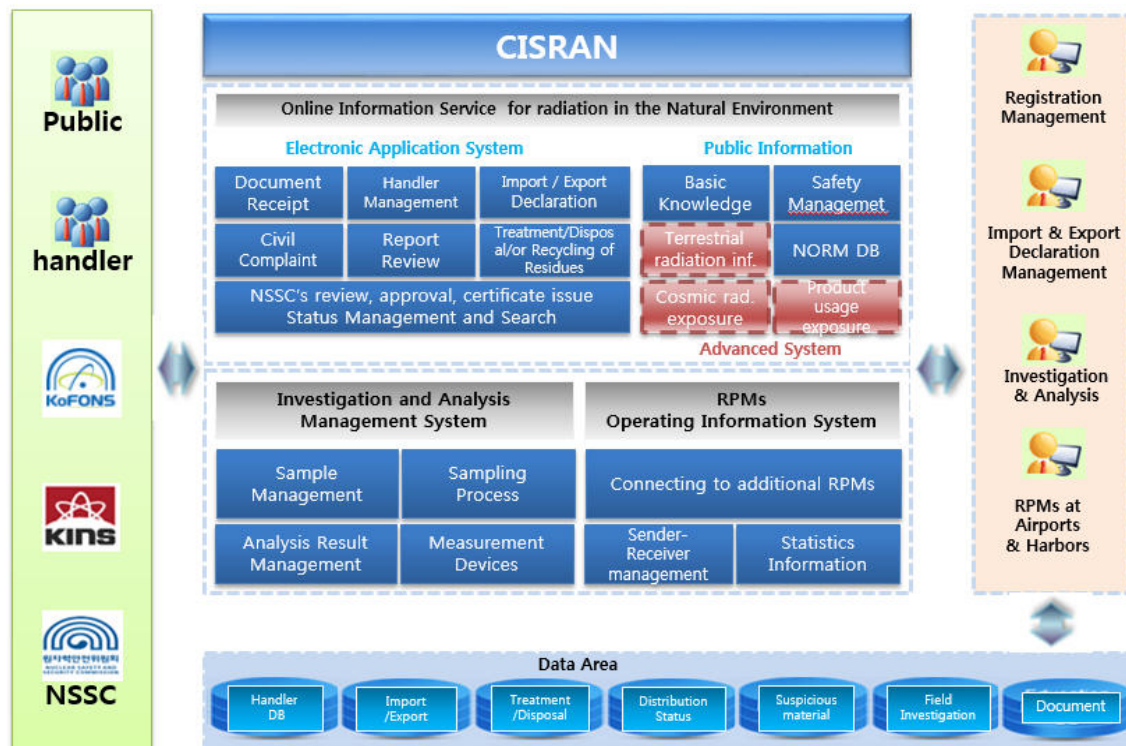


Fig 2. Configuration of CISRAN

3. Advanced function

3.1 NORM Database

NORM database, which is about the raw materials and residues available on domestic markets, was established based on the past 5 years of our field investigation results.

It provides handlers and public with the detailed information on type and concentration of natural radionuclides contained in NORM and even the regulatory judgment of whether or not some materials are subject to the safety management, including general information about

industrial raw material and usage purpose of it.

The Fig.3 shows that it is implemented the NORM database in CISRAN.

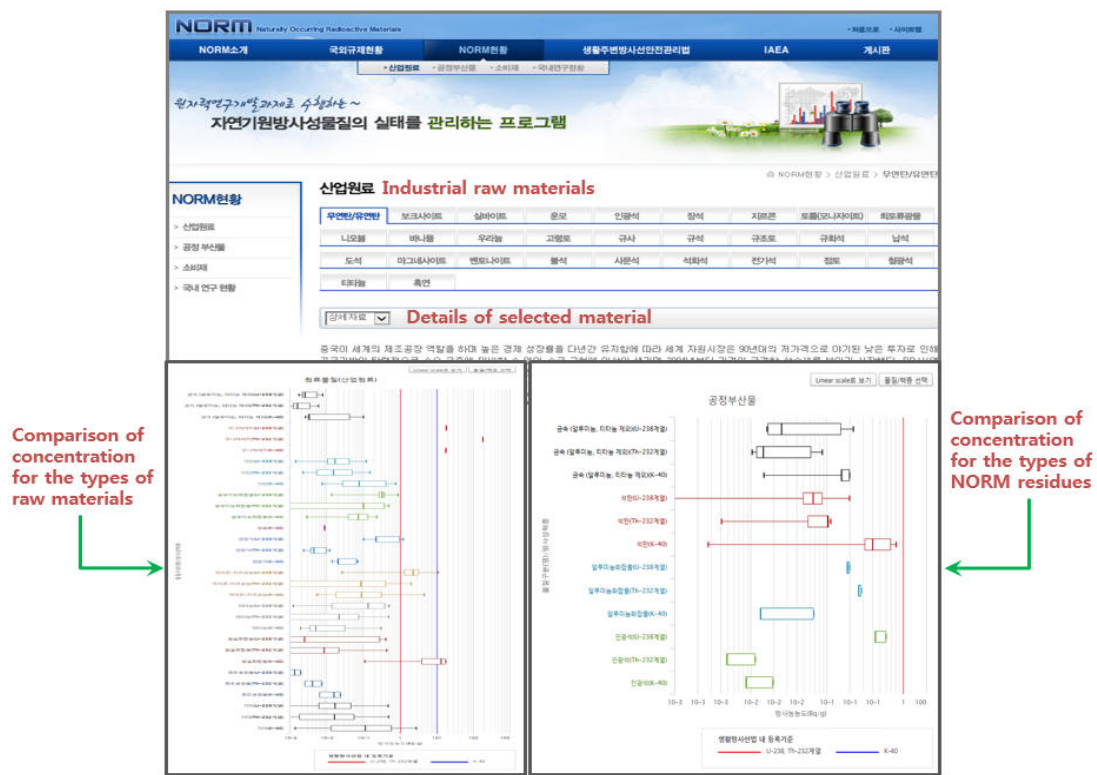


Fig 3. NORM Database

3.2 Cosmic radiation exposure information

There are currently around 14,000 of aircrew (4000 of cockpit crew and 10,000 of cabin crew) working in Korea and annual average about 16 million of people going abroad. Although cosmic radiation exposure during flights is low, as those who need to be in control exist and the popularity of air travel continues to increase, it is important to manage them and also provide the people's right to know.

In accordance with the Act, it force the air transportation business operator to manage the cosmic radiation exposure for the aircrew on board international air routes. However, domestic airlines depend on the only cosmic radiation assessment program developed by foreign countries. As a result, the values calculated by each airline are different even if they use the same air routes.

It was necessary to develop our own calculation program to solve this problem. So, KINS and KASIⁱⁱⁱ carried out the related research project from 2014 to 2015 and finally developed the dose assessment program regarding cosmic radiation with the research results.

By benchmarking the SIEVERT^{iv} of France, it is designed so that people can check the radiation dose received during a flight, by linking to CISRAN.

Simply, user puts some information for point of departure and arrival, then chooses the air

ⁱⁱⁱ Korea Astronomy and Space Institute

^{iv} <https://www.sievert-system.org>

routes on that day provided by domestic airlines, after that, the calculated dose value automatically appears on a screen, as shown in the following Fig 4.

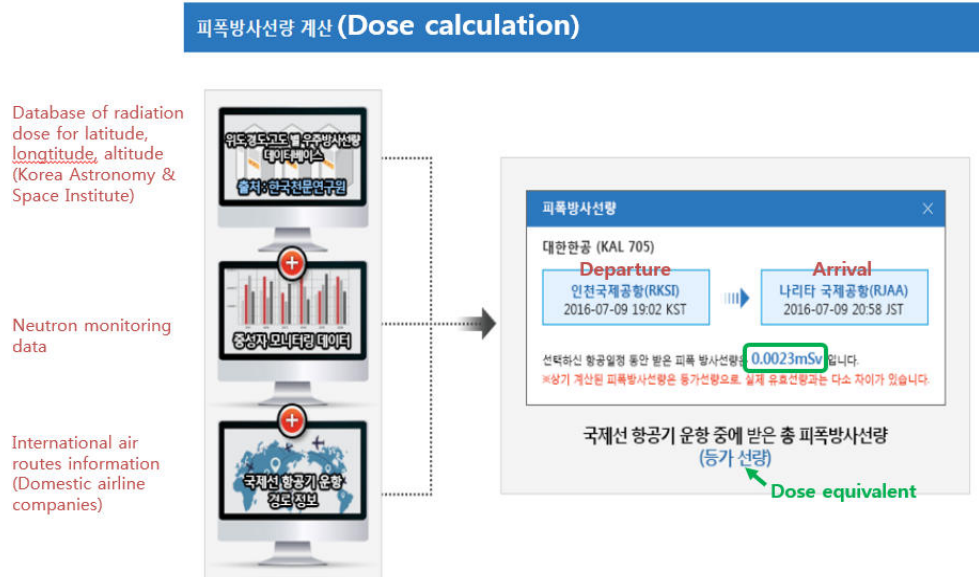


Fig 4. Cosmic radiation exposure information for general passenger

3.3 Consumer products usage exposure information

Due to the usage of building material or consumer product containing NORM, the program for calculating the radiation dose has been establishing and furthermore it would be implemented in CISRAN as following fig 5.

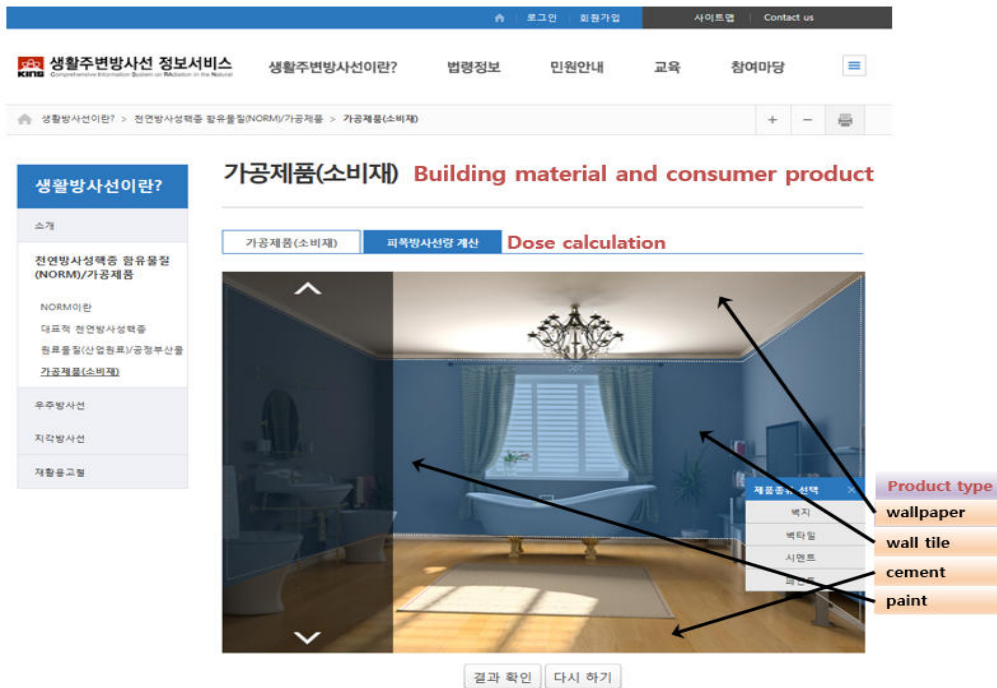


Fig 5. Calculation service for radiation dose to products containing NORMs

On a basis of the radioactivity results for building materials and products according to the latest surveys conducted by KoFONS, it is designed that when user specifies some sources such as the conditions and time of use, then the user's radiation exposure can be estimated automatically through this simulation program.

3.4 Terrestrial radiation exposure information

ICRP recommends the implementation of the optimization process in existing exposure situations and IAEA also emphasizes that national authority should implement the protective actions for the public against exposure indoors due to natural sources of radiation.

To fulfill harmoniously with the international standards, the national reference levels for Rn should be set up first. And then, by reflecting this to the Act, it is required that managing the public's existing exposure by a nation should be mandatory institutionally.

Meanwhile, in Korea, the researches on estimating the potential risk for the existing exposure have carried out for many years, to protect the public to the existing exposure. The terrestrial radiation and the exposure indoors due to radon are considered to be the most important factors in the existing exposure.

KINS completed the technology development for detecting and mapping the national background terrestrial radiation and has surveyed the concentration of radon in the existing dwellings and buildings. The Fig 6 shows these results surveyed, respectively.

In the near future, the information service on existing exposure will be provided to the public based on the collected results above. Through this system, the public might get the average indoor radon concentration and value in their living area. Also, the potential risk level due to existing exposure would be provided.

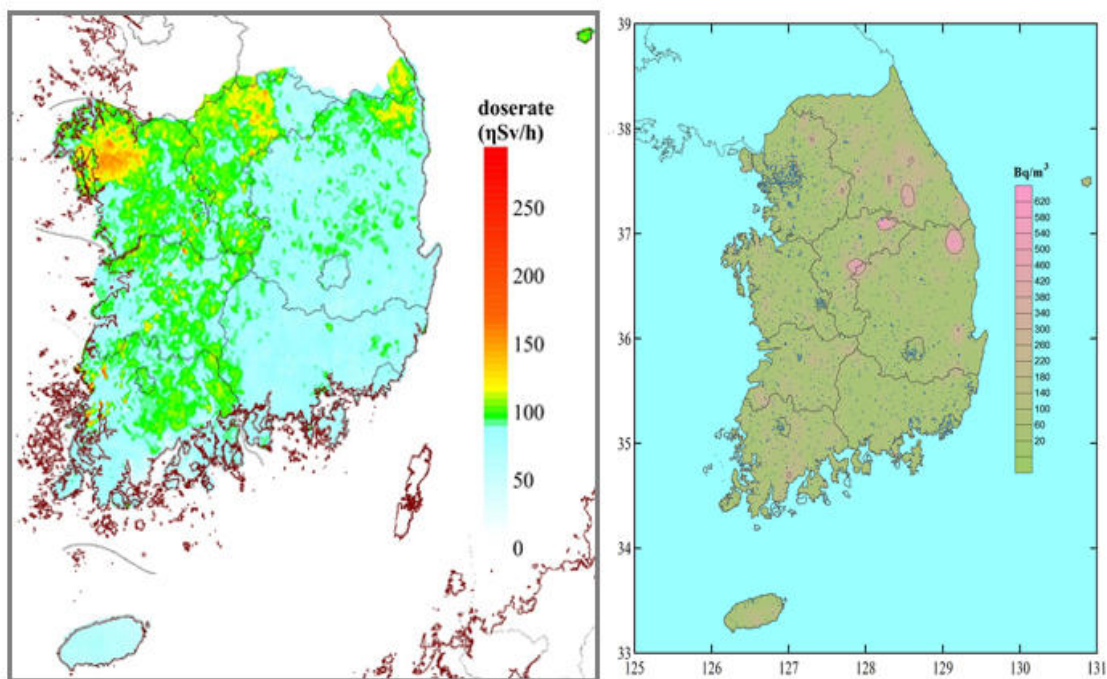


Fig 6. Total dose rate with terrestrial radiation (left) and concentration of radon (right)

4. Conclusion

Korea has completed the regulatory framework regarding the safety management of natural radiation. To fulfill the relevant regulation, the CISRAN for NORM management was developed and operated by the government.

There are not only public information like basic knowledge provided, but also the safety management information including the results of investigation and analysis that regulator performed and legal process between handlers and NSSC served.

With various highly functional items, it has been improving to make much more various information served. Furthermore, it is expected to use for the purpose of technical basis for decision-making related to radiation in the natural environment.

5. Reference

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