Analyzing trends of the Incident and Trafficking Database of Nuclear and Other Radioactive Material

Jounghoon Lee
Korea Institute of Nuclear Nonproliferation and Control, 573 Expo-Ro, Yuseong-Gu Daejeon, Korea
jhlee@kinac.re.kr

1. Introduction

As part of its overall program on nuclear material security, the IAEA has maintained a database on the number of incidents of trafficking in nuclear materials and other radioactive sources since 1995 [1].

In 2012 the title of the ITDB was aligned with the terms of reference which focuses on more than just 'illicit trafficking incidents' by explicitly including all nuclear and other radioactive material not under regulatory control. The name of Incident and Trafficking Database (ITDB): Incidents of nuclear and other radioactive material out of regulatory control, was agreed upon and was subsequently been adopted.

The IAEA ITDB supports the IAEA's secretariat, participating states and selected international organizations to improve nuclear security. The main purpose of ITDB is to facilitate the exchange of authoritative information about reported incidents among states. Information collected in various states is continually analyzed by the Agency's ITDB staff to identify common trends and patterns, to assess threats, and to evaluate weaknesses in material security and detection capabilities and practices [2]. And the IAEA issues a 'Fact Sheet' which summarizes the ITDB annually.

This paper reviews the fact sheet and discusses the trends and patterns which are analyzed using the ITDB from 1993 to 2017.

2. The Scope of the ITDB

The scope of information collected by the ITDB is broad. For analysis and reporting purposes, it is necessary to clearly distinguish among the various types of incidents it covers. The incidents categories which has been used since 2016 is as listed below:

- Group I – Incidents that are, or are likely to be, connected with trafficking or malicious use
- Group II – Incidents of undetermined intent
- Group III – Incidents that are not, or are unlikely to be, connected with trafficking or malicious use

The ITDB scope covers all types of nuclear material as defined by the Statute of the IAEA (i.e. uranium, plutonium and thorium), naturally occurring and artificially produced radioisotopes and radioactively contaminated material, such as scrap metal. The materials involved in incidents in the ITDB were classified into the following categories:

- Nuclear materials, including uranium, plutonium, and thorium
- Other radioactive materials, including sealed radioactive sources or bulk radioactive materials
- Other materials, including radioactively contaminated materials. (e.g. in the form of radioactively contaminated equipment, scrap, or agricultural products, and other materials involved in the incidents)

3. The Analysis of the ITDB from 1993 to 2017

Until 31 December 2017, the ITDB contained a total of 3235 confirmed incidents reported by participating States since 1993. Of these 3235 confirmed incidents there are 278 incidents that involved a confirmed or likely act of trafficking or malicious use (Group I), 913 incidents for which there is insufficient information to determine if it is related to trafficking or malicious use (Group II) and 2044 incidents that are not related to trafficking or malicious use (Group III).

Group I has sufficient information to determine that the incident is relevant to trafficking and malicious use. The fact sheet mentions that most incidents involved seizures of gram quantities of nuclear material, and it is not the weapons-usable nuclear material itself. However, the seized materials could be samples from larger unsecured stockpiles. And it is hard to know the scale of illicit nuclear market with this data because the number of successful trafficking is not known.

Group II has insufficient information to determine whether the incident is either connected or unconnected with trafficking and malicious use. The majority of incidents in this group involves stolen or missing material. It means that there are vulnerabilities in security at facilities or transportations which deal with materials. The fact sheet mentions that the majority of thefts and losses reported to the ITDB involve radioactive materials that are used in industrial or medical applications.

Group III has sufficient information to determine that the incident is not relevant to trafficking and malicious use. The majority of incidents in this group can be classified by three categories: the unauthorized disposal (e.g. radioactive sources entering the scrap metal industry); unauthorized shipment (e.g. scrap metals

contaminated with radioactive material being shipped across international borders); or the discovery of radioactive material (e.g. uncontrolled radioactive sources). The fact sheet mentions an increase in the number of detections of manufactured goods contaminated with radioactive materials in recent years. This occurs as the number of radiation portal monitoring systems increases at national borders and scrap metal facilities.

4. Lessons Learned from ITDB analysis

Based on the ITDB analysis, most reported incidents involve radioactive materials rather than incidents involving nuclear material. And the radioactive materials are used in industrial or medical applications.

In Korea, nuclear and radioactive materials are regulated by the following regulatory framework.

According the Act on Physical Protection and Radiological Emergency (APPRE), nuclear material and its facilities must comply with Korean security regulations to prevent illegal transfer and sabotage activities. There is a minimum amount on nuclear material to enforce the regulation, but it is low enough. Whereas regulations for radioactive materials are subject to safety regulations. Therefore, security measures for radioactive materials are inspected by safety regulatory framework. The measures for security of radioactive materials are only at the level of IAEA Code of Conduct on the Safety and Security of Radioactive Sources.

The IAEA recommendation, IAEA Nuclear Security Series no. 14, specifies that the security measures for radioactive sources should be designed to:

① Deter malicious acts;
② Detect and delay unauthorized access to or unauthorized removal of the radioactive material;
③ Allow rapid assessment any nuclear security events to enable appropriate response initiation and to allow recovery or mitigation efforts to start as soon as possible;
④ Provide for rapid response to any attempted or actual unauthorized access to radioactive material, or to other nuclear security events involving radioactive material. [3]

The security measures for radioactive sources in Korea couldn't meet the IAEA's recommendation level. And many other countries are in the same situation [4]. Therefore, the security regulatory framework for radioactive materials should be further strengthened to the IAEA recommendation level. At least, it should take into account the threat level and risk of malicious acts, scope of radioactive sources and associated facilities/activities, capability of licensees, etc.

In addition, according to the ITDB analysis, Group III is the largest number of incidents that incidents do not involve in trafficking or malicious use. They are mainly reported from contaminated goods. And they can cause potential health problems to unsuspecting consumers. It is very difficult to detect all manufactured goods contaminated with radioactive materials. According to the ITDB analysis, however, the main reason for such contamination is the raw material for product manufacturing. Therefore, radiation monitoring systems at borders and scrap metal facilities can help prevent the production of contaminated products. This analysis also applies to our situation.

In Korea, the Act on Protective Action Guidelines against Radiation in the Natural Environment was enacted in 2011 to protect public and environment by providing for matters regarding safety control of radiation. Under this law, major domestic steelmakers operating at least 30 tons of electric smelting facilities should monitor scrap metals from radioactive contamination when using recyclable scrap metal. And the Korean government should install and operate radiation monitors at airports with international air routes and international trade ports. This system covers most of the contaminated metal scrap and uncontrolled radioactive materials in Korea.

5. Conclusions

Trafficking in nuclear material and radioactive materials is a global concern. So the IAEA has maintained the ITDB and published the fact sheet about it. On the other hand, although the national ITDB reporting framework has been established, but it rarely works. And the analysis or use of the ITDB was little. From the ITDB fact sheet, some trends and patterns were drawn. They can be adopted in our context; efforts are needed to develop regulatory framework for radioactive sources and more attention is required to detect manufactured goods contaminated with radioactive material. Also, it is necessary to analyze the ITDB information regularly and participate the ITDB program more actively.

REFERENCES

[1] G. Anzelon, W. Hammond, M. Nicholas, The IAEA's Illicit Trafficking Database Programme, IAEA-CN-86-92P, International conference on measures to prevent, intercept and respond to illicit use of nuclear material and radioactive sources, Stockholm (Sweden) 7-11 May 2001

[2] IAEA Fact Sheet, IAEA Incident And Trafficking Database (ITDB), Incidents of Nuclear and Other Radioactive Material Out of Regulatory Control, 2018.

[3] IAEA Nuclear Security Series No. 14, Nuclear Security Recommendations on Radioactive Material and Associated Facilities, 2011.

[4] C. Englefield, Radioactive Sources Security: Why Do We Not Yet Have A Global Protection System?, Nuclear Engineering And Technology, Volume 46, Issue 4, August 2014, pp 461-466.