Chapter 7

Information Systems in Support of the Decision-Making Tools

Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture

Development and dissemination of the information technology throughout the world, as well as the convention potentials for rapid information exchange, primarily via Internet-based platforms, enable for rapid reporting, data collection, data analysis and situation-based decision-making. Such a workflow is especially important in management of rapidly developing emergencies, including NREs. IAEA has already established several such platforms and is intensively working on the improvements and upgrades of the existing ones, as well as on the development of new, sector-specific information platforms. This chapter gives information on the currently existing/developing IAEA platforms for management of NREs.

7.1 The IAEA Unified System for Information Exchange in Incidents and Emergencies (USIE)

The IAEA has emergency contact points worldwide that can use various channels to communicate with the agency through its Incident and Emergency Centre (IEC – <https://iec.iaea.org/usie/actual/LandingPage.aspx>). The Unified System for Information Exchange in Incidents and Emergencies (USIE) is a secure website maintained by the IAEA to enable countries to exchange urgent notifications and follow-up information during an emergency.

In an emergency, MS require prompt, authoritative and verified information about the situation and its potential consequences. The IAEA's IEC maintains a list of emergency contact points in MS, States Party to the Conventions on Early

Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture (✉)
Animal Production and Health Section, Vienna, Austria
e-mail: i.naletoski@iaea.org

Notification of a Nuclear Accident (IAEA 2002) and on Assistance in the Case of a Nuclear Accident or Radiological Emergency, and in other relevant international organizations. Via the USIE website, as well as by telephone, facsimile, email and video conferencing, the Centre maintains communication with these contact points. The IAEA's Operations Manual for Incident and Emergency Communication (IAEA 2013) outlines the arrangements for emergency communications.

More than 1000 users from over 150 MS are currently registered in USIE. The System not only facilitates the exchange of notifications and information between countries during an emergency; it also allows them to request information or international assistance. USIE is also used by officially nominated INES National Officers, who access it to share information on events rated using the INES (IAEA 2014). While USIE itself is not a public website, information on events obtained from USIE is available publicly on the NEWS website.

To shorten the time needed to share information from national systems to systems used at international level, the IAEA uses the International Radiological Information Exchange data standard (IRIX) as common data standard for information exchange. Developed by the IAEA together with MS and other international organizations, this standard enables the Agency's counterparts to connect their information exchange systems, thereby allowing for an efficient exchange of event details. This is required under the Convention on Early Notification of a Nuclear Accident. Details that can be shared using IRIX include information on the status of nuclear installations, releases of radioactive material and radiation levels measured in the environment. The IRIX standard has also been implemented in the USIE system.

7.2 Decision Support System for Nuclear Emergencies Affecting Food and Agriculture (DSS4NAFA)

Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture International Atomic Energy Agency, Vienna, Austria

In the event of a large-scale accident affecting food and agriculture, the management and visualization of data are crucial for efficient response by food and health authorities. Traditional collection and processing of datasets are presently inadequate for large-scale emergency response due to the analogue style of data transfer (often resulting in human errors for data input) and complex decision-making process (data not presented in an intuitive manner) which in turn prevents swift decision-making. However, advancements in information technology systems have allowed for improved real-time management of large volumes of data and optimized decision-making support.

The Soil and Water Management and Crop Nutrition Laboratory, under the Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture, developed the Decision Support System for Nuclear Emergencies Affecting Food and Agriculture

Fig. 7.1 DSS4NAFA is a cloud-based IT tool that assists in data management and data visualization using state-of-the-art technologies

(DSS4NAFA), to assist decision-makers in responding to large-scale emergencies affecting food and agriculture (Fig. 7.1). The specific features that set DSS4NAFA apart is its integrated data management, data visualization and decision support capabilities that assist in overcoming the logistical challenges encountered in a nuclear emergency. The modules in DSS4NAFA supports the logistical assignments of sample collection from the field, sample analysis in the lab, resource optimization and allocation as well as decision support through scenario forecasting. As the system was built such that the data called and time frames set can be customized, the DSS4NAFA system can be used both for nuclear and non-nuclear, routine monitoring and emergency response.

The system platform is accessible on-site through a smartphone application, or via a desktop interface, allowing for streamlined usage and communications. Through the mobile app, which samplers use during the data collection phase, DSS4NAFA allows for reduced human errors and increased information processing speed in the field and lab. Upon obtaining the radionuclide concentration data, the food restriction dashboard collates the information, including the spatial distribution and time resolution of the accident, and suggests food and planting restrictions based on the level of risk and the specified tolerance levels. The use of DSS4NAFA reduces the complexity in managing logistics of data collection, forecasting scenarios in data analysis and proposing restriction actions for decision-making

support. The combination of these functionalities brings together all stakeholders in the process and increases robust emergency response capabilities.

The DSS4NAFA system was built using open-source tools such as the Ruby on Rails web application framework, the PostgreSQL/PostGIS database system, the PhoneGap/Cordova framework, the Bootstrap User Interface library and the D3 and MapBox leaflet libraries. A video providing an overview of the DSS4NAFA system is available online at <https://youtu.be/U4GzjKabMc>.

7.3 iVetNet

iVetNet is an online information platform, developed by the Animal Production and Health Section of the Joint FAO/IAEA Division. The platform is still under development and is composed of multiple modules for support of veterinary entities (primarily laboratories) in information management (sharing of standardized operational procedures, SOPs), support in the development, implementation and maintenance of ISO 17025 standard and exchange of professional experiences among the members of the Veterinary Laboratory (VETLAB) network.

The core of iVetNet is the module of competent entities and staff members, attributed with different categorizations, aimed to easily identify institutions/persons competent for management of specific problems of veterinary importance. These include disease diagnosis, management of outbreaks, implementation of disease contingency plans as well as management of emergencies affecting animal production systems, such as the NREs.

The module for exchange of validated SOPs is subdivided into categories, such as procedures for disease detection, vector capturing and identification, procedures for support of ISO 17025 standard (equipment maintenance, staff management, etc.) as well as procedures for response to nuclear emergencies (the management options of this manuscript).

Validated and verified SOPs are shared among the registered users of iVetNet and are permanently available for implementation in their environment. All the procedures, including those aimed for response to NREs, are aimed for integration in the national contingency plans of the veterinary authorities in member states.

Currently iVetNet operates with 112 trial users in 45 member states, most of which (33) are in Africa. The aim of the trial group is to perform “field testing” of iVetNet, identify of gaps and propose improvement measures.

References

- IAEA. (2002). *Convention on early notification of a nuclear accident*. <https://www.iaea.org/publications/documents/infcircs/convention-early-notification-nuclear-accident>
- IAEA. (2013). *Operations manual for incident and emergency communication, emergency preparedness and response no. EPR-IEComm 2012*. Vienna: IAEA. <https://www.iaea.org/publications/8939/operations-manual-for-incident-and-emergency-communication>.
- IAEA. (2014). *The use of the international nuclear and radiological event scale (INES) for event communication*. Vienna: IAEA. <https://www.iaea.org/publications/10784/the-use-of-the-international-nuclear-and-radiological-event-scale-ines-for-event-communication>.

The opinions expressed in this chapter are those of the author(s) and do not necessarily reflect the views of the International Atomic Energy Agency, its Board of Directors, or the countries they represent.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution 3.0 IGO license (<http://creativecommons.org/licenses/by/3.0/igo/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the International Atomic Energy Agency, provide a link to the Creative Commons license and indicate if changes were made.

Any dispute related to the use of the works of the International Atomic Energy Agency that cannot be settled amicably shall be submitted to arbitration pursuant to the UNCITRAL rules. The use of the International Atomic Energy Agency's name for any purpose other than for attribution, and the use of the International Atomic Energy Agency's logo, shall be subject to a separate written license agreement between the International Atomic Energy Agency and the user and is not authorized as part of this CC-IGO license. Note that the link provided above includes additional terms and conditions of the license.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.