

POLICY BRIEF



Enhancing Nuclear and Radiological Emergency Preparedness and Response in ASEAN and Beyond: Regional practices and challenges

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Cover Photo: The ASEAN Regional Forum disaster relief exercise (ARF DIREX 2013, Cha-am, Thailand, 7-11 May 2013 (Wikimedia, the image has been cropped.)

ENHANCING NUCLEAR AND RADIOLOGICAL EMERGENCY PREPAREDNESS AND RESPONSE IN ASEAN AND BEYOND: REGIONAL PRACTICES AND CHALLENGES

JULIUS CESAR TRAJANO

EXECUTIVE SUMMARY

Although no country in ASEAN currently uses nuclear power, nuclear and radiological emergency preparedness remains essential in minimising the impacts of incidents and emergencies involving nuclear and radiological materials. It is also necessary to ensure that radiological materials used for peaceful purposes do not fall into the hands of people with malicious and criminal intentions. Furthermore, any radiological security incidents and even security threats to NPPs in several Asia-Pacific countries may trigger radioactive leaks and emergencies that can reach Southeast Asia.

Through ASEANTOM, ASEAN is pursuing work to enhance nuclear and radiological emergency preparedness and response. ASEANTOM has ongoing regional projects, with the United States, South Korea, the European Union and the International Atomic Energy Agency on nuclear security and nuclear emergency preparedness and response. These projects are essential at both national and regional levels to protect the people and the environment in case of nuclear or radiological accidents. Within ASEAN, a broad consensus has formed that a regional approach to nuclear emergency preparedness and response would complement national frameworks and capabilities. ASEANTOM's work is promising, but there is room to deepen and expand this work, for example by bringing in countries from the wider Asia-Pacific.

To this end, the ASEAN-wide network of radiation monitoring stations should be completed and extended to include other Asia-Pacific nations; a regional nuclear crisis centre should be established; and the hitherto untested ASEAN Protocol for Preparedness and Response to a Nuclear or Radiological Emergency should be put into practice by conducting regional exercises on CBRN and disaster response.

INTRODUCTION

Nuclear and radiological emergency preparedness is essential in minimising the impacts of incidents and emergencies involving nuclear and radiological materials. This preparedness is not only important for states that have nuclear weapons and nuclear power plants, but also for those that do not, as nearly all states use nuclear and radioactive materials for other civilian applications. Nuclear emergencies may arise from nuclear power plant accidents, such as those that occurred in Chernobyl and Fukushima. Radiological emergencies may result from the misuse of radioactive sources in industrial, medical, or research applications, accidental exposure, malicious acts, or accidents during the transport of radioactive sources.¹

The 10 member states of ASEAN – Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam – share a common interest in ensuring the safety and security of any future nuclear power plants or small modular reactors constructed in the region, as well as the peaceful use of radioactive materials. While there are currently no operational nuclear plants in Southeast Asia, there are three Chinese nuclear power plants located near Vietnam, and Chinese offshore nuclear reactors may be deployed in the South China Sea in the future. Additionally, Bangladesh, which shares a border with Myanmar, began construction of its first nuclear power plant in 2017 with Russian collaboration, and completion is slated for 2024. A nuclear disaster or radiological emergency could have transboundary impacts on ASEAN member states.

There is a need to ensure that radiological materials used for peaceful purposes do not fall into the hands of people with malicious and criminal intentions. Nuclear security measures, adequate regulatory oversight on the use, transport, and handling of radioactive materials, and strong nuclear security norms and practices for radiological sources, are therefore relevant for the region.

Since its inaugural annual meeting in 2013, the ASEAN Network of Regulatory Bodies on Atomic Energy (ASEANTOM) has been conducting regional capacity-building projects on the safety and security of radiological sources for all member countries, in collaboration with the International Atomic Energy Agency (IAEA), the European Union (EU), and other ASEAN dialogue partners in the Asia-Pacific region. ASEAN member states, together with other participating countries in the East Asia Summit, have collectively recognised the importance of enhancing cooperation in nuclear security and nuclear emergency preparedness and response (EP&R).²

¹ World Health Organization, Radiation Emergencies, accessed 24 March 2023, https://www.who.int/health-topics/radiation-emergencies#tab=tab_1.

² ASEANTOM, THE ASEAN Network of Regulatory Bodies on Atomic Energy (ASEANTOM) Work Plan 2018 – 2022, 27 June 2018, <https://cil.nus.edu.sg/wp-content/uploads/2019/10/Annex-8.-5-year-ASEANTOM-Work-Plan-adopted-on-27-Jun-20181.pdf>.

ASEANTOM AND REGIONAL COOPERATION IN NUCLEAR SECURITY

ASEANTOM was formally established with the adoption of its Terms of Reference in 2012. It is composed of nuclear regulatory agencies from 10 ASEAN member states (see Table 1).

ASEAN MEMBER STATE	REGULATORY AGENCY
Brunei	Radiation Safety and Quality Unit Energy Department, Prime Minister's Office
Cambodia	Office Nuclear Safety, Security and Safeguards, Ministry of Mine and Energy
Indonesia	Nuclear Energy Regulatory Agency (BAPETEN)
Laos	Department of Science, Ministry of Science and Technology
Malaysia	Atomic Energy Licensing Board (AELB)
Myanmar	Division of Atomic Energy, Ministry of Education/ Myanmar Nuclear Regulatory Commission
Philippines	Philippine Nuclear Research Institute
Singapore	Radiation Protection and Nuclear Science Department (RPNSD), National Environment Agency
Thailand	Office of Atoms for Peace (OAP)
Vietnam	Vietnam Agency for Radiation and Nuclear Safety (VARANS)

TABLE 1. ASEANTOM MEMBERS

As a network of nuclear regulatory bodies and relevant authorities in the region, ASEANTOM provides a platform for regulators to exchange nuclear-related information and best practices, enhance cooperation, and develop capacities in nuclear safety and security, as well as the peaceful uses of nuclear energy.

ASEAN member states clearly recognise the importance of nuclear security measures given the risk of radioactive materials being used in criminal, terrorist, or intentional unauthorised acts by malicious non-state actors.³ This explains why the security of

³ Representative of Thailand, "Intervention by Thailand: Panel I on measures to reduce and eliminate the risk of accidental, mistakes, unauthorized or intentional nuclear weapon detonations," UN General Assembly Open-Ended Working Group Session, May 2, 2016,

radioactive sources has become a key regional nuclear security agenda for ASEANTOM and is expected to remain a significant agenda item alongside nuclear emergency preparedness and response.⁴

In collaboration with the IAEA, ASEANTOM has conducted regional workshops on “Security Management and Security Plan on Radioactive Materials and Associated Facilities” and the “Regional Project on Nuclear Security: Strengthening Regulatory Capacities for Licensing, Inspection and Enforcement for the Security of Radioactive Materials and Associated Facilities in Southeast Asia (2018–2021).” These workshops highlight the increasing attention being given by the region to the security of nuclear and radioactive sources and relevant facilities.⁵

ASEANTOM also collaborates with ASEAN dialogue partners such as South Korea and the United States to enhance the nuclear security regime in Southeast Asia. One example is the ASEANTOM–US National Nuclear Security Administration (NNSA) Exercise Development Training Series that commenced in 2019. This series provides training to ASEANTOM members to improve their capability to plan and conduct tabletop and field exercises on nuclear security and non-proliferation.⁶

In January 2020, the Korea Institute of Nuclear Non-proliferation and Control (KINAC) organised a regional workshop for ASEAN members to develop training courses and a training strategy aimed at enhancing their national capabilities on nuclear forensics.⁷ This workshop reflected the growing concern for nuclear forensics due to the recent increase in international terror threats. It was also the outcome of South Korea-ASEAN cooperation, together with the IAEA, the United States, and the EU, in nuclear security. KINAC pledged to assist ASEAN countries in developing relevant nuclear security training courses.⁸

Due to the varying regulatory capabilities across Southeast Asia, several ASEANTOM members provide bilateral or trilateral capacity-building assistance to fellow members that do not have adequate regulatory infrastructure and resources. This ensures that they

https://www.reachingcriticalwill.org/images/documents/Disarmament-fora/OEWG/2016/Statements/02May_Thailand.pdf; Bayani Mercado, “ASEAN Statement: UN Conference to Negotiate a Legally Binding Instrument to Prohibit Nuclear Weapons, Leading Towards Their Total Elimination,” Permanent Mission of the Republic of the Philippines to the United Nations, March 27, 2017, https://www.un.int/philippines/statements_speeches/asean-statement-un-conference-negotiate-legally-binding-instrument-prohibit.

⁴ Interview with Thai experts, Zoom, August 3 and 24, 2020.

⁵ Interview with a Vietnamese expert, Zoom, August 7, 2020; Yuthana Tumnoi, “The Current Status of ASEANTOM and Future Plans,” Presentation at CSCAP Nuclear Energy Experts Group Meeting, Singapore, February 3–4, 2020.

⁶ Interview with a Thai expert, Zoom, August 3, 2020.

⁷ Hyeseung Kim and Byung-woo Shin, “Development of Nuclear Forensics Training Course for ASEAN Member States,” *Transactions of the Korean Nuclear Society Virtual Spring Meeting*, 9–10 July 2020, https://www.kns.org/files/pre_paper/43/20S-612-%EA%B9%80%ED%98%9C%EC%8A%B9.pdf.

⁸ Ibid; Workshop on Nuclear Forensic for raising ASEAN capability, KINAC, 8 January 2020, <https://www.kinac.re.kr/board/view?pageNum=1&rowCnt=2&no1=&linkId=17905&menuId=MENU00428>.

can effectively regulate radioactive sources and participate in regional nuclear security and non-proliferation initiatives. For instance, Thailand has been helping its neighbours, Laos and Cambodia, in developing their regulatory and radiation monitoring capabilities,⁹ while Vietnam provides technical assistance to the two countries through a trilateral arrangement.¹⁰ Additionally, Malaysia supports Brunei by sending its own experts to support the development of the country's regulatory oversight framework and resources.¹¹

ASEANTOM AND COOPERATION IN NUCLEAR AND RADIOLOGICAL EMERGENCY PREPAREDNESS AND RESPONSE

ASEANTOM is currently addressing the different capacities of Southeast Asian states to prepare for and respond to nuclear and radiological emergencies.¹² It identified this as one of its core priorities due to the increasing utilisation of radioactive sources for various non-power applications in Southeast Asian countries. Within ASEAN, there is a consensus among ASEANTOM members that a regional approach to radiological and nuclear emergency preparedness and response would enhance national frameworks and capabilities.¹³

In 2016, ASEANTOM launched a collaboration with the IAEA on a regional project titled “Supporting Regional Nuclear Emergency Preparedness and Response in the Member States of ASEAN Region.” Most ASEAN states have limited expertise or techniques for radiation monitoring or dose assessment in a radiological emergency. To address this, the project aims to establish a regional environmental radioactivity database, provide technical assistance to member states, and promote a more systematic regional response to radiological emergencies.¹⁴ ASEANTOM and the IAEA also completed a technical report titled “A Review of the Nuclear and Radiological Hazard Assessment in ASEAN,” which is crucial in identifying potential radiological and nuclear hazards in the ASEAN member states.

Another important outcome of the ASEANTOM's regional technical cooperation project with the IAEA is the development of the “ASEAN Protocol for Preparedness and Response to a Nuclear or Radiological Emergency.” From 2018 to 2021, a working

⁹ Interview with a Thai expert, Zoom, August 3, 2020.

¹⁰ Interview with a Vietnamese expert, Zoom, August 7, 2020.

¹¹ Interview with a Malaysian expert, Zoom, August 14, 2020.

¹² RSIS' NTS Centre, Nuclear Safety and Security Culture: Powering Nuclear Governance in East Asia, 27 October 2017, Event Report (Singapore: RSIS' Centre for NTS Studies, 2018)

¹³ Suthipat Fuenma, “Collaboration between OAP and EU to enhance ASEAN in establishing the first Decision Support System (DSS) during nuclear and radiation emergency in ASEAN”, Office of Atoms for Peace of Thailand, 16 September 2019, <https://www.oap.go.th/en/news/4184-collaboration-between-oap-and-eu-to-enhance-asean-in-establishing-the-first-decision-support-system-dss-during-nuclear-and-radiation-emergency-in-asean>.

¹⁴ ASEANTOM, “Appendix A: Logical Framework Matrix”, 2020, <https://www.oap.go.th/en/aseantom/activities/8145-iaea-rcaro-aseantom-regional-training-course-rapid-radiation-measurement-and-individual-dose-assessment-following-nuclear-and-radiological-emergency>.

group consisting of Singapore, Thailand, Malaysia, and Cambodia drafted the ASEAN Protocol, which was then submitted to ASEANTOM for review. The ASEAN Protocol was officially endorsed at the ASEAN Senior Officials' Meeting in October 2021. The Protocol is an official ASEAN document that guides future EP&R arrangements and cooperation for radiological or nuclear emergencies in Southeast Asia. It serves as the overarching framework that will harmonise decision-making and public communications in the ASEAN region during nuclear or radiological emergencies.¹⁵ The Protocol is envisioned to be the first global model of a regional emergency protocol.¹⁶ However, it remains to be seen how ASEAN members can effectively implement the Protocol and demonstrate stronger EP&R coordination under its guidance.

Meanwhile, the EU, through the European Commission, has also been assisting ASEANTOM with an EP&R project since 2014. The project's aim is to develop a regional platform for the early warning system and coordination during a nuclear or radiological emergency. The ASEAN Early Warning Radiation Monitoring Network was developed as part of this project. Technical and funding assistance from the EU enabled most of the developing countries in the region to acquire the equipment needed for their radiation monitoring stations.¹⁷

This cooperation between ASEANTOM and the EU has been the most visible achievement of ASEANTOM, as not all ASEAN member states have the immediate capacity to procure, set up, and operate these monitoring stations. Furthermore, the radiation monitoring network was supplemented with a regional data exchange platform launched in 2020. The radiation data exchange platform for relevant agencies, enables "more rapid and informed response from the exchange, in real time, of information from national radiation monitoring networks" while "reducing costs from sharing expertise, methods, training, equipment and facilities at a regional level and avoiding needless duplication."¹⁸

Recently, in March 2023, the Philippines spearheaded an international workshop on radiological emergency consequence management at its nuclear regulator's facility in Manila. Participants from Southeast Asia and other Asia-Pacific countries jointly trained on the use of radiation detection equipment with experts from the IAEA and the US Department of Energy National Nuclear Security Administration (DOE-NNSA).¹⁹

¹⁵ National Environment Agency of Singapore, "International Partnerships as Strategic Levers," *Integrated Sustainability Report 2021/2022*, <https://www.nea.gov.sg/integrated-sustainability-report-2021-2022/review-of-fy2021/together-with-our-partners-and-the-community/international-partnerships-as-strategic-levers>.

¹⁶ James Kon, "ASEAN endorses emergency preparedness protocol," *Borneo Bulletin*, July 21, 2021, <https://borneobulletin.com.bn/asean-endorses-emergency-preparedness-protocol/>

¹⁷ Interview with a Thai expert, Zoom, August 24, 2020.

¹⁸ Tumnoi, "The Current Status."

¹⁹ DOST-Philippine Nuclear Research Institute, Press Release on International Workshop on Emergency Consequence Management, March 16, 2021.

The workshop facilitated the sharing of best practices on radiation detection and national arrangements for monitoring, sampling, and assessment during a nuclear or radiological emergency. This recent development demonstrates the region's efforts to enhance EP&R, as well as the key role of the IAEA and ASEAN's dialogue partners in the Asia-Pacific, such as the United States.

RECOMMENDATIONS

Complete the ASEAN-wide network of monitoring stations and extend network to include other Asia-Pacific nations

In order to fully benefit from a region-wide early warning system, all Southeast Asian countries must have their own radiation monitoring stations. Currently, eight countries have already built and are operating monitoring stations which are all connected to the Regional Early Warning Radiation Monitoring Network and Data Exchange Platform in ASEAN. But two remaining countries, Myanmar and Laos, have yet to setup their respective stations. As the EU technical support for ASEANTOM excludes Myanmar, due to the EU's sanctions on its junta, it will be difficult for the country to acquire the needed facilities, software, and equipment for a monitoring station. The ongoing technical assistance being provided to the two countries by their neighbours – particularly by Vietnam and Thailand – is essential to ramp up the capacity of their nuclear regulatory agencies and their capability to use radiation detection equipment, and should be fully supported by all other ASEAN member states.²⁰ The establishment of radiation monitoring stations in Myanmar and Laos would significantly reduce blind spots in the region-wide early warning system network.

In the future, ASEAN member states should also consider linking ASEANTOM's radiation monitoring network with monitoring stations from other Asia-Pacific countries, especially Bangladesh, China, Japan, and South Korea. Data sharing from stations, particularly China and Bangladesh, would be important for ASEAN's EP&R in the event of a possible nuclear emergency from the nuclear power plants close to Vietnam and Myanmar. Vietnam and China currently do not have a data-sharing framework, despite several attempts by the Vietnamese government to initiate radiation monitoring cooperation between the two in the context of Chinese nuclear power plants near Vietnam's northern border.²¹ In this regard, ASEANTOM or ASEAN members can collectively propose to neighbouring countries through the ASEAN Plus Three and the East Asia Summit the creation of an Asia-Pacific regional early warning system using a network of radiation monitoring stations.

²⁰ Omar Yusuf, "Cambodia, Lao PDR and Viet Nam Renew and Scale-Up South-South Cooperation Through Practical Arrangements, with IAEA Support," IAEA, October 20, 2022, <https://www.iaea.org/newscenter/news/cambodia-lao-pdr-and-viet-nam-renew-and-scale-up-south-south-cooperation-through-practical-arrangements-with-iaea-support>.

²¹ Interview with a Vietnamese official, Zoom, 5 August 2020.

Establish a dedicated regional nuclear crisis centre

ASEANTOM, in coordination with the ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management (AHA Centre) and national disaster response agencies, can set up a regional nuclear crisis coordination centre in which the region's highly trained radiation emergency responders can come together and participate in workshops, trainings, and joint drills. This centre would facilitate information exchange and improve response coordination in the event of radiation plumes. During a crisis, the centre can act as a special coordinating body for regional and civil-military nuclear emergency response.

Given the unique nature of radiation-related disasters, a special coordinating body is required to coordinate appropriate responses. It may also serve as an information clearinghouse, providing up-to-date information regarding radiation risk in the region. The nuclear crisis centre can be established as a specialised unit within the AHA Centre, but it will require support from and coordination with all ASEAN countries, militaries, and existing civilian relief organisations to be recognised as a regional coordinating body.

A clear example of a regional nuclear crisis centre is the proposed ASEAN Radiological Assessment Centre (ARAC). ASEAN members should also pool together their technological and financial resources as well as expertise to establish ARAC in cooperation with the IAEA. ARAC would be responsible for conducting real-time radiation monitoring, modelling, and assessment, providing expert advice in an emergency, and relaying information to the ASEAN member state where the emergency originated and to the AHA Centre.²² Currently, the future role of ARAC is still being deliberated within ASEANTOM.

Conduct regional exercises guided by the ASEAN Protocol

The completion of the ASEAN Protocol should be followed by regular joint trainings and exercises among ASEANTOM member agencies as well as the region's national and regional CBRN and disaster response bodies. The Protocol's effectiveness is currently untested, and there is a need to identify potential capacity gaps among EP&R responders. It is important to note that the regional protocol has not yet been made publicly available. Regular ground exercises at the national and regional levels are necessary to test the interoperability and cohesiveness of nuclear emergency responders, CBRN agencies, and national disaster response teams from Southeast Asia in line with the Strategic and Holistic Initiative to Link ASEAN Responses to Emergencies and Disasters (ASEAN SHIELD). ASEAN SHIELD aspires "to ensure ASEAN's collective, rapid, effective and timely response in mitigating the impacts of different types of

²² Maxwell Daniels, Final Project Review Meeting: RAS9077 Supporting Regional Nuclear Emergency Preparedness and Response in the Member States of ASEAN Region, 2-6 December 2019, https://www.oap.go.th/images/documents/offices/baea/proap/training/RAS9077_Major_Events_with_Technical_Details.pdf.

emergencies and disasters affecting the region...”²³ Existing ASEAN frameworks and mechanisms on disaster preparedness and response, including national coordination mechanisms on nuclear EP&R in each member state, can ensure the comprehensive implementation of ASEAN SHIELD in the coming years.

In conclusion, the growing ASEAN cooperation on nuclear and radiological EP&R developed through regional projects could serve as a foundation for a similar framework in the broader Asia-Pacific region. The regional hazard assessment on radioactive sources and facilities could be expanded to include all Asia-Pacific countries, given that all states possess radioactive sources for various civilian applications. In addition, states in the Asia-Pacific could establish an integrated early warning radiation monitoring network and data exchange platform spearheaded by ASEANTOM. Building on these regional projects, ASEAN’s EP&R framework could also be used to develop a much broader EP&R framework for the Asia-Pacific.

²³ ASEAN, Bandar Seri Begawan Declaration on the Strategic and Holistic Initiative to Link ASEAN Responses to Emergencies and Disasters (ASEAN SHIELD), 2 October 2021, <https://asean.org/wp-content/uploads/2021/10/2.-BSB-Declaration-on-ASEAN-SHIELD.pdf>.

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The **Asia-Pacific Leadership Network for Nuclear Non-proliferation and Disarmament (APLN)** is a Seoul-based organization and network of political, military, diplomatic leaders, and experts from across the Asia-Pacific region, working to address global security challenges, with a particular focus on reducing and eliminating nuclear weapons risks. The mission of APLN is to inform and stimulate debate, influence action, and propose policy recommendations designed to address regional security threats, with an emphasis on nuclear and other WMD (weapon of mass destruction) threats, and to do everything possible to achieve a world in which nuclear weapons and other WMDs are contained, diminished, and eventually eliminated.



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