Low Occurrence, High Threat

AN ANALYTICAL FRAMEWORK FOR ENGAGING SOUTHEAST ASIAN PARTNERS ON NUCLEAR DETERRENCE AND DETECTION

COLUMBIA | SIPA CAPSTONE PROJECT

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School of International and Public Affairs

NSDD
NUCLEAR SMUGGLING DETECTION AND DETERRENCE

LOW OCCURRENCE, HIGH THREAT

An Analytical Framework for Engaging Southeast Asian Partners on Nuclear Deterrence and Detection

Amelia Cheatham, Julia Anderson Crane, Christopher Dolan, Jessie Laufer, Takayuki Omori, Aoi Takahashi, and Sophia Yelim Shin

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2. EXECUTIVE SUMMARY

Though the smuggling of radioactive and nuclear (R/N) materials remains a relatively infrequent activity, several factors contribute to its increased likelihood. The global spread of potential sources of illicit R/N material, the growing number of potential buyers such as terrorists, the challenges in monitoring trafficking, and geopolitical and resource constraints that hinder law enforcement efforts all contribute to heightened risk associated with R/N smuggling.

As a result, NSDD has built partnerships with states and multilateral organizations worldwide. At the same time, as NSDD looks to build new partnerships and deepen its relationships with current partners outside of Eastern Europe and Central Asia, it thinks strategically and sets programmatic priorities in the search for the greatest threat reduction per dollar spent. This report is intended to supplement that decision-making process.

This report considers Southeast Asia a useful example of a region of emerging risk with a comparatively thin NSDD presence. Southeast Asia struggles with endemic trafficking due to its unique geography, economic centrality, and relatively under-resourced governments. It is also home to multiple terrorist organizations which have declared interest in developing radioactive or nuclear weapons. This report analyzes these and other factors to assess the probable needs and programmatic difficulties outreach would encounter in the region.

This report examines multiple states from the region according to various metrics meant to capture factors that facilitate R/N smuggling or challenge law enforcement responses. The hope is that this tool will help develop and discuss programmatic priorities. Policymakers must decide what is feasible and, more importantly, make any headway in a country of high concern and difficulty or build on an already successful programmatic relationship. Likely, this determination will vary from time to time and region to region and rely upon a deep familiarity with NSDD's experiences and priorities.

Note that the rankings produced by this analytical framework are based upon information gleaned from open-source reporting and analysis, and the weighing of these metrics was based upon the analysis of the authors. It is possible that NSDD analysts working with this framework will find points of disagreement, either with the entries for various metrics or with the significance with which they were weighed. Indeed, "Ease of Implementation" and "Program Need" may include categories and subcategories that NSDD analysts find irrelevant to those assessments.

The report concludes with findings and recommendations on how NSDD can feasibly, efficiently, and effectively build its presence in the studied region. The primary recommendation around which this report is built is that the variety of factors which contribute to R/N trafficking risk can be organized in such a way that states might be ranked by the severity of that risk (Program Need) and the predicted difficulty they would have in instituting policies which reduce that risk (Ease of Implementation). After analysis, this report finds that Vietnam has the highest simultaneous Program Need and predicted Ease of Implementation, and recommends that NSDD outreach in the region prioritize building a relationship there. Given NSDD seeks to build relationships throughout the region, the assessments of other countries provide information as to their unique situation and a model for how other potential partners might be assessed.

The report concludes with findings and recommendations on how NSDD can feasibly, efficiently, and effectively build its presence in the studied region. These are found in Section 5 and are summarized in the following sections.

National Nuclear Security Administration

NSDD
NUCLEAR SMUGGLING DETECTION AND DETERRENCE

This infographic shows the Program Needs and Ease of Implementation of NSDD Programs in five Southeast Asian countries of interest.

Ease of Implementation

Hard
Medium
Easy

Program Needs

Low Need
Medium Need
High Need

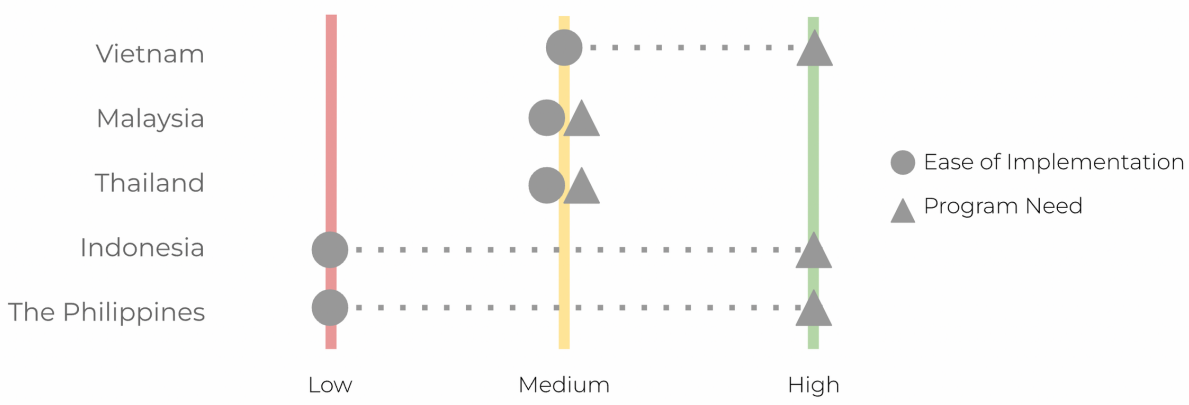
Ease of Implementation

Program Needs

In pursuit of greatest risk-reduction per dollar, NSDD should start its efforts in Vietnam. Vietnam has a medium Ease of Implementation and a high Program Needs.

How Should NSDD Prioritize Engagement in Southeast Asia?

Programmatic need and ease of implementation for selected countries, where both metrics scoring "green" indicates ideal conditions for engagement



Recommendations for NSDD Engagement With Southeast Asia Fall Into Three Action Groups:

Do Not Overburden Existing Missions

Focus on Capacity and Organizational Structure

Pursue Multi-Faceted Outreach Initiatives

2.1 FRAMEWORK SUMMARY

Color Scale	Ease of Implementation	Programmatic Needs
Green	Easy	High Need
Yellow	Medium	Medium Need
Red	Hard	Low Need
Blue	Not Relevant/No Causation	
Grey	Insufficient Data	

Ease of Implementation						
Indonesia	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
Malaysia	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Program and Current Participation	Institutional Capacity
The Philippines	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
Thailand	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
Vietnam	Geography	Source	Economic/Human Development	Indicators of R/N Smuggling	Program and Current Participation	Institutional Capacity

Program Needs						
Indonesia	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
Malaysia	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
The Philippines	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
Thailand	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
Vietnam	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity

2.2 FINDINGS AND RECOMMENDATIONS

Findings

1. The significant maritime dimension to Southeast Asian smuggling complicates law enforcement action.

2. The greatest "risk reduction per dollar" scenario is in Vietnam where moderately high programmatic needs intersect with predicted relative ease of implementation.

Recommendations

1. Do not overburden existing missions.

- Focus on breadth rather than depth.
- Support local law enforcement priorities and "be additive to the mission without changing the mission space.
- Prioritize the deployment of mobile detection resources.

2. Focus on capacity and organizational structure.

- Seek opportunities to gauge potential partners' capacities and will before fully dedicating NSDD resources and programs.
- Frequently stress-test NSDD and partner capacity.
- Assist partner countries in delineating R/N smuggling responsibilities within partners' counterterror and counter-smuggling apparatuses.

3. Pursue multi-faceted outreach initiatives.

- Prioritize engagement with organizational leaders and management.
- Seek to fill in the gaps in Chinese outreach to the region.
- Forward deploy at least one regional expert to Southeast Asia, given its enormous cultural, linguistic, religious, economic, and social diversity.

3. INTRODUCTION

3.1 THE SMUGGLING THREAT

Nuclear smuggling has been a growing concern since the fall of the Soviet Union in 1991. The exploitation of radioactive and nuclear (R/N) material by nefarious actors to create radiological dispersal devices (RDDs), improvised nuclear devices (INDs), and radiological exposure devices (REDs) poses a significant risk to global security.

While the threat is constant, the landscape has changed over time. The focus is no longer solely on weapons-usable nuclear material (WUNM), as concerns have risen around the potential misuse of radioactive material in the industrial, medical, and agricultural sectors. Furthermore, detection efforts no longer focus on megaports, as they did in the 2000s. Experts now assess that criminals and terrorists are smart enough to avoid moving material through highly-surveilled ports. Intelligence agencies or internal security services now apprehend most materials, not border security personnel. COVID-19 has also affected trafficking behaviors; the pandemic-related decline in air travel has led traffickers to seek alternative smuggling pathways.

Nuclear Smuggling Detection and Deterrence (NSDD) agency plays a crucial role in detecting and deterring R/N material smuggling but faces resource allocation and prioritization challenges. Given the evolving threat landscape, NSDD aims to prioritize internal security and expand its focus beyond Eastern and Central Europe. Emerging regions of concern include West Africa and Southeast Asia, which have less-than-rigorous reporting standards, under-resourced states, extremist organizations, and the trafficking of other illicit goods plague. These regions present complex challenges, as the United States' relationships and insights into these areas are often underdeveloped and limited.

This report seeks to provide an overview of the Southeast Asia region, focusing on ASEAN member states, and offer recommendations for how NSDD can prioritize its resources to effectively combat the threat of R/N smuggling. The analytical framework in this report highlights regional dynamics to help NSDD devise a strategic approach for maximizing impact in Southeast Asia.

3.2 PAST ROUTES AND METHODS OF R/N SMUGGLING

1992-1995

Amid the political, economic, and security turmoil of the early 1990s, newly-created states struggled to maintain security around nuclear materials, and their theft became more appealing. Much of the nuclear material intercepted in recent years have been traced back to power plants, research facilities, and fuel storage facilities in the former Soviet Union.

Cases involving weapons-usable nuclear material are of special concern. The seven confirmed apprehensions of weapons-usable nuclear material between 1992 and 1994 occurred in Russia, Germany, or the Czech Republic, with all material originating in the former USSR (Ewell, 2008). Known trafficking occurred entirely in Eastern Europe, with sellers moving material westward, searching for buyers. Then as now, the black market also contained lesser radioactive material, and most apparent trafficking attempts turned out to be scams (Ford, 1996).

During this period, signs emerged that R/N material was changing hands and being stored for extended periods before they were sold. For instance, materials apprehended in 1994, 1996, and 1997 were all traced back to a 1992 theft from a Lithuanian power plant (Ewell, 2008).

1995 – 1999

There were no confirmed instances of weapons-usable nuclear material trafficking between 1995 and 1999 (Ewell, 2008). This period was defined by national attempts to respond to the new trafficking threat. For instance, the Second Line of Defense program, NSDD's predecessor, began in 1998.

At the same time, Eastern European trafficking of R/N material other than WUNM became increasingly sophisticated compared to the opportunistic thefts of 1992-1995. Two smuggling schemes organized by facility insiders were discovered during this period. The first involved the illicit export of iridium-192 from a Russian radioisotope factory to the United Kingdom, and the latter entailed the movement of over 100 kg of low-enriched uranium (LEU) from a Kazakhstani metallurgy plant (Ewell, 2008). Both incidents involved multiple collaborating employees and the falsification of customs documents (as in the first case) or the help of a former customs agent (as in the latter case).

1997 – 2008

By 1997, the U.S. Department of Defense and the Federal Bureau of Investigation's Counterproliferation Program widened the focus of American counter-proliferation efforts to include Central Asia and the Caucasus (Ewell, 2008). Several cases of R/N trafficking were disrupted in these regions during this period. Due to limited information, it is hard to say when trafficking patterns shifted concretely. Regardless, between 1999 and 2001, R/N material was seized in Kyrgyzstan, Georgia, France, and Greece, with multiple culprits heading to or from Turkey (GAO, 2002). Material continued to be primarily sourced from the former Soviet Union. However, the R/N material trade in the late 1990s spread east and south as traffickers sought buyers outside the traditional markets of Central and Eastern Europe.

At the turn of the century, U.S. policymakers became increasingly worried about the demand side of the R/N material black market. The September 11, 2001, attacks reoriented American thinking on international security, and there was concern that Al-Qaeda and other terrorist organizations sought R/N weapons. This was especially the case due to these groups' connections in Pakistan, an emerging country of concern, and Chechnya, where insurgents had previously threatened Moscow with capabilities to construct a "dirty bomb" (Specter, 1995). Simultaneously, fears of nuclear programs in Iran, North Korea, and Iraq mounted. In 2002, it became clear that the DPRK had secretly continued its program despite signing the 1994 Agreed Framework, raising concerns about undetected R/N material trafficking.

Given the threat from non-state actors and the newly globalized economy, policymakers feared that shipping lanes and containers – already used by criminal entities to traffic other illicit goods – might facilitate R/N trafficking. As a result, the National Nuclear Security Administration founded the Megaports Initiative.

2008 – 2023

Two major trends in R/N material trafficking stand out since the early 2000s: the role of "breakaway republics" in facilitating R/N trafficking, the rise of ISIS and with it increased risks of R/N terrorism.

First, Moldova and Georgia experienced spikes in the seizures of Russian-sourced material. Between 2009 and 2015, authorities discovered at least four attempts to move material from Moldova and Georgia to the Middle East and North Africa (Butler, 2015). In 2016 alone, three groups trafficking nuclear materials were caught in Georgia (Shuster, 2017). These states have unrecognized breakaway republics, legacies of frozen conflicts with Russia. These regions pose difficulties for law enforcement and facilitate multiple forms of trafficking. The war in Ukraine has further complicated international anti-trafficking efforts in the region. Note again, however, that precise analysis is difficult, because a spike in materials seized does not necessarily correlate with a spike in materials trafficked.

Second, the rise of the Islamic State (IS) increased fears of R/N terrorism due to the organization's stated R/N ambitions and international attacks. One smuggler caught in Moldova believed he was dealing with an IS representative (Butler, 2015). In 2017, materials written by an Indonesian IS member were taken as evidence in the case of five men who acquired thorium with the hope of constructing a dirty bomb (Allard et al., 2017). IS has since declined in influence, but terrorists seeking R/N material remain a serious security concern.

Yet, uneven reporting standards across countries make it difficult to analyze the movement of radioactive material effectively. A 2016 CNS report points out that, between 2013 and 2016, 38 incidents of lost radioactive materials were reported in Colorado, compared to 22 reported across all of East Asia. Thirty of the Coloradan incidents involved missing “EXIT” signs containing tritium, which are simply not reported elsewhere. In 2017, the United States, Belgium, Canada, France, and the Republic of Korea accounted for over 76 percent of all R/N incidents reported, despite much broader participation in the International Atomic Energy Agency’s (IAEA) Incident and Trafficking Database (ITDB) (NTI, 2023).

The combined frequency of “low level” events in those states reliably reporting them, and the low number of those states means the reporting of missing or found non-nuclear radioactive material of concern likely undercounts actual incidents. Conversely, the rigor demonstrated by reliably-reporting countries can throw off data as well, by including many instances of misplaced or forgotten sources which were not taken with malicious intent. Moreover, data is likely distorted to varying degrees in different regions. Therefore, using open-source databases, it is impossible to draw definitive, accurate conclusions about global trends in R/N trafficking. Understanding each region as its own market ecosystem may be more analytically useful, with trafficking routes, sources, products, and buyers changing in popularity locally over time and in response to law enforcement efforts.

3.3 WHAT IS R/N MATERIAL?

Categorization of Nuclear Material

Material	Form	Category		
		I	II	III
1. Plutonium	Unirradiated	2 kg or more	Less than 2 kg but more than 500 g	500 g or less but more than 15 g
2. Uranium-235	Unirradiated - uranium enriched to 20% ^{235}U or more - uranium enriched to 10% ^{235}U but less than 20% - uranium enriched above natural, but less than 10% ^{235}U	5 kg or more	Less than 5 kg but more than 1 kg 10 kg or more	1 kg or less but more than 15 g Less than 10 kg but more than 1 kg 10 kg or more
3. Uranium-233	Unirradiated	2 kg or more	Less than 2 kg but more than 500 g	500 g or less but more than 15 g
4. Irradiated fuel			Depleted or natural uranium, thorium or low-enriched fuel (less than 10% fissile content)	

Radioactive materials emit alpha, beta, gamma, or neutron rays that can penetrate living tissues and cause severe damage. The IAEA categorizes radioactive sources on a scale of 1-5 based on their potential to harm human health (IAEA, 2005). Category 1 sources, such as gamma knives and irradiators, pose the greatest health risks to individuals, even with a brief exposure. In contrast, category five sources, such as X-ray fluorescence devices and positron emission tomography (PET) check sources, have a relatively low likelihood of causing harm to the human body.

"Nuclear materials" generally refer to substances containing many fissile materials. The exact definition of this term is outlined in the Amendment to the Convention on the Physical Protection of Nuclear Material, which was adopted in 2005 under the IAEA's auspices. The convention specifies that plutonium, uranium, and thorium can be classified as nuclear material, depending on their isotopic concentration and weight (Table 1) (IAEA, 2021).

To monitor unauthorized activities involving nuclear and radioactive materials that fall outside regulatory control, the IAEA has maintained the ITDB (IAEA, 2023) since 1995. Based on the most recent ITDB dataset, 14 percent of the total incidents

CASE STUDY: MISSING CYLINDERS IN THAILAND AND INDUSTRIAL MISUSE

In March 2023, a metal cylinder containing cesium-137 was reported missing from a coal powerplant in Thailand, prompting a widespread search for the missing material. Law enforcement eventually traced the cylinder to a steel foundry, where it had been processed for smelting. Fortunately, the radiation threat to the public was low.

In 2000, Thailand suffered a previous scrap metal-related R/N incident when two collectors acquired a cobalt-60 source and dismantled it in a scrapyard, hospitalizing 10 people, killing 3, and potentially exposing over 1,800 other people to radiation.

These incidents show how dangerous R/N material can be found in industrial, medical, and agricultural use, increasing the ease with which they can be acquired. These cases also demonstrate that R/N material include a number of elements beyond widely known uranium and plutonium.

recorded from 1993 to 2022 are linked to nuclear materials, while the majority (59 percent) are associated with radioactive materials. The remaining incidents (27 percent) involve radioactively contaminated and other materials. The ITDB is a crucial platform in global efforts to prevent and detect illicit trafficking and other unlawful activities involving nuclear and radioactive materials.

3.4 CURRENT SMUGGLING TACTICS

The smuggling of R/N material across borders is a pervasive threat that requires diligent detection and deterrence efforts. Smugglers utilize various methods to conceal the materials, including hiding them in vehicles or personal luggage or walking them across lightly protected borders. As detection and deterrence capabilities improve, smugglers develop new techniques to circumvent them.

One common tactic is to shield R/N material with heavy metals like lead, which absorb the emitted radiation and mask the material from detectors. For instance, a 2021 report in *Homeland Security Affairs* estimated the effectiveness of detectors based on source terms and shielding conditions (Thompson, 2021). The research revealed that the detection effectiveness for shielded large radioactive sources is 50 percent, while shielded uranium's detection effectiveness is only 20 percent. Additionally, smugglers may hide R/N material among piles of intrinsically radioactive materials, such as bricks and cat litter. Although the radiation dose from bricks is generally low, the presence of other radioactive materials increases the risk of concealment.

These tactics underscore the urgent need for advanced detector systems and border monitoring strategies.

3.5 SUITABILITY OF OTHER ILLICIT TRADES AS PROXIES FOR R/N SMUGGLING

Certain characteristics of R/N material make it uniquely challenging to smuggle. These include its chemical volatility, its detectability from a distance using appropriate technologies, and the potential health consequences of radiation exposure. Commonly-trafficked goods like ivory and antiquities do not pose these same difficulties. Regulatory loopholes may allow smugglers to claim plausible deniability for possessing ivory, antiquities, and certain drugs in specific jurisdictions. In contrast, the movement of R/N material is highly regulated, if not illegal, with few exploitable exceptions (VERTIC, 2012).

Thus, smuggling R/N material may require different techniques and greater risk tolerance by criminal organizations than trafficking “proxy” goods. Nonetheless, there are advantages to understanding other illicit flows. This can help us to assess a region’s general threat environment, including regulatory and law enforcement strengths and weaknesses, as well as to identify actors that may have the connections and risk tolerance to move R/N material. Finally, understanding the broader illicit trade landscape clarifies the priorities of law enforcement agencies and how much, if any, bandwidth they have to address low-occurrence R/N material smuggling. Aligning R/N interdiction recommendations with existing initiatives to address the trafficking of proxy goods may yield better uptake by capacity-strained local authorities.

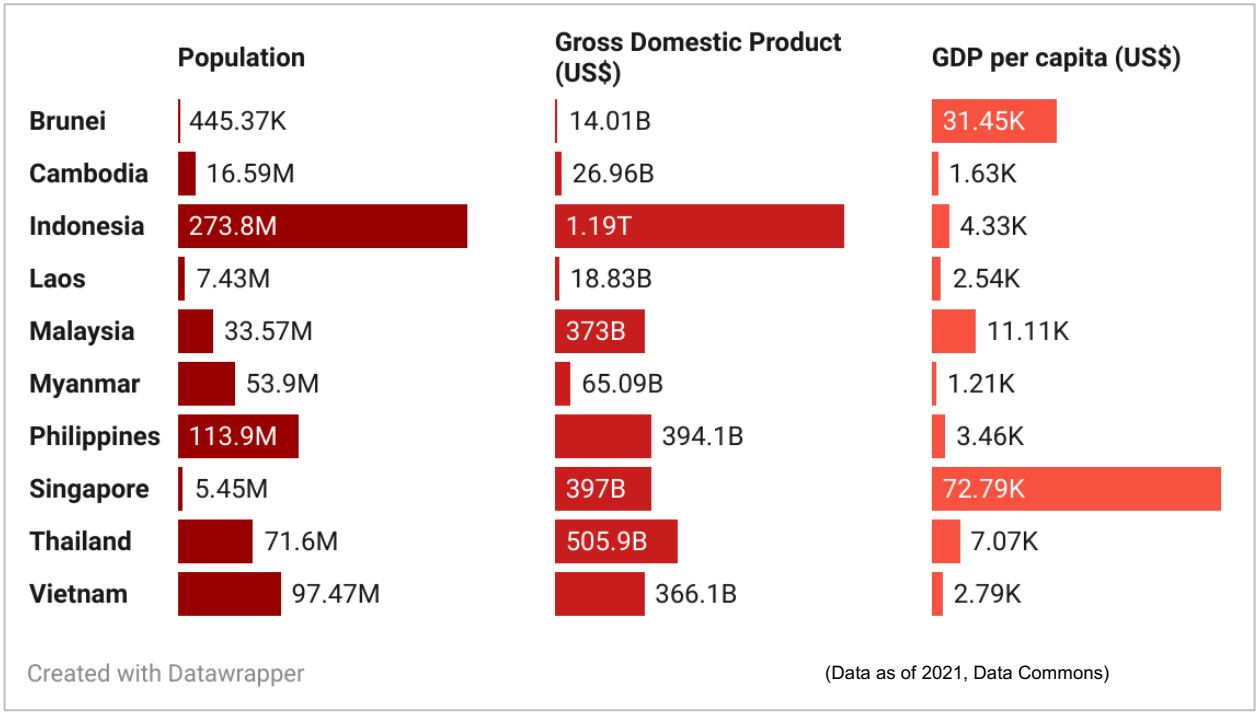
4. SOUTHEAST ASIA REGION

4.1 REGIONAL OVERVIEW

ASEAN REGIONAL DEVELOPMENT

The Association of Southeast Asian Nations (ASEAN) is Southeast Asia's primary vehicle for regional economic development and security cooperation. Since its establishment in 1967, the ASEAN regional group has seen consistent upward trends in development measures. The bloc has a population of over 662 million people with an overall gross domestic product (GDP) of $3.2 trillion USD. A 2021 report by the East-West Center projects an annual growth rate of 5.5 percent per year. The ASEAN Economic Community (AEC), which is tasked with the bloc's goal of economic integration, envisions the ASEAN member states as "a single market and product base…fully integrated into the global economy." The region has significant potential, but there are many challenges to continued development.

Although ASEAN is often treated as a monolith, there remain major inequalities amongst the ten member states. ASEAN is home to some of the world's most developed nation-states, like Singapore, and underdeveloped nations, such as Myanmar. The chart below provides information about each member state to illustrate some of the major gaps between nations.



Despite economic inequalities amongst member states, ASEAN is one of the world's fastest-developing regions. High levels of development introduce complexities into detecting and deterring the movement of illicit goods, especially R/N material. Growing infrastructure is accompanied by an increase in mundane sources of R/N material. Bricks, ceramics, medical imaging equipment, agricultural equipment, and other materials that have radioactive components and emit small amounts of radioactivity are entering the region in increasing amounts. Most of these materials do not pose a threat on their own. However, nefarious actors may use them to disguise highly enriched uranium (HEU) or other, more dangerous weapons-use isotopes. Additionally, in large enough amounts, they may be used to construct dirty bombs. Already, the region has seen at least one instance of an Indonesia-based terror organization attempting to construct a dirty bomb. The greater the amount of R/N material in a region, the greater the threat of smuggling.

NUCLEAR ENERGY

Many countries view nuclear energy capability as a major step in economic development, and ASEAN countries are no different. Indonesia, Thailand, The Philippines, and Vietnam are poised to develop their capacities in the coming years, and estimates predict nuclear energy facilities will be operational in Southeast Asia by 2030 (World Nuclear Association, 2023). Following the overall economic development patterns, additional nuclear material for peaceful purposes must be secured through effective nuclear and radioactive security measures.

ILLICIT GOODS SMUGGLING

Southeast Asia is a hub for illicit trade. Goods that may serve as proxies for R/N smuggling in the region include:

Drugs: Southeast Asia features heavily in the UN's World Drug Report 2022. The region has a "long-established" market for ketamine, and its centrality to global opiate, synthetic NPS, and methamphetamine trading has increased in recent years. In 2021, "the number of methamphetamine tablets seized in East and Southeast Asia exceeded a billion…for the first time (NPR, 2022)." Like other illicit flows, the drug trade flourishes in conflict-prone settings with a poor rule of law. These dynamics are common in Southeast Asia, particularly in regions like the Golden Triangle. The increased spending power of young people in the region facilitates drug trading. ASEAN has a coordinated effort to confront illicit drugs, but traffickers have proven resilient to interdiction efforts.

Conventional Arms: Thailand, Cambodia, and Vietnam are regional focal points for the trafficking of conventional small arms. Historical facilitating factors include Russian arms exports to the region and the glut of weapons created by decades-long instability in Cambodia. Interregional interdiction initiatives are notable; "Cambodia, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam take an active role in international initiatives to curb the proliferation of small arms (GunPolicy.org)."

Wildlife: Trafficking of wildlife products is a high-profit, low-risk business in Southeast Asia. Tourism, poverty, criminal groups, and difficult-to-monitor borders are all facilitating factors in the region. PRC China's proximity has also played a clear role. Following PRC China's 2017 ban on ivory, "Cambodia is becoming a significant commercial hub for ivory" that has often already transited through Thailand or Lao PDR. Trafficking of wildlife products differs from R/N smuggling, however, because there are some legal markets for these goods and because they are status symbols. As a result, buyers likely want to show off these products, whereas purchasers of R/N material presumably wish to keep them hidden.

Timber: Demand from within the region, PRC China, Japan, and the Middle East drives illegal logging in Cambodia and Myanmar. Poor governance, legal loopholes, corruption, and poverty facilitate this trade. Timber trafficking illustrates the challenge of patrolling unclear borders, which may facilitate R/N smuggling. Indeed, "a large proportion of Myanmar's timber exports to PRC China in recent years consisted of illegal overland flows from contested border regions (Idris, 2019)."

Antiquities: Asia ranks first among all regions globally for the illegal excavation of artifacts. Within Southeast Asia, Bangkok, Singapore, and Cambodia are trading hubs for antiquities that eventually end up in wealthy locales like the United States, Europe, and the Persian Gulf. Terrorist and organized crime groups may capitalize on political instability to loot antiquities, and Cambodian and Thai military personnel have previously facilitated the trade. The Islamic State's routing of Middle Eastern artifacts

through Singapore and Thailand, an attempt to obscure their provenance, illustrates Southeast Asia's integration within global smuggling networks. Yet, antiquities trafficking differs from R/N smuggling because "buyers must be able to conspicuously consume their purchases without fear of legal reprisal (Yates, 2021)."

Minerals: Myanmar is a focal point for state-enabled illicit mining of minerals, including jade. This activity—which grew exponentially following the country's 2021 coup—generates radioactive waste. Similarly, the COVID-19 pandemic caused a surge in gold mining in Indonesia. Illegal tin production also occurs on Indonesia's Bangka-Belitung Islands. Potential synergies with R/N smuggling include PRC China's role in driving mineral trafficking within the region.

Oil: As with R/N smuggling, Southeast Asia's geography creates unique risks for oil trafficking. Authorities have limited capacity to surveil the maritime vector, Singapore is the "world's biggest ship refueling port," and Malaysia has vast oil reserves. Smuggling—including illicit fuel transfers –- occurs near Indonesia's Natuna Islands and "in a triangle of sea anchored by Thailand, Vietnam, and Singapore." Organized crime syndicates and nuclear-armed countries are involved in this trade. In 2021, Cambodian officials seized a Singaporean tanker allegedly used to transport petroleum to DPRK. North Korea.

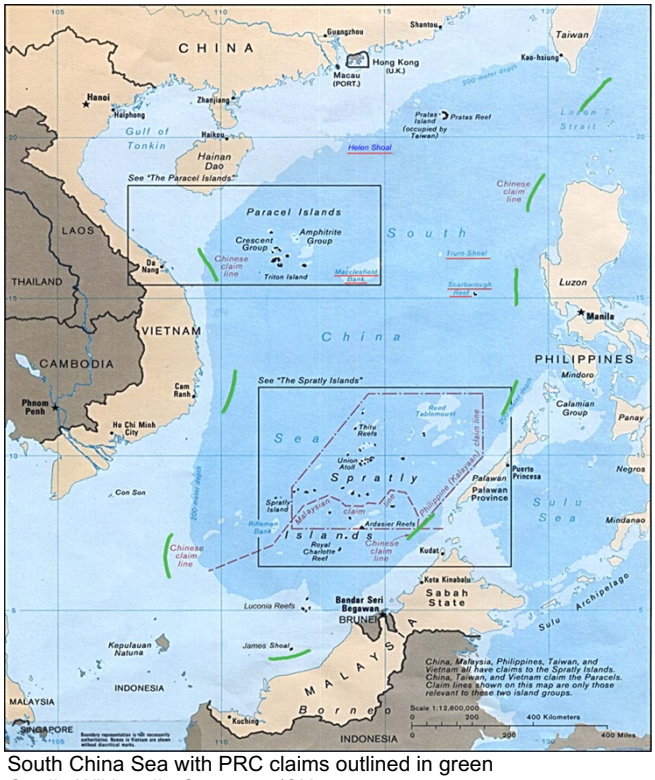
ASEAN GEOPOLITICAL LANDSCAPE

Although ASEAN supports economic globalization and foreign direct investment, the organization has a strong non-interference policy. The region's history of colonization and bloody foreign wars created a core value among the ten member states of not interfering in one another's internal affairs. This value extends to a general distrust of foreign powers who seek to assert their influence over the region. Today, non-interference manifests itself in two major issues: the muted responses of member states to the 2021 military coup in Myanmar and their reactions to U.S.-China competition. ASEAN member states have been reluctant to interfere following Myanmar's 2021 military coup, despite the escalation of violence (Strangio, 2021). In the case of great power competition, ASEAN member states have voiced displeasure at seemingly being forced to pick sides in the U.S.-China influence competition.

Nuclear-armed states geographically surround the ASEAN regional group. However, the bloc adopted the Bangkok Treaty designating Southeast Asia as a "nuclear weapons free" zone (UN). The treaty entered force in 1997, reaffirming the region's commitment to nuclear non-proliferation. Southeast Asian nations are forbidden under the Bangkok Treaty from developing, testing, using, or transporting nuclear weapons. The treaty also limits the use of R/N material for purely peaceful purposes. ASEAN's adherence to this treaty means it is currently unlikely for nuclear weapons proliferation to occur within ASEAN borders, and respect for the Bangkok Treaty may make member states amenable to cooperation with NSDD to detect R/N material smuggling.

While nation-state weapons proliferation is illegal under the Bangkok Treaty, that does not mean the region is free of illicit movement and use of R/N material. Given the archipelagic nature of many of the ASEAN member states, a substantial amount of ungoverned maritime space complicates jurisdictional authorities for smuggling interdiction operations. Parts of the South China Sea are actively disputed between Brunei Darussalam, China, Malaysia, the Philippines, and Vietnam (Pesek, 2017).

Research suggests that maritime border disputes affect the likelihood of piracy and the smuggling of goods (Phayal et al., 2022). "Target rich" areas such as shipping lanes are accompanied by heightened law enforcement and border security, but disputed waters often have a lesser law enforcement presence. When maritime boundaries are ambiguous, clashes over jurisdiction could spiral into conflict. To prevent potential conflicts, law enforcement presence decreases and creates an opportunity space for maritime criminals. In addition to disputed waters, Southeast Asia is home to tens of thousands of islands. Indonesia alone comprises over 18,000 islands and islets, most of which are uninhabited. The Philippines is an archipelago of over 7,000 islands and islets, and Malaysia has over 800. The sheer number of islands can make these countries difficult to patrol adequately. This, in turn, makes it challenging for authorities to detect and disrupt smuggling operations.



South China Sea with PRC claims outlined in green
Credit: Wikimedia Commons/CIA

REGIONAL INSTABILITY

Border disputes in the South China Sea are not the only sources of regional instability. Islamist militant groups are active in the Philippines and Indonesia (Sumpter et al., 2021). A civil war rages in Myanmar following the 2021 military coup, while Rohingya populations continue to flee the country due to religious persecution. A longstanding insurgency in Southern Thailand has created a porous land border with Malaysia through which illegal goods smuggling has been known to occur (Marshall et al., 2014). Instability spreads authorities thin as resources are prioritized to address these issues rather than detecting R/N material smuggling.

IAEA MEMBERSHIPS AND PROTOCOLS

Every ASEAN member state is a member of the IAEA and has signed the Non-Proliferation Treaty (NPT). Additionally, they have signed and ratified Comprehensive Safeguard Agreements, which allow the IAEA to monitor declared nuclear material within a state's jurisdiction to ensure the safety of material use and storage safety. The Member States have each signed either an Additional Protocol (AP) or a Small Quantities Protocol (SQP). An AP allows the IAEA to monitor, investigate and draw conclusions on both declared and undeclared nuclear material, while SQPs are for states that have minimal or no nuclear material to declare. If states with an SQP possess a small amount of nuclear material, this material cannot reside in a facility.

From 2015-2021, the IAEA concluded that no diversion of declared nuclear material in any ASEAN country. For those states with an additional protocol, the IAEA found no diversion of undeclared nuclear material for those states with an additional protocol. (IAEA, 2015; IAEA, 2016; IAEA, 2017; IAEA, 2018; IAEA, 2019; IAEA, 2020; IAEA, 2021).

The IAEA also facilitates on-the-ground nuclear detection programming in Southeast Asia through its Tool for Radiation Alarm and Commodity Evaluation (TRACE) mobile application. The TRACE was launched in 2017 and is designed to address "false flag incidents" in detection. Customs officials use the application to determine whether radiation portal monitors (RPMs) detected concealed R/N material or naturally-occurring radiation found in materials such as ceramics and soybeans. While much of the app is publicly available, customs officials have additional access to data about the expected radiation levels in shipments of various goods.

PROXIMITY TO AND RELATIONS WITH NUCLEAR COUNTRIES IN SOUTHEAST ASIA

The Treaty on the Non-Proliferation of Nuclear Weapons (NPT), a significant international agreement since 1970, aims to prevent the spread of nuclear weapons and facilitate disarmament. However, India, Pakistan, and the DPRK remain outside the treaty's framework (Preeze et al., 2003). Their proximity to the Southeast Asia region, coupled with close relationships, political and social situations, and previous instances, indicate a high risk of these countries provoking nuclear and R/N material smuggling in Southeast Asia.

The DPRK, known for its secretive and aggressive behavior, is believed to have smuggled nuclear weapons or materials from former Soviet Union countries during the 1990s. Moreover, the DPRK is suspected of engaging in ongoing trade involving nuclear or radioactive materials and related technologies with other countries or actors. In this context, the commitment of Southeast Asian countries to non-aligned principles, which prioritize sovereignty and non-interference, has increased the likelihood of smuggling activities initiated by the DPRK in the region. Furthermore, the DPRK already has a precedent of providing nuclear technology and resources to other countries. A prime example is the discovery by Israel's intelligence agency, Mossad, that DPRK workers were helping Syria build a nuclear facility (Makovsky, 2012). Victor Cha, CSIS Korea Chair, also stated that he is confident that the DPRK has successfully and consistently provided, stolen, smuggled, and traded with state and non-state actors without being detected (Cha et al., 2023).

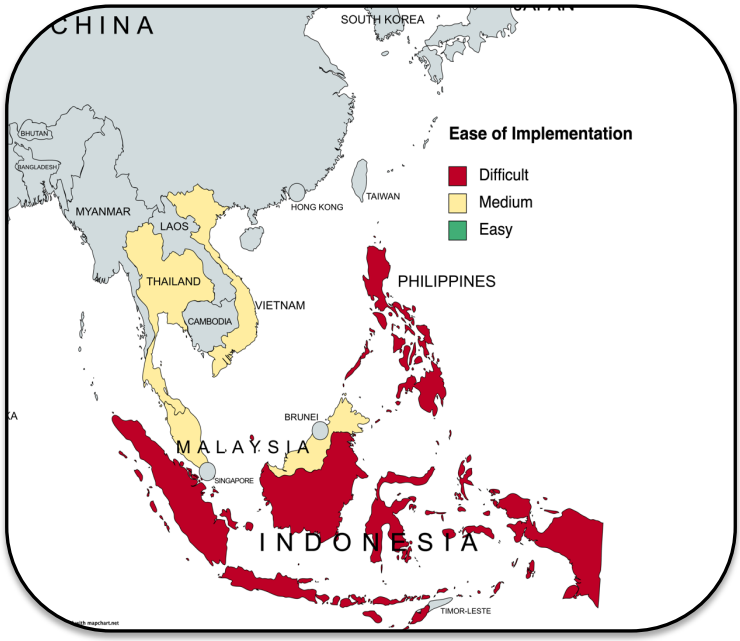
India has conducted nuclear tests in 1974 and 1998 and is now considered a de facto nuclear-armed state (Arms Control Association). Many Indians view nuclear weapons as a tool and symbol of national power, and this perspective has gradually increased over the years. India's historical and cultural connections with Southeast Asia, established through the spread of Hinduism and Buddhism and centuries of trade and maritime links, have fostered trust and familiarity among these nations.

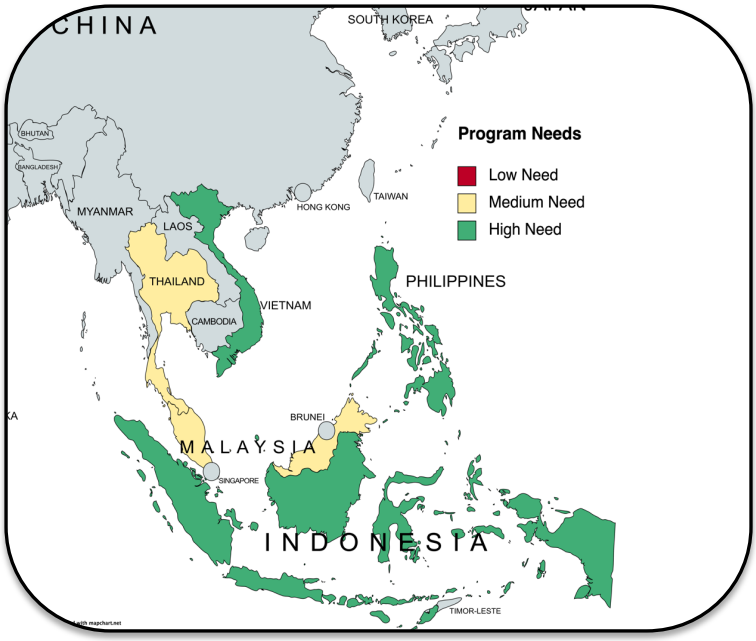
India's nuclear tests directly led to subsequent tests by Pakistan. Since gaining independence from Britain in 1947, India and Pakistan have fought three large-scale wars and experienced numerous military conflicts along their border near the Himalayan mountain range in recent years (Pokraka, 2019). The complex rivalry between India and Pakistan encompasses not only terrorist violence but also territorial disputes based on concepts of national identity. The two countries continue to engage in nuclear competition as a means of mutual deterrence. India and Pakistan seem uninterested in measures to build trust regarding nuclear weapons. Therefore, this ongoing rivalry raises the possibility that nuclear resources or technologies could be leaked or stolen, a risk that cannot be ignored. As such, longstanding security conflicts and the absence of comprehensive solutions to disputes between India and Pakistan, as well as between India and China, contribute to the shaping of nuclear doctrines and proliferation dynamics in the region.

Additionally, Pakistan's ongoing internal security issues, such as military coups and the spread of Islamic extremism, raise concerns about the safety and security of its nuclear weapons and materials, which could be diverted and smuggled to other actors in the region. Extremist groups like Al-Qaeda and the Taliban could potentially overthrow the Pakistani regime or acquire nuclear weapons by infiltrating nuclear facilities. Moreover,

Pakistan has a history of involvement in nuclear technology exchanges, as evidenced by the case of Dr. Abdul Qadeer Khan, who provided nuclear technology to Iran, Libya, and DPRK (Laufer, 2005). Determining whether the underground nuclear smuggling network he organized remains operational is impossible. The extent of the Pakistani government's knowledge of Khan's nuclear dealings remains unclear, but he is still revered as a hero in the country. A 2008 report by the United States Congress' "Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism" stated that the possibility of nuclear terrorism could become unprecedentedly high in the next five years.

4.2 ANALYTICAL FRAMEWORK





This flexible analytical framework consists of six title categories that indicate the climate for NSDD programs in five Southeast Asian countries that the team identified collaboratively with the client. These title categories are "Geography," "Sources," "Economic/Human Development," "Indicators of R/N Smuggling," "Programs and Current Participation," and "Institutional Capacity." The framework also contains subcategories that fall under each title category. Each of these subcategories represents an important consideration that can impact R/N material smuggling and/or change the way NSDD interacts with each selected country in regards to nuclear smuggling detection and deterrence.

The team researched each subcategory for the selected countries. After this data was gathered, the subcategories were analyzed through two different lenses deemed important for NSDD to consider when approaching the Southeast Asia Region: Ease of Implementation and Program Needs. After each category was analyzed, it was given a color ranking, as outlined in the key below. When determining the overall color ranking of the title category, the subcategories were weighed to consider the impact within Ease of Implementation or Program Needs lens. The color ranking of each title category then determined the overall color ranking for the selected country under Ease of Implementation and Program Needs.

Ultimately, this analytical framework indicates where implementing NSDD programs would be easiest and most difficult, as well as where program needs are highest and lowest, in Southeast Asia. However, there are caveats to this analysis. For example, there is limited open-source information about some categories, and the

framework follows a quasi-quantitative–rather than fully quantitative–approach. In addition, while objective metrics were utilized when possible, weights assigned to them are inherently subjective. There is no unit of risk that can be used to definitively compare these metrics, as they all contribute to the potential for R/N smuggling in different ways. As such, the final color rankings of countries may seem more decisive than they are. While this report makes tentative conclusions as to prioritization, NSDD analysts working with this framework should start from the ground up with their own expertise.

Color Scale	Ease of Implementation	Programmatic Needs
Green	Easy	High Need
Yellow	Medium	Medium Need
Red	Hard	Low Need
Blue	Not Relevant/No Causation	
Grey	Insufficient Data	

Ease of Implementation						
Indonesia	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
Malaysia	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Program and Current Participation	Institutional Capacity
The Philippines	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
Thailand	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
Vietnam	Geography	Source	Economic/Human Development	Indicators of R/N Smuggling	Program and Current Participation	Institutional Capacity

Program Needs						
Indonesia	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
Malaysia	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
The Philippines	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
Thailand	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity
Vietnam	Geography	Sources	Economic/Human Development	Indicators of R/N Smuggling	Programs and Current Participation	Institutional Capacity

4.3 BREAKDOWN OF ANALYTICAL CATEGORIES

4.3.1 GEOGRAPHY

Land Borders

Length: Measuring the length of shared borders with neighboring countries helps to understand the scale of potential smuggling activity and allocate resources accordingly for more effective monitoring and control.

Terrain/Geographical Challenges: Evaluating terrain and geographical challenges in each country, such as dense forests, mountains, and remote areas, allows authorities to develop targeted strategies and deploy specialized personnel and equipment to address unique smuggling threats in different environments, considering the region's natural complexity.

Air Borders

International Airports: Assessing the number of international airports in Southeast Asian countries is important for estimating the resources needed to monitor and control potential smuggling activities effectively. The region's strategic location and global connectivity necessitate comprehensive strategies for monitoring and screening passengers and cargo and coordinating with international partners to share intelligence on potential smuggling threats.

Domestic Airports: Evaluating the number of domestic airports in Southeast Asia allows authorities to understand the potential for smuggling networks to exploit smaller airports within the region's diverse and rapidly growing economies. This helps design more comprehensive surveillance strategies and allocate appropriate resources for effective control of smuggling activities.

Geographical Complexities: Assessing the geographical complexities, such as vast land areas, high numbers of islands, dispersed population centers, and logistical challenges of air border surveillance and control, which can impact the efficiency and effectiveness of detecting illegal smuggling activities within the region.

Air Traffic Density: Understanding the air traffic density enables authorities to grasp the difficulty of singling out and monitoring specific flights that may be involved in smuggling activities amid the region's vibrant economic growth and increasing global interconnectedness.

Sea Borders

Total Maritime Area (Exclusive Economic Zones (EEZ)): Measuring the total maritime area, including Exclusive Economic Zones (EEZ), helps authorities understand the vast expanse they need to patrol and control. The region's extensive coastlines and numerous islands make it crucial to allocate resources, personnel, and equipment accordingly to effectively detect and intercept smuggling activities.

Miles of Coastline: Evaluating the miles of coastline allows authorities to identify potential smuggling entry points and develop targeted strategies for patrolling, surveillance, and interdiction along the coast, considering the region's intricate maritime geography and dense coastal populations.

Number of Islands: Assessing the number of islands in the region helps understanding the challenges in monitoring and controlling smuggling activities in the region's archipelagic nations. A higher number of islands increases the complexity of maritime surveillance and may require more advanced technology and coordination to effectively counter smuggling threats.

CASE STUDY: SEIGE OF MARAWI AND GEOGRAPHY CHALLENGES

Over the course of five months in 2017 in the Philippines, Marawi was the site of fierce fighting between occupying ISIS fighters and the armed forces of the Philippines. Among ISIS forces were up to 100 fighters from abroad, principally Malaysia and Indonesia. Over 200,000 people evacuated the city, and government efforts to rehabilitate the city continue to this day.

This incident highlights the serious struggle against Salafi jihadist terrorism taking place in maritime Southeast Asia, and how these fighters are empowered by trafficking routes and ease of undetected movement between these island nations. Reporting has focused on routes from North Sulawesi in Indonesia, through the Sangihe and Talaud islands and across the Celebes Sea, and from Sabah in Malaysian Borneo, across island chains bounding the Sulu Sea. Maritime space provides opportunities for criminal activity due to logistical difficulties of patrolling large numbers of islands across several countries.

4.3.2 SOURCES

This particular category pertains to the evaluation of domestic inventory and the possible transboundary movement of R/N material. The extent of R/N material in circulation directly corresponds to the level of risk associated with illicit smuggling operations. The category is further subdivided into four distinct subcategories.

Nuclear Program: The presence of enriched nuclear materials within a country can be inferred from its established national nuclear programs, which may include the development of enrichment facilities, research reactors, or nuclear power plants. Such materials can potentially be weaponized into improvised nuclear devices if smuggled out of these facilities.

Use of Radioactive Material: In countries where the level of medical or industrial treatment involves the use of hazardous radioactive materials, the risk of smugglers stealing these materials and creating lethal devices such as dirty bombs or REDs increases if proper protection and handling measures are not in place.

Trading Activities with States of Concern: Some neighboring countries of Southeast Asia, namely India, Pakistan, China, and North Korea, are capable of enriching nuclear materials and creating nuclear warheads. Trading activities with these countries can be associated with the risk of transboundary smuggling of R/N material.

Spatial Proximity with States of Concern: In addition to the trading activities, territorial connection with the states of concern can also be an indicator of potential transboundary R/N smuggling incidents.

4.3.3 ECONOMIC/HUMAN DEVELOPMENT

Crimes involving R/N material smuggling exist in every society in respective of its level of economic and human development. This category assesses how well ASEAN countries' economy and human development rates

are. The worse the situation of economic and human development are, the more risk exists in illicit smuggling activities. Four subcategories are as below.

HDI: The Human Development Index (HDI), which ranks countries on their level of human development, is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living (Human Development Reports). Countries with low HDI are at risk of being drawn to illegal activities.

Drug-Use Rate: Drugs are one of the major proxy goods in Southeast Asia, and countries with high drug-use rates are prone to criminals and terrorists conducting other illegal trades. Prevalence of Drug Use as a Percentage in the General Population in 2019 (excluding new psychoactive substances) is reported by UNODC.

GDP: GDP, a standard measure of the value added created through the production of goods and services in a country during a certain period, is the most important indicator to capture economic activity.

Industry and Economic Development: A country's level of economic development cannot be only measured by its GDP. Each country has a different industry structure and trend of economic development, and it is necessary to look through in order to analyze its economic growth.

4.3.4 INDICATORS OF R/N SMUGGLING

This category contains more direct measurements of R/N smuggling, from presence of actors likely to be engaged in it, to frequency of trafficking broadly, to actual seizures of R/N material. This category strongly influences determination of Program Need, as states which struggle most with these issues are likely to present the strongest opportunity for R/N traffickers. Conversely, its influence on Ease of Implementation varies; while higher rates of criminality and terrorist activity poses challenges for local law enforcement, it is not always clear (working with open-source material) what threat patterns would create the most challenge for NSDD officers.

Presence of Terrorist/Extremist Groups: The number of terrorist or extremist groups, their interest in acquiring R/N material or facilitation of its trafficking, their transnational ties and their territorial influence are all factors which have a direct influence on the likelihood of R/N trafficking in a state. Indeed, multiple extremist groups, including Aum Shinrikyo in Japan, have allegedly sought to develop nuclear weapons (Gunaratna, 2018). Southeast Asia is home to multiple Islamist extremist groups which have claimed interest in developing an R/N weapon, most commonly in the form of a dirty bomb, including Al-Qaeda-affiliated Jemaah Islamiyah (JI) and ISIS-aligned Jamaah Ansharut Daulah (JAD). Assessments in this subcategory are based on qualitative assessments of the national security situation.

Acts of Terrorism: Rates of terrorist or extremist violence are important measures for a couple of reasons. Higher rates of violence strain the resources of states' security apparatus, and indicate the actual activity and relevance of known groups. Violence can also enable trafficking, or indicate successful trafficking of persons and arms. In addition, the quality of violence matters - groups which restrict themselves to attacking security services with small arms are less likely to pose a direct threat of R/N material use, compared to groups which have expressed interest in or actually attempted construction of an R/N weapon. This subcategory examines patterns of terrorist violence in the country over the last 10 - 20 years, in numbers and tactics. U.S. Dept of State Country Reports on Terrorism and IEP Global Terrorism Index are primary sources, augmented where necessary by news reporting.

R/N Incidents: Reported cases of RN loss, theft, or seizure are the most direct indicators of policy need. The CNS Global Incidents and Trafficking Database is used as a primary source, augmented by news reporting.

Existing Trafficking Routes: Trafficking is a major security issue in Southeast Asia. As such, there is a great deal of reporting and analysis of trafficking of illicit drugs, arms, wildlife, and people in this region. Due to the low incidence and visibility of R/N smuggling, this report makes use of non-R/N trafficking as an indirect measure of program need. This is because trafficking routes are commonly used by various actors, criminal actors can engage in trafficking of different materials opportunistically, and so the presence of trafficking of non-R/N material advantages would-be R/N traffickers. In addition, the number of trafficking routes and the terrain they occupy can pose serious issues for law enforcement, especially in the already difficult task of widespread radiation detection. This subcategory relies on qualitative assessment of trafficking routes passing through the state's borders, and the difficulty posed in securing them.

In the final analysis, this subcategory was not determinative. Each ASEAN country deals with significant smuggling issues across a wide range of goods and routes, and deals with difficult issues of border geography, and from the position of a student researcher, the differences between them are not clear. Thus, this subcategory conveys some information regarding existing border issues, in the hopes that NSDD engagement with the region would work with Department of State partners or (as recommended below) a forward-deployed regional expert to better grasp the unique challenges faced by each country.

Proxy Good Smuggling: This subcategory similarly attempts to measure existent trafficking behavior, here more objectively through recorded seizures of non-R/N illicit goods. UNODC data on seized drugs and wildlife by country is used as a primary source.

4.3.5 PROGRAMS/CURRENT PARTICIPATION:

The "Programs and Current Participation" category analyzes NSDD programs and initiatives that currently exist within each country. It also looks at international treaties and Safeguards Protocols that the countries have ratified. Whether a country has ratified certain relevant international treaties may factor into its willingness to implement NSDD programs and initiatives. The volume of U.S. imports from each country is also analyzed, as the United States has a clear interest in ensuring that its trade partners screen exports to ensure they are free from R/N material. This category also captures whether the Chinese company Nuctech has operations within each country of interest. This generally increases need for NSDD programs, though it may complicate implementation. This category strongly reflects Program Needs as it highlights what countries have gaps or no NSDD programs.

GICNT Participation: The Global Initiative to Combat Nuclear Terrorism (GICNT) is a partnership with 89 country members and six international organizations. Voluntary participation focuses on preventing, detecting, and responding to incidents of nuclear terrorism. The main goal of this multilateral partnership works to strengthen plans, policies and procedures between partnering countries and increase capacity to respond to such terrorist events. The United States and Russia are co-chairs of GICNT. Due to Russia's invasion of Ukraine, all GICNT meetings and activities have been suspended. However, GICNT

participation remains an important metric because it indicates a country's past commitment to countering nuclear terrorism and potential willingness to engage with NSDD on this issue.

Existing NSDD Programs / State of Anti-Smuggling NSDD Infrastructure and Programs: NSDD has a number of initiatives to detect and deter R/N Material smuggling within Southeast Asia. In a government capacity, NSDD has multiple initiatives to detect R/N material at border crossings. These initiatives include the Green Border Security Initiative (GBSI) and The Strategic Airport Initiative and the Maritime Vectors Partnership. In each of these programs, NSDD focuses on providing detection capabilities and investigation capacity to the appropriate officials who work at each of these border types, including border patrol agents, interdiction units, and detection units. Part of these initiatives can also work to build a country's nuclear forensics capabilities to better understand any material that is interdicted. A large part of the capacity in how these programs are implemented is through workshops, exercises, and technical trainings with countries where such programs are implemented (NNSA, 2019).

Nuctech Presence: This analytical category assesses the degree of engagement between Nuctech and the country of interest. Founded in 1997, Nuctech is a Chinese government-affiliated company that bills itself as a "globally advanced provider of security inspection products and solutions" to more than 170 countries. These include Southeast Asian states. Among other examples of regional engagement, Nuctech has a Thai branch and provided tools including vehicle scanning equipment at the 2018 Asian Games in Indonesia.

In recent years, Nuctech's efforts to expand into the Mexican and European markets have elicited concerns from U.S. and European Union officials. A 2020 Department of Homeland Security (DHS) briefing warned that the company "very likely has a close and enduring relationship with the Chinese Government," which could enable Beijing to exploit Nuctech detection equipment (DHS, 2020). DHS also alleged the company's tools may compromise citizens' privacy and that Nuctech is involved in "illegal business practices…to gain an unfair market advantage (DHS, 2020)." The Department of State has similarly said that Nuctech prices its equipment below market value to aggressively "grab significant market share (O'Keeffe et al., 2020)." Taiwan and Namibia have also identified instances of corruption by Nuctech personnel.

Exports to the United States: This analytical category considers how much Southeast Asian countries export to the United States. This is relevant to NSDD's programmatic planning because the United States has a clear interest in ensuring that its imports do not contain R/N material. Therefore, it should prioritize engagement with Southeast Asian countries that have larger exports to the United States. Overall, the United States has strong economic ties to ASEAN; trade between them amounted to $441.7 billion in 2021 (DOS, 2022).

Engagement with UN/IAEA on R/N Smuggling: As analyzed above in section 4.1.5, the IAEA has a significant presence in Southeast Asia. This analytical category assesses IAEA engagement with the country of interest by determining whether the country is a party to the IAEA Safeguards Additional Protocols and/or a party to the Treaty on the Prohibition of Nuclear Weapons.

History of NSDD-Law Enforcement Cooperation: In 2019, NSDD began working with Internal Security and Law Enforcement (ISLE) to build capacity in R/N detection and response. The primary goal of this initiative is to create a whole government approach to nuclear material detection and deterrence. ISLE allows for mobile detection in urban areas and major known routes and infrastructure Interdiction

and/or law enforcement teams are equipped with modular mobile detection units as well as traditional detection tools to increase likelihood of interdiction. The introduction of this new equipment also includes training modules and additional operational needs support (NSDD).

4.3.6 INSTITUTIONAL CAPACITY

The Institutional Capacity category assesses countries based on strengths, weaknesses, and vulnerabilities of governments and institutions. Some metrics, such as regime type and government turnover rate have unknown influences on proclivity for R/N smuggling. Presence of institutional corruption does not necessarily hinder efforts to work bilaterally with governments. Local law enforcement and border patrol capacities, and relationships with international partners appear to be more significant indicators of a nation's vulnerability to smuggling incidents and their ability for interdiction and deterrence.

Regime type: Regime type has two primary influences over work in the realm of R/N smuggling. First, different government structures have different decision-making processes and speed of action. Research indicates that authoritarian structures are more conducive to quick action than democratic structures that rely on consensus building. Second, it should be considered if democratic systems or authoritarian systems in the region respond to U.S. activities differently. Analysis at this time could not definitely determine whether regime types had positive or negative effects on smuggling, however the category remains in the framework to account for information

Government turnover: Government turnover can affect the continuity of programs and initiatives. Whether leaders frequently appoint and remove officials, or countries have regular elections that result in widespread turnover of government officials, the ability of a government to continue existing programs and initiatives influences how easily NSDD might be able to work as a partner.

Institutional corruption: Institutional corruption is present in many ASEAN member states, with most members possessing corruption indices above the global average. The presence of corruption does not necessarily indicate higher difficulty for NSDD to cooperate with governments, however it does contribute to a country's vulnerability to smuggling and illegal activity. Corruption among local officials and law enforcement can contribute to the proliferation of illegal activity within a country's borders.

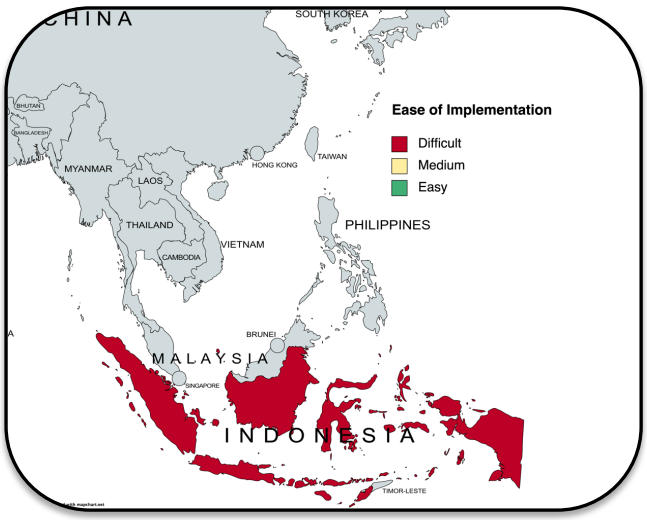
Law Enforcement/Border Security: The Law Enforcement and Border Security assessment indicates the capabilities of these agencies and their ability to interdict illegal activity and potential R/N smuggling activity. Counterterror operations can run across a number of law enforcement agencies and military affairs. Countries considered most likely to be able to interdict R/N material will have responsibilities for counterterror and WMD operations clearly delineated amongst its national security structure.

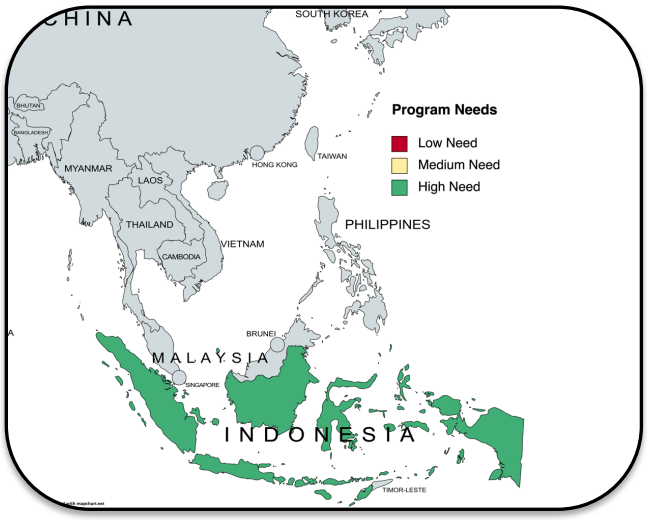
Capacity for Disruption of Smuggling Routes: In evaluating a country's ability to detect and deter nuclear smuggling, demonstrated capacity for disrupting existing smuggling routes can be an indicator of a country's ability to add R/N detection to their mission scope.

Relationships with International Organizations and Other Partners: Demonstrated cooperation with international organizations and other partners, particularly on issues concerning counterterror and smuggling detection, may indicate a greater willingness to cooperate in NSDD programs. For countries

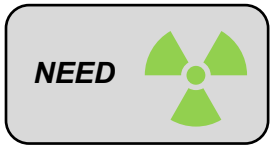
that are difficult to reach bilaterally, cooperation with international organizations may provide trusted alternative paths for NSDD outreach.

4.4 INDONESIA





4.4.1 GEOGRAPHY



Despite Indonesia's geographical complexities, with extensive land and sea borders, diverse terrain, and a large number of airports, it falls into the 'green' level. This is due to the high need for programs across the country, which balances out implementation challenges. The archipelago's geography, while vast and diverse, does not present insurmountable obstacles to effective program deployment.

Land Borders (Ease of Implementation / Program Needs)

- Length: 2,830 miles (4,555 km)
- Terrain/Geographical Challenges: Dense forests, mountain terrain, remote areas + shared borders with Malaysia and Papua New Guinea

Air Borders (Ease of Implementation / Program Needs)

- International Airports: 29
- Domestic Airports: 200
- Geographical Complexities: As an archipelago consisting of more than 17,000 islands, Indonesia's air borders span a vast and diverse geographic area.
- Air Traffic Density: High (regional transportation hubs and popular tourist destinations)

Sea Borders (Ease of Implementation / Program Needs)

- Total Maritime Area (Exclusive Economic Zones (EEZ)): 2.3 million square miles (6 million square kms)
- Miles of Coastline: 54,716 miles (88,000 km)
- Number of Islands: 17,580 islands (6,000 are inhabited)

4.4.2 SOURCES AND SUBCATEGORY METHODOLOGY EXPLANATION

Based on the presence of several nuclear facilities in Indonesia, as well as their demonstrated capacity to handle nuclear materials, and their expressed ambition to develop a nuclear power plant in order to further their environmental objectives, it can be concluded that the Program Needs for Indonesia are categorized as "green". It should be noted, however, that despite the relatively low level of immediate threat, there exists a steady stream of commercial goods containing metals that traverse the borders between Indonesia and the States of Concern.

Nuclear Program (Ease of Implementation / Program Needs)

- The country has 3 research reactors and 1 fuel fabrication facility, but no nuclear power plant exists.
- The government announced a plan to develop nuclear power plants by 2039.

Use of Radioactive Materials (Ease of Implementation / Program Needs)

- Radioactive sources do exist in the country, and the government tracks and regulates them.
- No further detailed data on existing sources are available.

Trading Activities (Ease of Implementation / Program Needs)

- China is the 1st largest country from which Indonesia imports goods. (31 of total imports) Import goods include machinery, mechanical appliances, and parts; electrical machinery and electronics; iron and steel.
- India is the 6th largest country from which Indonesia imports goods. (4 % of total imports) Import goods include refined petroleum, raw sugar, and semi-finished iron.
- Given the bulk amount of ongoing transboundary movement of goods with the states of concern, Indonesia needs capacity building for the detection, but it is difficult to scan all trading goods.

Spatial Proximity (Ease of Implementation / Program Needs)

- No land borders are shared with the states of concern.
- The South China Sea separates the sea route.
- Indonesia and the States of Concern are geographically well separated, which indicates the low need for NSDD intervention. And this fact has no influence on the ease of NSDD program implementation.

4.4.3 ECONOMIC/HUMAN DEVELOPMENT AND SUBCATEGORY METHODOLOGY EXPLANATION

Though Indonesia's economy is getting better after the covid pandemic and the Drug-Use Rate is not that high, both its GDP and HDI are low, which could trigger a high potential of illegal smuggling. Therefore, we overall assume that the level of ease of implementation is hard while the level of program needs is high.

HDI (Ease of Implementation / Program Needs)

- Malaysia's HDI in 2021 was 0.803 which is a high number compared to the world average of 0.732 and its world rank was 62/191.

Drug-Use Rate (Ease of Implementation / Program Needs)

- Indonesia's prevalence percentage of every type of drug (Cannabis: 1.44, Amphetamines: 0.60, Ecstasy: 0.37, Cocaine: 0.03, opiates: 0.07) was lower than global estimates from 2020.

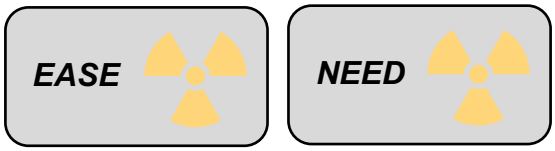
GDP (Ease of Implementation / Program Needs)

- Indonesia's GDP per capita in 2021 was $4,332.7 which is a low relative to the global average of $12,236.60.

Industry and Economic Development (Ease of Implementation / Program Needs)

- Employment conditions improved and domestic demand expanded due to deregulation to curb COVID-19, service exports recovered due to deregulation of immigration, and exports of goods (especially electrical and electronic products) also maintained solidity. Although the pace of growth will slow down due to the global economic slowdown, exports will remain strong and tourism will recover due to easing immigration

4.4.4 INDICATORS OF R/N SMUGGLING AND SUBCATEGORY METHODOLOGY EXPLANATION



Indonesia falls in the middle of the distribution of smuggling activity detected here. Given its spread out and complicated geography, and reported issues with corruption and overlapping jurisdictions between its multiple maritime law enforcement agencies, it is likely that this measure underestimates the amount of smuggling taking place in Indonesia, though the magnitude of this error is unclear. It is also in the center of the distribution of terrorist activity, existing in a network it shares with Malaysia and the Philippines. These difficulties complicate implementation of law enforcement response to smuggling.

There is a significant argument to be made that Indonesia should be rated higher in terms of program need, given that its list of R/N incidents includes an ill-fated attempt to construct a radiological dispersal device; this nexus of verified R/N trafficking and terrorist activity has not been as clearly demonstrated in other ASEAN states analyzed. However, it should be noted that the attempt to transform thorium-232 into uranium-233 using microwaves or X-ray machines could not have succeeded to begin with. Ultimately, Indonesia's ratings in the R/N Seizures and Losses subcategory does not outweigh its middle-of-the-pack status overall. Future reports may decide to weigh these categories differently based on NSDD information and expertise.

CASE STUDY: INDONESIAN TERRORIST "DIRTY BOMB" PLOT

In 2017, Indonesian authorities arrest five individuals in Bandung, West Java who faced charges of planning to convert thorium-232 into uranium-233, following the instructions of an ISIS manual which erroneously claimed this could be possible through microwaves and X-Ray machines.

While the faulty science means the plan could never have succeeded, it is a notable instance of R/N terrorism in Southeast Asia. This case highlights the presence of extremist actors in the region who harbor intention to acquire and use radiological or nuclear weapons. While reporting has not disclosed from where and how the individuals came to possess the thorium, the incident serves as a reminder that dangerous actors can acquire R/N material, whether sourced from commercial uses or trafficking activity.

Presence of Terrorist/Extremist Groups: (Ease of Implementation / Program Needs)

- Indonesia is home to a range of local insurgents and native radical jihadist groups with transnational ties. Organizations of note include the ISIS-affiliated Mujahidin Indonesia Timur (MIT), Jamaah Ansharut Daulah (JAD) and the Al-Qaeda-affiliated Jemaah Islamiyah (JI).Transit of Indonesian fighters to the Battle of Marawi in the Philippines, using probable arms-trafficking routes across the Celebes Sea, demonstrates transnational ties.

Acts of Terrorism (Ease of Implementation / Program Need)

- Indonesia continues to experience regular acts of Salafi jihadist-inspired terror.
- As of 2022, Indonesia scores a 5.502 on the Global Terrorism Index, with a ten-year average score of 5.18, a ten-year high of 5.85 in 2018 and a low of 4.69 in 2014. It is ranked 24th out of all countries.
    - At least one of these incidents has involved a plot to create an RN weapon, foiled in 2017 (see **R/N Material Seizures or Losses** for details).

R/N Material Seizures or Losses (Ease of Implementation / Program Needs)

- CNS data: 1 incident.
    - 2020: Residential area vacant lot emitting high levels of radiation - investigation turns up cesium-137 fragments. Two individuals, one of whom was formerly employed by the National Nuclear Energy Agency (BATAM) had used the site as a dump.
- Other sources:
    - 2017: Five men are arrested in possession of thorium-232, which they planned to convert into uranium-233 using microwaves on the guidance of an ISIS manual, for the purposes of constructing a “dirty bomb.”

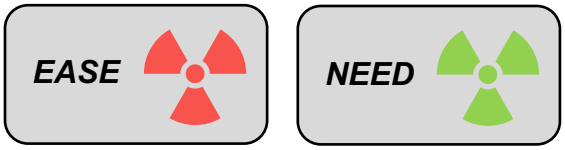
Existing Trafficking Routes (Ease of Implementation / Program Needs)

- Indonesia is surrounded by and home to a number of trafficking routes. In particular, the Tri-Border Area defined by the Sulu and Celebes Seas between Indonesia, Malaysia, and the Philippines, as well as the Malacca Strait and straits of Singapore, are regions of frequent illicit trafficking. The difficulties these routes pose is compounded by the terrain they tend to traverse. Indonesia is a particularly archipelagic country, and traffickers make use of its great number of under- or unpopulated islands and jungled areas to evade detection.
- Establishing maritime awareness has posed a particular policy challenge for Indonesia, given the far-flung nature of these islands (the Talaud and Sangihe Islands, for instance, are closer to the Philippines than they are to their provincial capital in North Sulawesi). These islands are sometimes home to poorer, sea-reliant communities with long traditions of maritime transport without regard to international borders.

Proxy Good Smuggling (Ease of Implementation / Program Needs)

- In 2020, the UNODC reported that 313 people were detected being smuggled through Indonesia.
- In 2020, the UNODC reported that 7.91 tons of amphetamines, 53.57 tons of cannabis, and 313 individuals were found being trafficked through Indonesia.

4.4.5 PROGRAMS/CURRENT PARTICIPATION AND SUBCATEGORY METHODOLOGY EXPLANATION



Indonesia has been coded red for Ease of Implementation because it has yet to take important steps to deter smuggling of R/N material. Indonesia has no existing programs with NSDD, however, they have implemented Nuctech equipment. Indonesia has not signed and/or ratified important treaties that speaks to the importance of detecting R/N Material smuggling. Due to these factors, it has been labeled green for Program Needs.

GICNT Participation (Ease of Implementation/ Program Needs)

- Indonesia is not a participant in GICNT. They have not taken this step to show their desire to combat nuclear terrorism, potentially making them less willing to work with NSDD.

Existing NSDD Programs (Ease of Implementation/ Program Needs)

- NSDD currently has no programmatic relationship with NSDD, making implementation of new programs more challenging as NSDD would have to work to build a programmatic relationship.

Nuctech Presence (Ease of Implementation/ Program Needs)

- Indonesia has already begun using Nuctech equipment This could make it more of a challenge for Indonesia to also be willing to fund NSDD programs.

Exports to the United States (Ease of Implementation/ Program Needs)

- Indonesia exports $26.2 billion of goods annually to the United States. This does not affect the ease of NSDD program implementation.

Party to the IAEA Additional. Protocols (Ease of Implementation/ Program Needs)

- Indonesia has a Comprehensive Safeguards Agreement and a Small Quantities Protocol and in the past six years there has been no discovered diversion of declared or undeclared nuclear material.

Party to the Treaty on the Prohibition of Nuclear Weapons (Ease of Implementation/ Program Needs)

- Indonesia has signed, but not ratified, this treaty.

History of NSDD-ISLE Law Enforcement Cooperation (Ease of Implementation/ Program Needs)

- There is currently insufficient data regarding NSDD participation with Indonesian law enforcement.

4.4.6 INSTITUTIONAL CAPACITY AND SUBCATEGORY METHODOLOGY EXPLANATION

Indonesia presents a major implementation challenge for NSDD projects (red), however it also has extremely high program needs (green). NSDD currently lacks presence in Indonesia, and according to expert interviews, it is difficult to establish relationships with law enforcement as there seems to be a lack of coordination

and delineation of responsibilities over R/N smuggling cases. Indonesia's geography puts Jakarta at great distances from many of the country's islands, which further complicates the ability for the government to organize and respond to smuggling threats. Widespread governmental corruption may or may not hinder efforts to establish working relationships with local security and law enforcement; the link between corruption and ability for NSDD to implement programs is unclear in this analysis.

Regime type: (Ease of Implementation / Program Needs)

- Indonesia is a transitioning democratic republic with overall democratic gains since the fall of the Suharto regime in 1998, but some deterioration has occurred in the last few years
- The effects of regime type on the ability for NSDD to operate is unclear at the time of this analysis, but remains in the framework as a potentially useful analytical tool.

Recent Government Leadership Changes/Government Turnover Rate (Ease of Implementation / Program Needs)

- Indonesians go to the polls for elected positions at all levels of government every five years. All elections since 1998 have been peaceful transitions of power, therefore Indonesia has predictable leadership changes and turnovers.
- The effects of leadership on the ability for NSDD to operate is unclear at the time of this analysis, but remains in the framework as a potentially useful analytical tool.

Institutional Corruption (Ease of Implementation / Program Needs)

- Indonesia lacks formal organization for political parties and campaign finance; thus politicians seek out sponsorship from oligarchs
- There are few safeguards against corruption. The Corruption Eradication Commission and National Police are rival agencies and no civilian oversight of the military
- Corruption is endemic at every level of government and in every branch mostly in the form of embezzlement, bribery, extortion
- In terms of ease of implementation, it is unclear to what extent corruption in the Indonesian government would affect NSDD's ability to form a cooperative partnership. In terms of program needs, the endemic presence of corruption in government means that criminal actors are more likely to be able to operate without detection or with the ability to bribe their way out of the judicial system. Program needs are high relative to other countries given the potential ease of movement for criminal actors.

Law enforcement, and border security (Ease of Implementation / Program Needs)

- The main security focus is on domestic terrorism, but there is also border security cooperation with INTERPOL. Coordination between stakeholder agencies and law enforcement is unclear.
- Drug trafficking occurs mainly through sea routes, and Indonesia major target of international drug syndicates. Traffickers are often able to bribe their way through the judicial system.

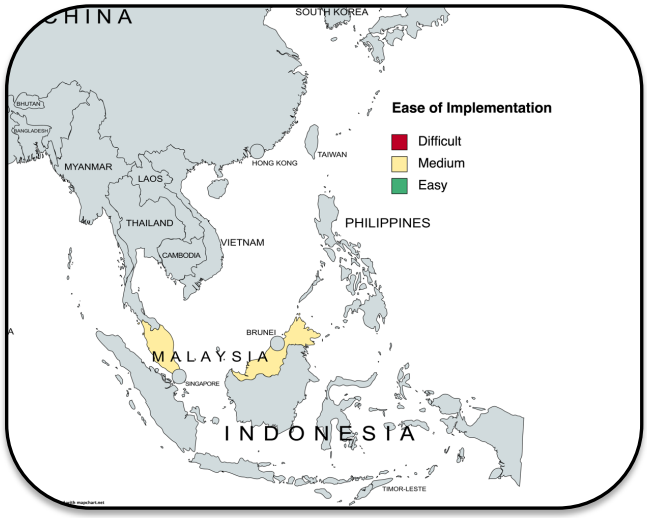
Demonstrated capability to disrupt smuggling routes (Ease of Implementation / Program Needs)

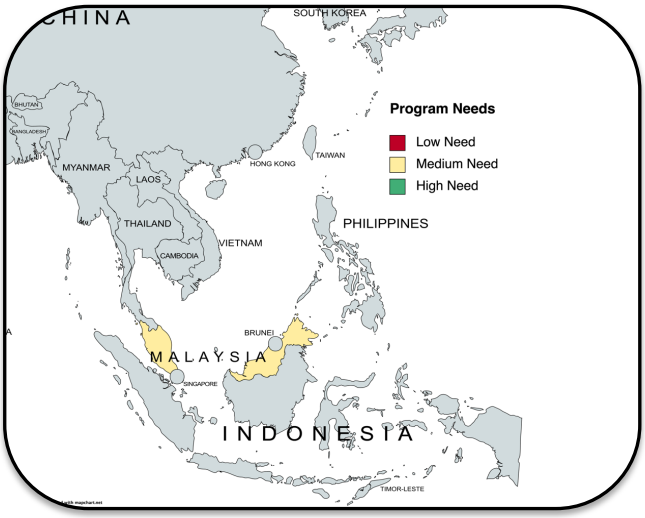
- Some of the current President's more anti-democratic actions have been aimed at eliminating the influence of prominent Islamist groups in the country. Indonesian authorities have actively disrupted ISIS–inspired and ISIS-friendly groups as well as other terrorist movements
- Drug trafficking highest priority amongst illicit goods due to presence of drug syndicates with an accompanying heavy focus on maritime domain. The Indonesian National Police and the Indonesian Navy patrol the country's maritime domain.

Relationships with international organizations (Ease of Implementation / Program Needs)

- Indonesia is diplomatically active in a large number of international organizations through the United Nations and the ASEAN group. It is also a member of the G20.
- Indonesia is open to foreign investment for infrastructure, although they tend to favor the quickest, cheapest solutions that aren't necessarily best in the long-term. The Chinese-backed high speed rail project was not successful, and Indonesia also opted to adopt Sinovax for COVID-19 vaccinations without considering more costly, but more effective, options from Pfizer, Moderna, AstraZeneca, or Johnson and Johnson.

4.5 MALAYSIA





4.5.1 GEOGRAPHY

During summer in Malaysia, the dense rainforest and mountainous land borders, the air borders managed by numerous airports separated by sea, and the extensive maritime area with a long coastline and numerous islands, all present significant implementation challenges (red level) for smuggling control. However, the high need for these control measures (green level) and the extended summer daylight can aid in visibility and effectiveness of operations.

Land Borders (Ease of Implementation / Program Needs)

- Length: 1,658 miles (2,669 km)
- Terrain/Geographical Challenges: Dense tropical rainforests, mountainous regions

Air Borders (Ease of Implementation / Program Needs)

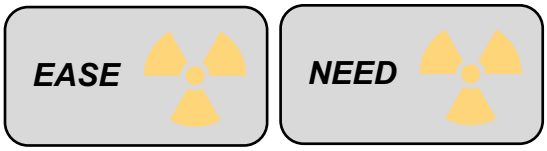
- International Airports: 7
- Domestic Airports: 33

- Geographical Complexities: Peninsular Malaysia and East Malaysia (Malaysian Borneo) separated by the South China Sea
- Air Traffic Density: Moderate

Sea Borders (Ease of Implementation / Program Needs)

- Total Maritime Area (Exclusive Economic Zones (EEZ)): 129,217 sq miles (334,671 sq km)
- Miles of Coastline: 2,905 miles (4,675 km)
- Number of Islands: 878 islands

4.5.2 SOURCES AND SUBCATEGORY METHODOLOGY EXPLANATION



Based on the information available, it can be inferred that Malaysia has been designated as a "yellow" country in terms of both ease of implementation and program needs. This is due to the country's possession of only one small research reactor, and the recent cancellation of its nuclear program by the current administration. It is important to note that although the level of immediate threat may be relatively low, there is a consistent flow of commercial goods containing metals that cross the borders between Malaysia and the States of Concern.

Nuclear Program (Ease of Implementation / Program Needs)

- Malaysia has only 1 small-scale research reactor, but no nuclear power plant exists.
- With support from the IAEA, the country pursued the install of nuclear power plants, but the current administration canceled the plan.

Use of Radioactive Materials (Ease of Implementation / Program Needs)

- Radioactive sources do exist in the country, and the government tracks and regulates them.
- No further detailed data on existing sources are available.

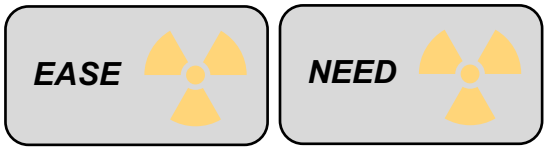
Trading Activities (Ease of Implementation / Program Needs)

- China is the 1st largest country from which Malaysia imports goods. (28.8% of total imports) Import goods include electrical machinery, mechanical appliances, and furniture.
- India is the 8th largest country from which Malaysia imports goods. (2.7% of total imports) Import goods include refined petroleum, meat, and raw aluminum.
- Given the bulk amount of ongoing transboundary movement of goods with the states of concern, Malaysia needs capacity building for the detection, but it is difficult to scan all trading goods.

Spatial Proximity (Ease of Implementation / Program Needs)

- No land borders are shared with the states of concern.
- The South China Sea and the Bay of Bengal separate the sea route.
- Malaysia and the States of Concern are geographically well separated, which indicates the low need for NSDD intervention. And this fact has no influence on the ease of NSDD program implementation.

4.5.3 ECONOMIC/HUMAN DEVELOPMENT AND SUBCATEGORY METHODOLOGY EXPLANATION



With Malaysia's moderate numbers of GDP and HDI and improvements in economic situation, we overall assume that both the level of ease of implementation and the level of program needs are to be moderate.

HDI (Ease of Implementation / Program Needs)

- Malaysia's HDI in 2021 was 0.803 which is a high number compared to the world average of 0.732 and its world rank was 62/191.

Drug-Use Rate (Ease of Implementation / Program Needs)

- No data

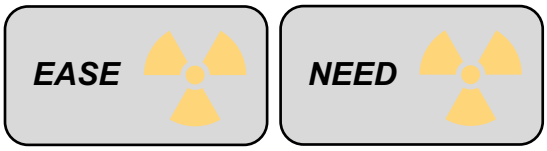
GDP (Ease of Implementation / Program Needs)

- Malaysia's GDP per capita in 2021 was $11,109.3 which is a moderate number compared to the world average of $12,236.6.

Industry and Economic Development (Ease of Implementation / Program Needs)

- Employment conditions improved and domestic demand expanded due to deregulation to curb COVID-19, service exports recovered due to deregulation of immigration, and exports of goods (especially electrical and electronic products) also maintained solidity. Although the pace of growth will slow down due to the global economic slowdown, exports will remain strong and tourism will recover due to easing immigration.

4.5.4 INDICATORS OF R/N SMUGGLING AND SUBCATEGORY METHODOLOGY EXPLANATION



Malaysia, like Thailand and Vietnam, is connected to the Golden Triangle trafficking network to its east, and like the Philippines and Indonesia, faces significant maritime trafficking across the Sulu and Celebes seas to its west. Its reported seizures of illicit drugs and detection of human trafficking are comparable with Indonesia's. However, Malaysia faces a comparatively low number of terrorist attacks, and is not currently home to active, indigenous terrorist organizations (although it continues to combat Abu Sayyaf Group activity). In short, Malaysia faces some unique trafficking challenges, but also performs comparatively well on terrorism metrics. As a result, its assessment in this category is mixed.

Presence of Terrorist and Extremist Groups (Ease of Implementation / Program Needs)

- Malaysia has been home to Islamist terrorist groups, including Al-Ma'unah and the Kumpulan Mujahidin Malaysia, though the former was very short-lived, and the latter is believed to no longer be active.
- However, transit of terrorist groups active in the wider region continues to be an issue in Malaysia, especially in the province of Sabah, located in northern Borneo. ISIS, Abu Sayyaf Group, Al-

Qaeda and Jemaah Islamiyah fighters have been known to use this region as a transit point on their way across the Sulu and Celebes seas.

Acts of Terrorism (Ease of Implementation / Program Needs)

- As of 2022, Malaysia rates 1.357 points on the Global Terrorism Index. averaging 2.52 over the last ten years, and with a ten-year peak of 3.438 in 2016.. It ranks 75th out of all countries.

R/N Material Seizures or Losses (Ease of Implementation / Program Needs)

- CNS data: 2 incidents 2013-2022.
  - February 2017: After equipment stolen from an oil and gas company in Klang was discovered dismantled, police arrested eight men (four of which were employees) in possession of iridium-192. Additional canisters are discovered in an apartment building and a scrapyard.
  - August 2018: A device containing iridium-192 goes missing. Technicians employed by a company which tests equipment for oil, gas, and power companies discover it has gone missing from their vehicle after arriving in Sha Alam. It is uncertain if the device was stolen, or simply fell out.
- Other sources:
  - 2017: Then-Inspector General of Police Khalid Abu Bakar states that, following the assassination of Kim Jong Nam using VX nerve agent, police will sweep the scene and other locations for radioactive materials.

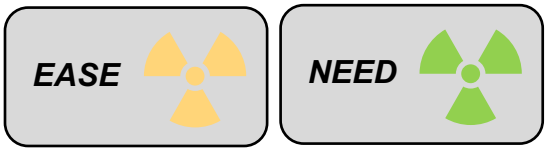
Existing Trafficking Routes (Ease of Implementation / Program Needs)

- The trafficking routes across the Sulu and Celebes seas which connect the Philippines and Indonesia also cross through Malaysia, especially in Sabah, on Borneo. For instance, many foreign fighters who traveled to the Philippines to take part in the 2017 battle of Marawi are alleged to have entered the country through Tawi-Tawi, the tip of an island chain which bifurcates the Sulu and Celebes seas and stretches from the Philippines to Borneo. The Malaysian-Indonesian border across Borneo is also known for traffickers taking advantage of its thick jungles.
- Peninsular Malaysia has historically experienced trafficking and piracy in the Malacca Strait, which it borders, as well as the Singapore Straits. To the north, Malaysia borders Thailand, and specifically its southern provinces which have seen security disrupted by an ongoing insurgency. Since then, trafficking has become common in this region as well. Portions of this border are walled or fenced off by both Thailand and Malaysia, in hopes of deterring smuggling and insurgent transit.

Proxy Good Smuggling (Ease of Implementation / Program Needs)

- In 2020, the UNODC reported that 544 people were detected being smuggled through Malaysia.
- In 2020, the UNODC reported that 14.59 tons of methamphetamine, 5.43 tons of marijuana herb, 0.01 tons of cocaine, and 0.93 tons of heroin were seized in Malaysia.

4.5.5 PROGRAMS/CURRENT PARTICIPATION AND SUBCATEGORY METHODOLOGY EXPLANATION



Within this category, Malaysia is coded "yellow" for Ease of Implementation and "green" for Program Needs. This is in part due to the country's legacy megaports initiative, yet lack of subsequent programs, and its history of engaging with Nuctech. Malaysia has demonstrated willingness to work with NSDD, and its government has expressed concerns about the quality of Nuctech products. Both of these factors contribute to a "yellow" coding for Ease of Implementation. Nonetheless, there is significant need for NSDD engagement in Malaysia, making Program Needs "green."

GICNT Participation (Ease of Implementation/Program Needs)

- Malaysia is a participant in GICNT. Being a signatory shows their willingness to work to combat global terrorism, making them potentially more open for NSDD programing.

Existing NSDD Programs (Ease of Implementation/ Program Needs)

- Malaysia has a legacy megaports initiative with NSDD. The status of other programs and initiatives are currently unknown. More programs and initiatives are needed in Malaysia, thus it is coded green for program needs. Malaysia has already shown some initiative to work with NSDD, thus Ease of Implementation is coded yellow.

Nuctech Presence (Ease of Implementation/Program Needs)

- Nuctech has seemingly had a Malaysian branch since 2019, but it has reportedly provided equipment to Malaysian authorities since around 2010. The Deputy Prime Minister of Malaysia has visited Nuctech, though the Malaysian government has had concerns about the quality of its products. This questionable history might help NSDD supplant Nuctech, so "Ease of Implementation" is coded yellow.

Exports to the United States (Ease of Implementation/Program Needs)

- Malaysia exports $42.9 billion of goods annually to the United States. The United States has an interest in ensuring shipments of goods do not contain R/N material. Its volume of imports from Malaysia is larger than its imports from Indonesia or The Philippines. Thus, this is coded green for "Program Needs." This does not affect the ease of NSDD program implementation.

Party to the IAEA Additional Protocols (Ease of Implementation/Program Needs)

- Malaysia has signed a Comprehensive Safeguard Agreement. It has signed, but has not yet ratified an Additional Protocol. This, in the past six years, the IAEA has concluded that there has been no diversion of declared material, but has not been able to draw a conclusion on the diversion of undeclared material. It is unclear why Malaysia has yet to ratify the Additional Protocol, thus Ease of Implementation is labeled yellow. The IAEA being unable to draw a conclusion on undeclared material raises the need for NSDD programs to exist in Malaysia, thus it is labeled yellow.

Party to the Treaty on the Prohibition of Nuclear Weapons (Ease of Implementation/Program Needs)

- Malaysia has signed and ratified this treaty, showing a high level of commitment to preventing nuclear weapons.

History of NSDD-ISLE Law Enforcement Cooperation (Ease of Implementation/Program Needs)

- There is no known programmatic relationship between Malaysia's police force and NSDD, thus there is no known ISLE program in place in Malaysia. Beginning this program from the ground up is challenging, thus Ease of Implementation is red, and program needs are high (green).

4.5.6 INSTITUTIONAL CAPACITY AND SUBCATEGORY METHODOLOGY EXPLANATION

Malaysia is a democratic nation in ASEAN with whom the United States has a productive cooperative relationship in a number of key security areas relevant to R/N detection and interdiction. On a whole, NSDD programs may be easier to implement relative to other ASEAN countries (green) due to participation in similar international organizations, the presence of DoS forward deployed INL personnel, and a demonstrated commitment to nuclear detection at major border crossings. Malaysia does still struggle heavily with human trafficking and issues of corruption within government and law enforcement that may hinder efficiency of government programming (green). Despite a number of human rights concerns in the country, these issue areas do not have significant overlap with NSDD operations. The IAEA has already noted Malaysia's need for capacity building in R/N detection training, and NSDD may have the opportunity to work both bilaterally with Kuala Lumpur and through multilateral organizations.

Regime type: (Ease of Implementation / Program Needs)

- Malaysia is a Parliamentary democracy with a constitutional monarchy. The head of state is also leader of Islamic faith in Malaysia. The U.S. voices strong support for Malaysia as a regional democratic nation.
- The effects of regime type on the ability for NSDD to operate is unclear at the time of this analysis, but remains in the framework as a potentially useful analytical tool.

Recent Government Leadership Changes/Government Turnover Rate (Ease of Implementation / Program Needs)

- The Malaysian Monarch serves five-year terms and is selected from among the hereditary rules of the country. The lower levels of government combine hereditary appointments and elections.
- The effects of government changes on the ability for NSDD to operate is unclear at the time of this analysis, but remains in the framework as a potentially useful analytical tool.

Institutional Corruption (Ease of Implementation / Program Needs)

- The U.S. Department of State's human rights report on Malaysia claims that civilian authorities do not always maintain effective control over security forces, which has led to abuses and issues of impunity. Some corruption-related arrests have occurred, although many human rights watchers contend that there is still widespread corruption in government
- Suspects engaged in terrorism, organized crime, gang activity, and trafficking (drugs and people) can be detained for two years without warrant, and this can be renewed indefinitely. After 7 days police must make a case to a public prosecutor - if prosecutor decides detainment is justifiable, another report must be made to a fact-finding committee within 59 days. It is not specifically illegal; however, this does run counter to many U.S. values in judicial systems
- In 2021, then-retiring police chief Abdul Hamid Bador alleged corruption in the police force, particularly at senior levels.

Law enforcement, and border security (Ease of Implementation / Program Needs)

- Malaysia's complicated geography, porous borders, and major port cities create opportunities for various types of crimes; thus, the Department of State Bureau of International Narcotics and Law Enforcement Affairs (INL) engages with Malaysia on capacity building and rule of law. A Maritime Law Enforcement Advisor supports capacity building for Malaysia's Coast Guard (MMEA) on search and rescue, counter-piracy, trafficking, other transnational security issues. Promotes regional cooperation in maritime law enforcement.
- Malaysia has long-standing issues with certain types of cross-border trafficking - namely, human trafficking - as a result of the confluence of extreme poverty and economic exploitation from globalized economies.

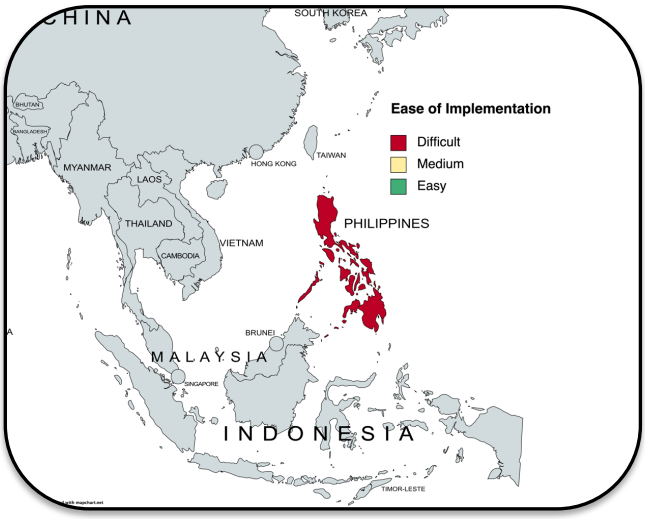
Demonstrated capability to disrupt smuggling routes (Ease of Implementation / Program Needs)

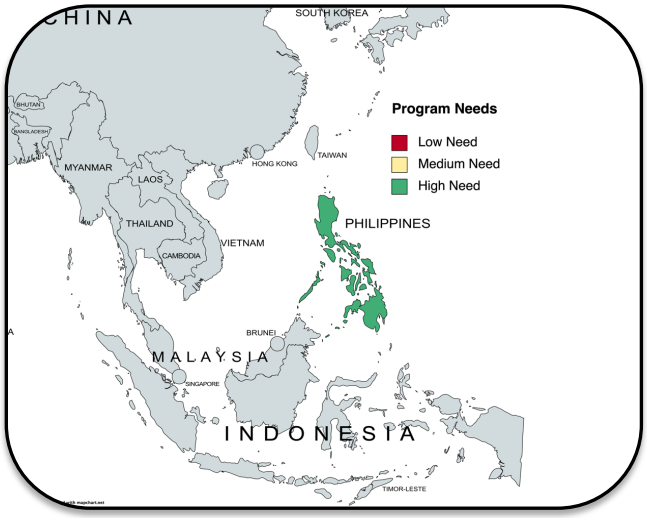
- In 2015, US DoS upgraded human trafficking ranking from tier 3 to tier 2 in a controversial move to ensure Malaysia's entry into the TPP (which the U.S. later pulled out of), and then relegated it back to tier 3. The COVID-19 pandemic worsened human trafficking in Malaysia, and smuggling of persons remains Malaysia's most pressing trafficking problem.
    - Tier 3: governments do not comply with minimum standards for elimination of trafficking; also making no efforts to comply
    - Tier 2: governments are making efforts to come into compliance with minimum standards
- Malaysia's high-tech manufacturing sector was used as a staging location for centrifuge shipments to Libya as part of A.Q. Khan's nuclear proliferation network. As a result, the Strategic Trade Bill was passed in 2010 to curb trafficking of nuclear weapons components
- IAEA International Nuclear Security Advisory Service (INSServ) had a successful mission to Malaysia in 2022, noting Malaysia's commitment to R/N detection at border crossings and ports of entry. INSServ recommends more comprehensive training programs for nuclear security bodies, and identified a number of good practices, including a national nuclear security framework that involves relevant laws and law enforcement agencies and responsibilities, information dissemination among public, and effective procedures for screening at Penang Port

Relationships with international organizations (Ease of Implementation / Program Needs)

- Malaysia and the United States are members of many of the same international organizations, particularly those through ASEAN and the UN.
- IAEA International Nuclear Security Advisory Service (INSServ) had a successful mission to Malaysia in 2022, noting Malaysia's commitment to R/N detection at border crossings and ports of entry.

4.6 THE PHILIPPINES





4.6.1 GEOGRAPHY

Indonesia's geography represents a 'yellow' level scenario, indicating moderate ease of program implementation and need. The flat land border with Malaysia, manageable air traffic across numerous airports, and extensive yet navigable sea borders balance the programmatic necessities with the potential challenges, making overall program execution moderately feasible.

Land Borders (Ease of Implementation / Program Needs)

- Length: 3,018 miles (4,858 km)
- Terrain/Geographical Challenges: mostly flat and characterized by tropical rainforest and plantations + only shares a land border with Malaysia on the island of Borneo, there are no significant terrain or geographical challenges for this land border.

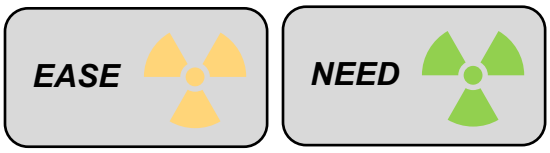
Air Borders (Ease of Implementation / Program Needs)

- International Airports: 13
- Domestic Airports: 69
- Geographical Complexities: archipelagic country, consisting of thousands of islands spread across a vast area of the Pacific Ocean
- Air Traffic Density: High (a large volume of air traffic due to its significant tourism industry and its role as a regional hub for air transportation)

Sea Borders (Ease of Implementation / Program Needs)

- Total Maritime Area (Exclusive Economic Zones (EEZ)): 849,400 square miles (2.2 million square km)
- Miles of Coastline: 22,549 miles (36,289 km)
- Number of Islands: ranging from around 7,500 to over 7,641 islands (2,000 are inhabited)

4.6.2 SOURCES AND SUBCATEGORY METHODOLOGY EXPLANATION



The presence of nuclear facilities and unused fuels in the Philippines, along with the government's plans to integrate a nuclear power plant in its future energy mix, suggest that the Program Needs for the country are classified as "green." In addition, it is important to note that despite the current low level of threat, there is a steady influx of commercial goods containing metals that traverse the borders between the Philippines and the States of Concern.

Nuclear Program (Ease of Implementation / Program Needs)

- The Philippines completed NPP construction in 1984, but no fuels were loaded and it never operated due to financial and safety concerns.
- Unused fuel rods are stored for decades and are now utilized in a research reactor too.
- The government still aims to include nuclear in the future energy mix.

Use of Radioactive Materials (Ease of Implementation / Program Needs)

- Radioactive sources do exist in the country, and the government tracks and regulates them.
- No further detailed data on existing sources are available.

Trading Activities (Ease of Implementation / Program Needs)

- Importing goods from
- China is the 1st largest country from which the Philippines imports goods. (34% of total imports) Import goods include electrical machinery, mechanical appliances, and minerals.
- India is the 10th largest country from which the Philippines imports goods. (1% of total imports) Import goods include cars, pharmaceuticals, and iron & steel.
- Given the bulk amount of ongoing transboundary movement of goods with the states of concern, the Philippines needs capacity building for the detection, but it is difficult to scan all trading goods.

Spatial Proximity (Ease of Implementation / Program Needs)

- No land borders are shared with the states of concern.
- The South China Sea separates the sea route.
- The Philippines and the States of Concern are geographically well separated, which indicates the low need for NSDD intervention. And this fact has no influence on the ease of NSDD program implementation.

4.6.3 ECONOMIC/HUMAN DEVELOPMENT AND SUBCATEGORY METHODOLOGY EXPLANATION

Though the Philippine economy is getting better after the covid pandemic and its Drug-Use Rate is medium level, both its GDP and HDI are pretty low, which could trigger a high potential of illegal smuggling. Therefore, we overall assume that the level of ease of implementation is hard while the level of program needs is high.

HDI (Ease of Implementation / Program Needs)

- The Philippines's HDI in 2021 was 0.699 which is a low number compared to the world average of 0.732 and its world rank was 116/191.

Drug-Use Rate (Ease of Implementation / Program Needs)

- Besides Amphetamines, the Philippines's prevalence percentage of every type of drugs (Cannabis: 1.64, Amphetamines: 1.10, Cocaine: 0.07) was lower than the global estimates of 2020 (Amphetamines: 0.68, Cannabis: 4.12, Cocaine: 0.42).

GDP (Ease of Implementation / Program Needs)

- The Philippines's GDP per capita in 2021 was $3,460.5 which is a low number compared to the world average of $12,236.6.

Industry and Economic Development (Ease of Implementation / Program Needs)

- Since the recovery from the global financial crisis, the Philippine economy has achieved a high growth rate of more than 6 percent in a row from 2012 to 2019. In 2020, it fell to -9.6 percent year-on-year due to the spread of COVID-19 and the subsequent restrictions on domestic economic activities, but recovered 5.6 percent in 2021.

4.6.4 INDICATORS OF R/N SMUGGLING AND SUBCATEGORY METHODOLOGY EXPLANATION

The Philippines has the most significant struggles with terrorist activity of any of the countries studied. It has been home to multiple Salafi jihadist groups with ties to ISIS and/or Al-Qaeda, as well as regional insurgencies, and consistently suffers one of the highest rates of terror attacks in the group. The recent history of the Philippines demonstrates the cross-borders nature of this issue, from the inflow of foreign fighters leading up to the 2017 battle of Marawi to the ongoing issue of Abu Sayyaf Group kidnapping-for-ransom in the surrounding seas.

Shortcomings in the data complicate analysis of proxy good trafficking in the Philippines. With other states analyzed, reported seizures of trafficked drugs tracked with those of detected human trafficking, according to UNODC data. The Philippines bucks this trend - having both the highest reported rate of human trafficking and the lowest recorded rate of drug trafficking. It is uncertain if this is an issue with data collected - under-reported or under-detected trafficking - or reflective of reality on the ground - perhaps a result of the Philippines' recent violent responses to drug trade within their borders. This ambiguity reinforces this report's recommendation that the NSDD forward deploy a regional expert to Southeast Asia; on the ground, expert familiarity with the nuances of the region is necessary.

Presence of Terrorist and Extremist Groups (Ease of Implementation / Program Needs)

- The Philippines faces a number of challenges with regards to extremist groups.
  - A longstanding insurgency in the country's south, focused around the Muslim-majority Moro/Bandsamoro people, has recently entered a peace process. In 2018, the government passed the creation of the Bangsamoro Autonomous Region in Muslim Mindanao

(BARMM), with the leading Moro Islamic Liberation Front declaring it will disarm in response.

- However, organizations affiliated with global jihadist groups - chiefly Abu Sayyaf or "Islamic State-East Asia" - continue to operate in the country, particularly in the south and recruiting from the same population, bolstered by poverty and outrage over government security policy.
- Throughout the countryside, the Philippines faces a communist rebellion led by the New People's Army (NPA).

Acts of Terrorism (Ease of Implementation / Program Needs)

- Despite progress regarding the Moro conflict, the Philippines has over the last few years seen multiple bombing attacks in its south executed by Abu Sayyaf.
- In addition, the country's struggle with insurgency has left lasting scars.
  - In 2017, Marawi (a city in this southern BARMM region) was captured for months by Abu Sayyaf fighters, with recruits pouring in from around Southeast Asia. While the government was able to drive out the terrorists, the city was heavily damaged. By 2020, over 2,800 families still lived in temporary shelters as rehabilitation was carried out.
- As of 2022, the Philippines rates 6.328 points on the Global Terrorism Index, averaging 6.91 over the last ten years, with a ten-year high of 7.2 in 2013. In this period, the Philippines rated above 7 points in 2013, 2017, 2018, 2019, and 2020. The 2020 Global Terrorism Index report listed the Philippines as the country 10th most impacted by terrorism; the 2023 report lists it as 18th.

R/N Material Seizures or Losses (Ease of Implementation / Program Needs)

- CNS data: 1
  - In 2018, a moisture density gauge was reported as stolen to the Philippines Department of Science and Technology.
- Like many ASEAN countries, the Philippines lack rigorous required reporting of RN material loss or theft, so analysis of the extent of the issue is difficult.

Existing Trafficking Routes (Ease of Implementation / Program Needs)

- As is the case with Indonesia, the Philippines faces extensive smuggling routes across the Sulu and Celebes Seas, with illicit goods regularly traveling across its borders to and from Malaysia and Indonesia, especially out of Borneo and up from Indonesian Sulawesi.
- Establishing maritime awareness is a difficult task for both the Philippines and Indonesia. Both countries share issues handling smuggling across large stretches of ocean, many small populated and unpopulated islands, and dense small vessel traffic (licit and illicit). Populations on both sides of the Malaysian-Philippines and Indonesian-Philippines borders have strong historic ties, and so cross-border transit for reasons other than illicit trafficking is common.

Proxy Good Smuggling (Ease of Implementation / Program Needs)

- The 2022 International Narcotics Control Strategy Report states that the majority of drugs smuggled through the Philippines originate in the Golden Triangle area, with precursor chemicals sourced from the PRC.
  - The report's section on the Philippines focuses on the supply reduction prosecuted under Duterte, noting both complaints about human rights violations and successful seizure operations (including 1.7 tons of methamphetamine and 165 grams of cocaine, less than 2020's 973 grams).

- In 2020, the UNODC reported that 4,721 people were detected being smuggled through the Philippines.
- In 2019, the UNODC reported that 2.08 tons of methamphetamine, 0.61 tons of marijuana herb, 0.04 tons of cocaine, and 1.87 tons of heroin were seized in the Philippines. Note that the UNODC has not yet reported 2020 drug trafficking data regarding the Philippines, problematizing direct comparison with other countries.
- While the other four countries are easily ranked in terms of their smuggling problem, the Philippines seems to have either the worst issue (by people trafficked) or the least problematic (by drugs). It is important to reiterate that this is data regarding what is *detected and disrupted*, and does not necessarily reflect actual numbers. Further investigation is necessary to determine what causes this apparent disconnect.

4.6.5 PROGRAMS/CURRENT PARTICIPATION AND SUBCATEGORY METHODOLOGY EXPLANATION

GICNT Participation (Ease of Implementation/Program Needs)

- The Philippines is a participant in GICNT. Being a signatory shows their willingness to work to combat global terrorism, making them potentially more open for NSDD programing.

Existing NSDD Programs (Ease of Implementation/ Program Needs)

- The Philippines has a historical relationship with NSDD and a long-standing megaports initiative. In 2019, NSDD changed focus to work internally, begin the GBSI program, and increase mobile detection units. The implementation progress of these initiatives are unknown

Nuctech Presence (Ease of Implementation/Program Needs)

- Nuctech has had business in The Philippines for more than 15 years, and it appears to have an office in Pasig City. However, in a 2006 deal, Nuctech allegedly sold Philippine officials ineffective equipment for well over market value. This questionable history might help NSDD supplant Nuctech, so "Ease of Implementation" is coded yellow.

Exports to the United States (Ease of Implementation/Program Needs)

- The Philippines exports $13.3B of goods to the United States annually. The United States has an interest in ensuring shipments of goods do not contain R/N material. However, its volume of imports from The Philippines is small compared to the volume from Thailand and Indonesia. Thus, this is coded red for "Program Needs."

Party to the IAEA Additional Protocols (Ease of Implementation/Program Needs)

- The Philippines has a Comprehensive Safeguards Agreement and an Additional Protocol in place. In the past 6 years, there has been no diversion of declared nuclear material and the investigation on undeclared material ongoing at the time of each annual report. This shows a willingness to work with non-governmental organizations, making Ease of Implementation Green. No diversion of undeclared and declared R/N material from Nuclear Facilities could be seen as a lower risk of smuggled R/N material from these locations, lowering the need for NSDD programs. Program

Needs are labeled red.

Party to the Treaty on the Prohibition of Nuclear Weapons (Ease of Implementation/Program Needs)

- The Philippines has signed and ratified this treaty, showing a high level of commitment to preventing nuclear weapons.

History of NSDD-ISLE Law Enforcement Cooperation (Ease of Implementation/Program Needs)

- The Philippines is actively working with NSDD to increase partnerships with local law enforcement. This shift began in 2019. The progress of this implementation is not known.

4.6.6 INSTITUTIONAL CAPACITY AND SUBCATEGORY METHODOLOGY EXPLANATION

As with Indonesia, archipelago nations like the Philippines face unique maritime difficulties when combating smuggling due to the logistical difficulties of patrolling thousands of islands. The Philippines also struggles with terrorist groups in certain parts of the country. Fortunately, the United States has a very productive diplomatic and security relationship with the Philippines as treaty allies, which has improved even further in recent months due to President Ferdinand Marcos Jr.'s decision to align more closely with the U.S. in regional security. The Philippines has a significant amount of program needs (yellow), and a positive bilateral relationship in which productive work towards counter R/N smuggling is possible (green).

Regime type: (Ease of Implementation / Program Needs)

- Democratic constitutional republic
- The effects of regime type on the ability for NSDD to operate is unclear at the time of this analysis, but remains in the framework as a potentially useful analytical tool.

Recent Government Leadership Changes/Government Turnover Rate (Ease of Implementation / Program Needs)

- President and Vice-Presidential elections every 6 years, other elected positions in legislature and municipal levels are every 3 to 6 years
- Government leadership changes between the Duterte presidency and the current Marcos administration have come with renewed focus on U.S.-Philippines security cooperation. This could be beneficial for NSDD's ability to continue working effectively with partners in the Philippines.
- Effects of government changes on program needs are unclear.

Institutional Corruption (Ease of Implementation / Program Needs)

- The Philippines experiences high levels of government corruption across presidential administrations. The previous administration under Duterte gave broad powers to police forces to engage in extrajudicial killings to curb the influence of drug sales and use. The administration of Ferdinand Marcos was marked by the Marcos' family growing wealth as a result of illegally appropriated government funds. Given the close security cooperation between the U.S. and the Philippines, corruption may not affect NSDD's ability to cooperate with the government of the Philippines

Law enforcement, and border security (Ease of Implementation / Program Needs)

- U.S. Philippines Security Partnership creates opportunities in the national security space for bilateral cooperation. NSDD and the Philippines already have a history of cooperation through capacity building exercises and exchange of technology. Given the difficulties of monitoring the many islands that make up the Philippines archipelago, as well as the existence of active extremist groups in the country, the Philippines continues to be a "medium need" country in terms of program needs.

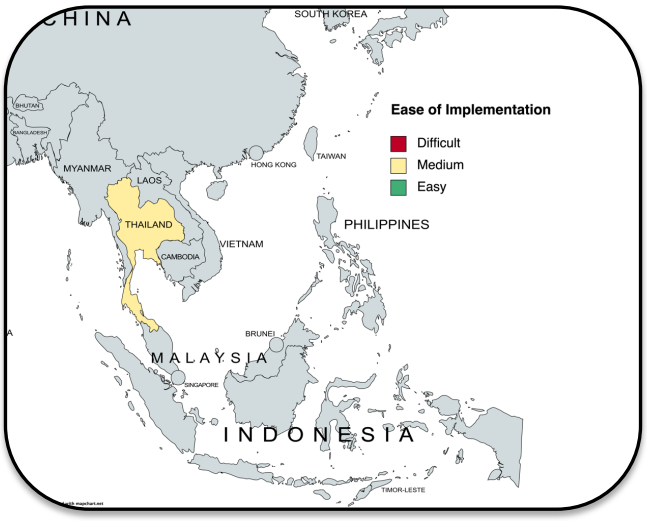
Demonstrated capability to disrupt smuggling routes (Ease of Implementation / Program Needs)

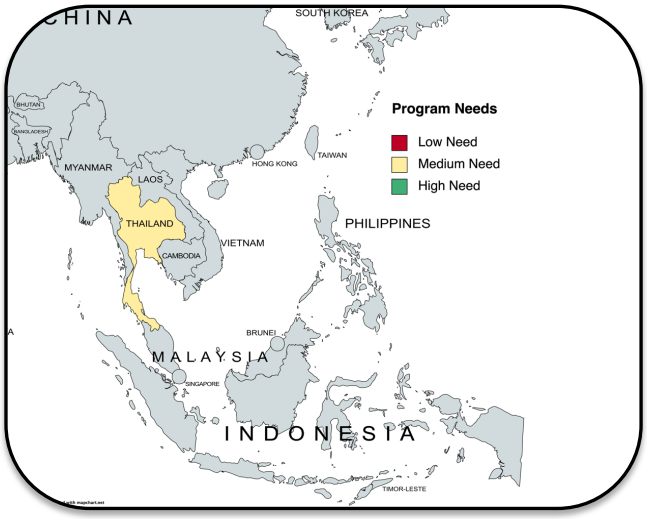
- Recent hikes in agricultural smuggling show that authorities in the Philippines have the ability to disrupt smuggling networks. For example, authorities have conducted raids on recent agricultural smuggling
- The Duterte regime undertook a violent approach to curbing the influence of illegal drug use in the Philippines which was met with global condemnation. NSDD should consider whether or not their programming might be used by the government to conduct detection, deterrence, and punishment in ways that do not align with U.S. values

Relationships with international organizations (Ease of Implementation / Program Needs)

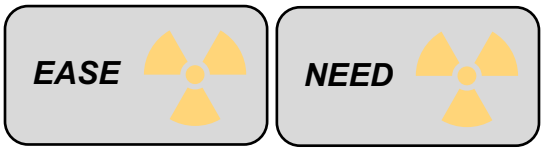
- The Philippines has broad multilateral relationships with ASEAN member states and various international organizations. It also has close economic ties with China, although that relationship is also currently affected by U.S.-China influence competitions in the region. Going forward, the U.S.-Philippines relationship will likely be more influential in NSDD's work than cooperation in the multilateral space.

4.7 THAILAND





4.7.1 GEOGRAPHY



Thailand's geography presents a yellow level scenario. Despite the country's extensive land and air borders, coupled with high air traffic density and complex maritime areas, program implementation is still feasible. The relatively straightforward sea borders and manageable geographical challenges enhance the ease of implementation, balancing out the high programmatic needs.

Land Borders (Ease of Implementation / Program Needs)

- Length: 3,159 miles (5,083 km)
- Terrain/Geographical Challenges: Dense forests, remote areas + shared border with Myanmar

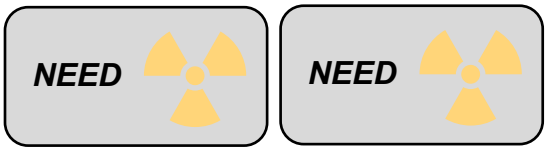
Air Borders (Ease of Implementation / Program Needs)

- International Airports: 8
- Domestic Airports: 26
- Geographical Complexities: Thailand shares borders with Myanmar, Laos, Cambodia, and Malaysia. This proximity to neighboring countries adds complexity to managing and securing its airspace, as it requires coordination with multiple neighboring air traffic control systems.
- Air Traffic Density: High (regional transportation hubs and popular tourist destinations)

Sea Borders (Ease of Implementation / Program Needs)

- Total Maritime Area (Exclusive Economic Zones (EEZ)): 115,831 square miles (300,000 square kms)
- Miles of Coastline: 1,864 miles (3,000 km)
- Number of Islands: 1,430 islands

4.7.2 SOURCES AND SUBCATEGORY METHODOLOGY EXPLANATION



In light of the limited number of nuclear facilities and Thailand's nascent national nuclear program, Thailand has been classified as "yellow" with respect to both ease of implementation and program needs. It should be noted, however, that despite the relatively low level of immediate threat, there exists a steady stream of commercial goods containing metals that traverse the borders between Thailand and the States of Concern.

Nuclear Program (Ease of Implementation / Program Needs)

- Thailand has had only one research reactor since 1962, and no nuclear power plant exists.
- The government shows interest in nuclear energy, but no solid plan exists yet.

Use of Radioactive Materials (Ease of Implementation / Program Needs)

- Radioactive sources do exist in the country, and the government tracks and regulates them.
- No further detailed data on existing sources are available.

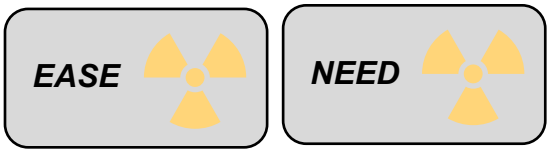
Activities (Ease of Implementation / Program Needs)

- China is the 1st largest country from which Thailand imports goods. (28 % of total imports) Import goods include electrical machinery and electronics; machinery, mechanical appliances, and parts; iron and steel.
- India is the 10th largest country from which Thailand imports goods. (2 % of total imports) Import goods include diamonds, combustion engines, and motor vehicles.
- Given the bulk amount of ongoing transboundary movement of goods with the states of concern, Thailand needs capacity building for the detection, but it is difficult to scan all trading goods.

Spatial Proximity (Ease of Implementation / Program Needs)

- No land borders are shared with the states of concern.
- The South China Sea and the Gulf of Thailand separate the sea route.
- Thailand and the States of Concern are geographically well separated, which indicates the low need for NSDD intervention. And this fact has no influence on the ease of NSDD program implementation.

4.7.3 ECONOMIC/HUMAN DEVELOPMENT AND SUBCATEGORY METHODOLOGY EXPLANATION



Though Thailand’s economy is getting better after the covid pandemic, still its GDP is relatively low. However, considering the relatively high number of HDI and moderate percentage of Drug-Use Rate, we overall assume that both the ease of implementation and program needs are medium level.

HDI (Ease of Implementation / Program Needs)

- Thailand’s HDI in 2021 was 0.800 which is a relatively high number compared to the world average of 0.732 and its world rank was 66/191.

Drug-Use Rate (Ease of Implementation / Program Needs)

- Beside Amphetamines and Ecstasy, Thailand's prevalence percentage of each type of drugs (Cannabis: 1.33, Amphetamines: 1.67, Ecstasy: 0.44, Cocaine: 0.06) is lower than the global estimates of 2020 (Amphetamines: 0.68, Cannabis: 4.12, Cocaine: 0.42, Ecstasy: 0.39).

GDP (Ease of Implementation / Program Needs)

- Thailand's GDP per capita in 2021 was $7,066.2 which is a relatively low number compared to the world average of $12,236.6.

Industry and Economic Development (Ease of Implementation / Program Needs)

- Agriculture accounts for about 30 percent of the workforce, but only less than 10 percent of GDP. On the other hand, manufacturing workers account for about 15 percent of GDP, accounting for the highest percentage. In addition, tourism is the pillar of Thailand's economy, for example, before the spread of COVID-19, tourism revenue from overseas reached $60.5 billion (fourth in the world).

4.7.4 INDICATORS OF R/N SMUGGLING AND SUBCATEGORY METHODOLOGY EXPLANATION

Thailand has developed peace talks intended to end its southern insurgency, but violence continues and the country suffers comparatively high rates of terrorist activity. In addition, it appears to have very high rates of trafficking compared to the other countries analyzed in this report, reporting the highest rates of illicit drug seizures, and the second highest rate of human trafficking detected. Thailand as a whole represents a significant crossroads for Golden Triangle trafficking. It has recently been the location of an R/N incident, involving industrial-use cesium-137 being brought to a scrapyard. This is reminiscent of an earlier case in 2000, which falls outside the scope of the period studied for this measure, in which canisters of cobalt-60 were brought to a scrapyard in Samut Prakan province, where it was disassembled - sending ten individuals to the hospital with radiation sickness, and potentially exposing 1,800 more to radiation.

Because of Thailand's significant issues regarding trafficking and terrorist activity, it is likely faces significant difficulties in implementing counter-trafficking law enforcement solutions, and would require strong assistance in doing so.

Presence of Terrorist and Extremist Groups (Ease of Implementation / Program Needs)

- Since 2004, Thailand has experienced a regional ethno-religious insurgency, primarily located in Songkhla, Pattani, Yala, Narathiway provinces, along the Malaysian border. While the groups engaging in this Malay-Muslim insurgency are Islamist, potential for links to transnational Salafi jihadist movements have gone unrealized.
    - Renewed peace talks between the government and Barisan Revolusi Nasional, the leading insurgent organization, have been ongoing since 2020 in spite of interruption by the COVID pandemic.

Acts of Terrorism (Ease of Implementation / Program Needs)

- The peak of the insurgency's violence took place in 2007. The period from 2020 onwards has represented a comparative lull in violence, with Deep South Watch recording 158 incidents and 30 deaths in 2022 (compared to a peak of 2,396 incidents and 892 deaths in 2007).

- The regional nature of this insurgency challenges law enforcement action against trafficking, which has in turn worsened significantly in Thailand's Deep South.
- Thailand currently rates 5.43 points on the Global Terrorism Index, averaging 6.67 over the last ten years, and with a peak of 7.47 in 2013. It ranks 89th out of all countries.

R/N Material Seizures or Losses (Ease of Implementation / Program Needs)

- CNS data: 0 incidents 2013-2022.
- Other sources: 1
  - 2000: Canisters containing cobalt-60 are purchased by two scrap collectors, who cut them open in a junkyard. 2,000 are exposed to radiation.
  - 2023: Cylinder containing cesium-137 goes missing; found to have been smelted in a scrapyard.
- Like many ASEAN countries, Thailand lacks rigorous required reporting of RN material loss or theft, so analysis of the extent of the issue is difficult.
  - That said, known incidents revolve around missing industrial use materials entering into the scrap market. While these are not the highest risk R/N incidents, they are very difficult to track, and likely to be more common than (for instance) smuggling of nuclear material. In other words, this is assessed as a mid-tier programmatic need.
  - These cases could be better prevented by better tracking and reporting of radioactive materials, and empowering law enforcement to detect them. As stated above, tracking challenges exist but are not insurmountable. Mid-tier ease of implementation.

Existing Trafficking Routes (Ease of Implementation / Program Needs)

- Thailand sits in the Golden Triangle, a dense network of trafficking routes known for methamphetamine and opium flows but which facilitates the transfer of all manner of illicit goods. As such, Thailand experiences regular illicit trafficking between neighboring states of Myanmar, the Lao PDR, Cambodia, and Malaysia.

Proxy Good Smuggling (Ease of Implementation / Program Needs)

- In 2020, the UNODC reported that 1,473 people were detected being smuggled through Thailand.
- In 2020, the UNODC reported that 62.21 tons of methamphetamine, 41.61 tons of marijuana herb, 0.04 tons of cocaine, and 1.87 tons of heroin were seized in Thailand.

4.7.5 PROGRAMS/CURRENT PARTICIPATION AND SUBCATEGORY METHODOLOGY EXPLANATION

Thailand has shown a willingness and desire to work with NSDD and implement various programs, including the legacy megaports initiative as well as maintaining Internal Law Enforcement Academy maintaining a relationship with NSDD.

GICNT Participation (Ease of Implementation/ Program Needs)

- Thailand is a participant in GICNT. Being a signatory shows their willingness to work to combat global terrorism, making them potentially more open for NSDD programing.

Existing NSDD Programs (Ease of Implementation/ Program Needs)

- Thailand currently works with NSDD through the Megaports initiative. Other programming is unknown, thus we have insufficient information.

Nuctech Presence (Ease of Implementation/ Program Needs)

- Thailand does have an existing relationship with Nuctech and has already implemented Nuctech equipment and successfully interdicted contraband. This could make it more of a challenge for Thailand to also be willing to fund NSDD programs.

Exports to the United States (Ease of Implementation/ Program Needs)

- Thailand exports $45.3 billion of goods annually to the United States. This is a larger trade volume than that of Indonesia or The Philippines. This does not affect the ease of NSDD program implementation.

Party to the IAEA Additional. Protocols (Ease of Implementation/ Program Needs)

- Thailand has a Comprehensive Safeguards Agreement and an Additional Protocol in place. In the past 6 years, there has been no diversion of declared nuclear material and the investigation on undeclared material ongoing at the time of each annual report.

Party to the Treaty on the Prohibition of Nuclear Weapons (Ease of Implementation/ Program Needs)

- Thailand has signed and ratified this treaty, showing a high level of commitment to preventing nuclear weapons.

History of NSDD-ISLE Law Enforcement Cooperation (Ease of Implementation/ Program Needs)

- Thailand's Internal Law Enforcement Academy has a relationship with NSDD.

4.7.6 INSTITUTIONAL CAPACITY AND SUBCATEGORY METHODOLOGY EXPLANATION

Thailand and the United States share a close relationship given their status as treaty allies, which creates a positive environment for cooperation with NSDD at law enforcement and border security levels. Thailand works bilaterally with the U.S. as well as with international organizations to combat various types of smuggling and terrorism. Ongoing conflicts on the southern border with Malaysia pose as a major challenge for law enforcement. Government type and institutional corruption may cause some general inefficiencies in government response; however it remains unclear as to whether this causes particular problems with NSDD programming.

Regime type (Ease of Implementation/Program Needs)

- Thailand has an authoritarian constitutional monarchy. The Military junta in Thailand ended in 2019, but the military remains the most powerful political actor in the system. Despite an authoritarian junta in power for several years, and general authoritarian tendencies of the monarchy the US and Thailand have a very productive security partnership and a formal military alliance, however, this does not directly influence Ease of Implementation and Program Needs.

Recent Government Leadership Changes/Government Turnover Rate (Ease of Implementation/Program Needs)

- Every level of the Thai government holds regular elections. It is unclear from open-source research whether these types of political dynamics significantly affect the NSDD's ability to partner with the Thai government. The effects of regime type (or government turnover) on the ability for NSDD

to operate is unclear at the time of this analysis, but remains in the framework as a potentially useful analytical tool.

Institutional Corruption (Ease of Implementation/Program Needs)

- Thailand experiences a high level of police and security force corruption. Thailand is run by a military junta that regularly rigs elections, prevents opposition parties from gaining power, and currently has a highly centralized bureaucracy around authoritarian decision makers. It is unclear whether or not corruption affects NSDD's ability to form a productive relationship with the Thai government, hence Ease of Implementation is coded blue. In terms of program needs, corruption can indicate gaps in the judicial system that allows different types of smuggling, including potential R/N smuggling to exist, thus Program Needs is coded yellow.

Law enforcement, and border security (Ease of Implementation/Program Needs)

- Thailand is currently adopting a new counterterrorism strategy through the Royal Thai Police, Department of Special Investigation. This Department is located in the Thai Military and has historically worked on counterterrorism in Thailand. However, the exact duties within this department are unclear. The International Law Enforcement Academy of Thailand conducts training on R/N detection and border interdiction. Despite the fact that Thailand has relatively porous borders and limited information sharing with neighbors, their existing program support and organization makes Ease of Implementation Green and Program Needs Red.

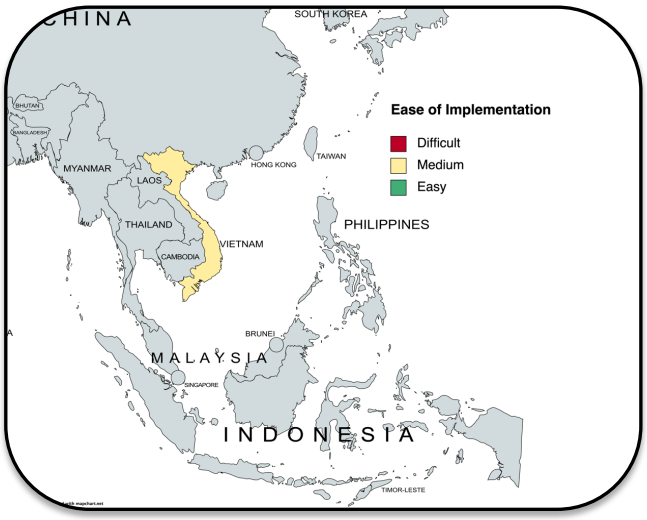
Demonstrated capability to disrupt smuggling routes (Ease of Implementation/Program Needs)

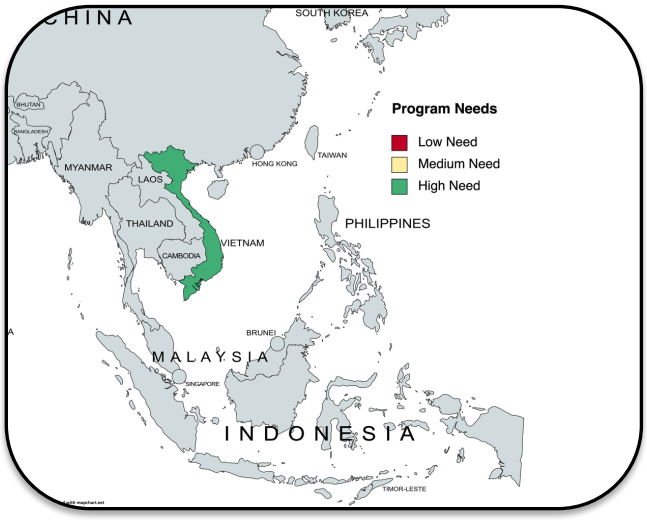
- Thailand faces challenges with an ongoing insurgency on its southern border, drug cartels, oil smuggling networks and a Jihadist presence. Despite this, the State Department assessments state that Thai law enforcement demonstrates the capacity to "detect, deter, and respond to terrorist incidents," thus, it should be very possible for NSDD programs to be included in capacities of Thai law enforcement. The presence of a variety of smuggling networks, insurgency, and extremist groups means that Thailand can be considered a "medium need" country for program needs.

Relationships with international organizations (counterterror efforts) (Ease of Implementation/Program Needs)

- Thailand is active in regional multilateral efforts through the auspices of ASEAN and is also an active member in other international organizations. Bilateral and multilateral cooperation is generally not a problematic area for Thailand; thus, Ease of Implementation is green and Program needs is red.

4.8 VIETNAM





4.8.1 GEOGRAPHY

EASE ***NEED***

In Vietnam, the extensive land borders featuring mountainous regions, dense forests, and river deltas, along with a long, narrow coastline and a mix of topographies present moderate implementation challenges (yellow level) for smuggling control. The air borders, managed by 6 international and 14 domestic airports with moderate air traffic, further contribute to these complexities. The expansive maritime area, with over 3,000 islands and a coastline exceeding 2,000 miles, also necessitates balanced control efforts. Both the ease of implementation and the programmatic needs for smuggling control are considered moderate (yellow level), with the extended daylight hours of summer aiding in enhancing the effectiveness of these operations.

Land Borders (Ease of Implementation / Program Needs)

- Length: 2,883 miles (4,639 km)
- Terrain/Geographical Challenges: Mountainous regions, dense forests, and river deltas

Air Borders (Ease of Implementation / Program Needs)

- International Airports: 6
- Domestic Airports: 14
- Geographical Complexities: a long, narrow coastline along the South China Sea, with varying terrains like mountains, hills, and river deltas; unique shape and the mix of topographies present complexities for monitoring air borders
- Air Traffic Density: Moderate

Sea Borders (Ease of Implementation / Program Needs)

- Total Maritime Area (Exclusive Economic Zones (EEZ)): 161,381 sq miles (418,000 sq km)
- Miles of Coastline: 3,260 km (2,025 miles)
- Number of Islands: 3,000 islands

4.8.2 SOURCES AND SUBCATEGORY METHODOLOGY EXPLANATION

Based on available information, Vietnam currently possesses only one small-scale research reactor and has previously canceled plans to establish a commercial plant in 2016. Nevertheless, it is noteworthy that a consistent flow of trade goods, including metal-containing products, occurs between Vietnam and China. Also, the two countries share a border that spans 870 miles, including 190 miles of river and stream boundaries. Consequently, it can be inferred that Vietnam's ease of implementation is hard, while its programmatic needs are high.

Nuclear Program (Ease of Implementation / Program Needs)

- Vietnam has only 1 small-scale research reactor, but no nuclear power plant exists.
- Vietnam has considered establishing nuclear power generation since 1995, and firm proposals surfaced in 2006. But in 2016, plans were canceled in favor of gas and coal.

Use of Radioactive Materials (Ease of Implementation / Program Needs)

- Radioactive sources do exist in the country, and the government tracks and regulates them.
- No further detailed data on existing sources are available.

Trading Activities (Ease of Implementation / Program Needs)

- China is 1st largest country from which Vietnam imports goods. (38.8% of total imports) Import goods include electrical machinery, mechanical appliances, and plastics.
- India is the 9th largest country from which Vietnam imports goods. (2% of total imports) Import goods include iron, meat, and corn.
- Given the bulk amount of ongoing transboundary movement of goods with the states of concern, Vietnam needs capacity building for the detection, but it is difficult to scan all trading goods.

Spatial Proximity (Ease of Implementation / Program Needs)

- The border between Vietnam and China stretches about 1,400 km, including 300 km of river and stream borderlines.

4.8.3 ECONOMIC/HUMAN DEVELOPMENT AND SUBCATEGORY METHODOLOGY EXPLANATION

Though Vietnam's economy is getting better after the covid pandemic, and the Drug-Use Rate is not that high, both its GDP and HDI are low, which could trigger a high potential of illegal smuggling. Therefore, we overall assume that the level of ease of implementation is hard while the level of program needs is high.

HDI (Ease of Implementation / Program Needs)

- Vietnam's HDI in 2021 was 0.703 which is a low number compared to the world average of 0.732 and its world rank was 115/191.

Drug-Use Rate (Ease of Implementation / Program Needs)

- The prevalence percentage of opiates in Vietnam (Opiates: 0.53) is slightly lower than the global estimate of 2020 (Opiates: 0.61).

GDP (Ease of Implementation / Program Needs)

- Vietnam's GDP per capita in 2021 was $3,756.5 which is a low number compared to the world average of $12,236.6.

Industry and Economic Development (Ease of Implementation / Program Needs)

- Although growth has slowed temporarily since 2011 due to efforts to stabilize macroeconomics, it has achieved the highest growth rate in ASEAN in the past few years. In 2020, the growth rate was the lowest in 10 years due to the influence of COVID-19, but neighboring countries recorded the highest growth rate in ASEAN amid negative growth. It achieved a high growth of 8.02 percent in 2022.

4.8.4 INDICATORS OF R/N SMUGGLING AND SUBCATEGORY METHODOLOGY EXPLANATION

Vietnam has relatively low rates of detected/disrupted smuggling compared to its neighbors, as well as very low rates of terrorist activity within its borders. It does have a comparatively high number of reported R/N material incidents - three since 2013, as well as additional incidents earlier in the century. However, not all of the missing materials are clearly cases of theft, and all were relatively small amounts taken from industrial sources. While this is a cause for concern, it also raises a question about the limitations of this measure - it may be that Vietnam sees more rigorous reporting of these incidents, or that its media is more interested in them. While Vietnam suffers from regional concerns, it has the lowest programmatic needs demonstrated by indicators of R/N smuggling, and appears to have the easiest implementation of law enforcement action discouraging it.

Presence of Terrorist and Extremist Groups (Ease of Implementation / Program Needs)

- Unlike many of the other countries examined in this report, Vietnam is not home to an active insurgency, or home-grown Salafi jihadist terrorist groups. However, Vietnamese citizens have been victims of actions by Abu Sayyaf, primarily by being kidnapped for ransom while at sea, with some later executed.
- Vietnam has recently arrested individuals for planning bombings of police stations at the behest of Trieu Dai Viet, a group based in Canada which calls for the violent overthrow of the Communist Party of Vietnam.

Acts of Terrorism (Ease of Implementation / Program Needs)

- As of 2022, Vietnam rates 0.227 points on the Global Terrorism Index, averaging 0.357 over the last ten years, with a ten-year peak of 1.52 in 2018. It ranks 87th out of all countries.

R/N Material Seizures or Losses (Ease of Implementation / Program Needs)

- CNS data: 3 incidents 2013-2022.

- September 2014: Apave-Asia Pacific Co. Ltd. reports to police that a device containing iridium-192 has gone missing. It is found in a man's house in Ho Chi Minh City, and police declare this a case of theft.
- March 2015: A lead box containing cobalt-60 is discovered missing from a steel mill, with its presence last recorded in 2014.
- December 2015: An industrial device containing cesium-137 discovered to be missing from a cement manufacturing plant.

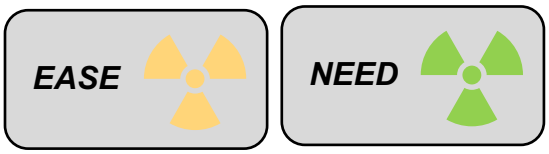
Existing Trafficking Routes (Ease of Implementation / Program Needs)

- Although Vietnam is subject to the same regional dynamics as other countries examined in this study, it appears to be penetrated by fewer reported trafficking routes, potentially reflected in its comparatively low reported drug seizures (although caveats regarding that measure still apply).
- Vietnam is connected to trafficking in the Golden Triangle through its borders with Cambodia and Laos, and also sees trafficking from China - a significant source of illicit drug precursors. It has also been reported that human trafficking worsened in Vietnam as the COVID pandemic created more economic insecurity.

Proxy Good Smuggling (Ease of Implementation / Program Needs)

- In 2020, the UNODC reported that 12 people were detected being smuggled through Vietnam
- In 2020, the UNODC reported that 4.17 tons of methamphetamine, 0.28 tons of marijuana herb, and 0.84 tons of heroin were seized in Vietnam.

4.8.5 PROGRAMS/CURRENT PARTICIPATION AND SUBCATEGORY METHODOLOGY EXPLANATION



It is difficult to assess the climate for NSDD engagement with Vietnam through the lens of current programs and participation. Indeed, there is limited publicly-available information about Nuctech's presence in the country, any existing NSDD programs, or the history of NSDD-ISLE law enforcement cooperation. These three subcategories are the most determinative of *both* Ease of Implementation and Program Need. Nonetheless, given available information for other subcategories, Ease of Implementation is coded "yellow" and Program Need is "green."

GICNT Participation (Ease of Implementation/Program Needs)

- Vietnam is a participant in GICNT. Being a signatory shows their willingness to work to combat global terrorism, making them potentially more open for NSDD programing.

Existing NSDD Programs (Ease of Implementation/ Program Needs)

- Vietnam has a legacy megaports initiative with NSDD. The status of other programs and initiatives are currently unknown. More programs and initiatives are needed in Vietnam; thus it is coded green for program needs. Malaysia has already shown some initiative to work with NSDD, thus Ease of Implementation is coded yellow.

Nuctech Presence (Ease of Implementation/Program Needs)

- There is insufficient publicly available information to usefully analyze Nuctech's presence in Vietnam.

Exports to the United States (Ease of Implementation/Program Needs)

- Vietnam exports $99.3B of goods to the United States annually. The United States has an interest in ensuring shipments of goods do not contain R/N material. Its volume of imports from Vietnam is extremely large compared to the volume from other countries analyzed. Thus, this is coded green for "Program Needs."

Party to the IAEA Additional Protocols (Ease of Implementation/Program Needs)

- Vietnam has a Comprehensive Safeguards Agreement and an Additional Protocol in place. In the past 6 years, there has been no diversion of declared nuclear material and the investigation on undeclared material ongoing at the time of each annual report. This shows a willingness to work with non-governmental organizations, making Ease of Implementation Green.

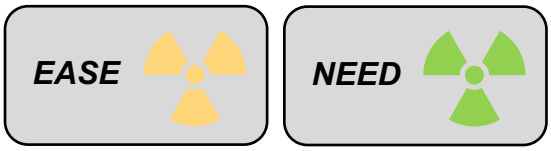
Party to the Treaty on the Prohibition of Nuclear Weapons (Ease of Implementation/Program Needs)

- Vietnam has signed and ratified this treaty, showing a high level of commitment to preventing nuclear weapons.

History of NSDD-ISLE Law Enforcement Cooperation (Ease of Implementation/Program Needs)

- There is no known programmatic relationship between Vietnams local or national police force and NSDD, thus there is no known ISLE program in place in Vietnam. Beginning this program from the ground up is challenging and time intensive, thus Ease of Implementation is red, and Program Needs are high (green).

4.6.6 INSTITUTIONAL CAPACITY AND SUBCATEGORY METHODOLOGY EXPLANATION



Vietnam currently shows an interest in improving its R/N detection and deterrence capabilities, as seen from the IAEA's INSServ mission conducted in March 2023. Vietnam and the United States currently cooperate on capacity building efforts in Vietnam's maritime space to combat illegal activities, however Vietnam's land border remains rather porous, and border security is extremely lenient on wildlife trafficking, demonstrating that the government has a high tolerance for the smuggling of certain types of illegal goods.

Regime type: (Ease of Implementation / Program Needs)

- Vietnam has a communist political structure, in which the President is the head of state and the Prime Minister is the head of government.

Recent Government Leadership Changes/Government Turnover Rate (Ease of Implementation / Program Needs)

- Vietnam holds popular elections to elect its National Assembly every five years. After each election, this National Assembly appoints the country's President and justices. The President subsequently appoints the Prime Minister.

Institutional Corruption (Ease of Implementation / Program Needs)

- Despite anti-corruption measures under the current general secretary of the Communist Party of Vietnam (CPV), there is still a broad public perception that corruption is endemic within the Vietnamese government. Some watch dogs claim that corruption has even risen in recent years. The government recently faced embarrassment due to a scandal related to COVID-19 test kit procurement that involved regional Centers for Diseases Control and other public institutions. Still, government corruption is less of a concern for the Vietnamese public than Chinese encroachment on Vietnam's maritime sovereignty.

Law enforcement, and border security (Ease of Implementation / Program Needs)

- The Department of State maintains an INL partnership that seeks to strengthen Vietnam's maritime law enforcement. Its specific focuses are disrupting the maritime trafficking of various goods and strengthening overall maritime domain awareness through regional cooperation. The United States similarly has an INL partnership with Vietnam's Defense Department, which aims to improve security infrastructure, increase technical assistance, and equip Vietnam's Coast Guard to combat illegal activity in the maritime domain. Furthermore, the 2016 U.S.-Vietnam Letter of Agreement (LOA) expanded law enforcement capabilities and strengthened the criminal justice sector.

Demonstrated capability to disrupt smuggling routes (Ease of Implementation / Program Needs)

- Rapid development in Vietnam creates incentives for economic exploitation through the smuggling of illicit goods. Occasional interdiction occurs, but there is little evidence that Vietnamese law enforcement is organized or resourced enough to do this consistently. Vietnam is a hotspot for global wildlife trafficking, though the country has made little progress combating this. Yet, in March 2023, customs agents did interdict seven tons of ivory at Vietnam's Port of Hai Phong through the UNODC-World Customs Organization Container Control Programme. Vietnamese officials have also recently cracked down on air smuggling. This year, they have arrested dozens of people for trying to smuggle narcotics into Vietnam, including in toothpaste tubes.

Relationships with international organizations (Ease of Implementation / Program Needs)

- Vietnam invited the IAEA to conduct an INSServ Mission in March 2023 focused on Material Out of Regulatory Control (MORC). IAEA officials assessed Vietnamese interagency cooperation on nuclear security and found that Vietnam is making progress to strengthen its nuclear regulations. They recommended that the country continue to improve cross-agency cooperation and increase detection system efficacy at seaports and airports. Nonetheless, Vietnam's relationship with the IAEA and other multilateral organizations indicates that it likely has bandwidth and will to engage with NSDD.

5. FINDINGS AND RECOMMENDATIONS FOR NSDD ENGAGEMENT IN SOUTHEAST ASIA

5.1 FINDINGS

Prioritize outreach to countries in which program implementation is less challenging but still needed to maximize "risk reduction per dollar". This report concludes that Vietnam should thus be prioritized, with this report's understanding of the weights and values of its metrics, due to its comparatively high program needs and middling ease of implementation.

This analysis points to Malaysia and Thailand as the next states to target – states assessed to have middling challenges to implementation as well as program needs – and Indonesia and the Philippines, which are assessed as having particularly high program needs but also facing significant challenges to program implementation.

Three caveats must be addressed. First, this report understands ease of implementation as being affected by both obstacles to partnership building (such as political constraints) and obstacles to law enforcement (such as high trafficking or long borders). NSDD may not share this assumption as it prioritizes partnerships. Second, the weights overall assigned to this report's various metrics are products of its authors' analysis, which may differ from NSDD experience in what contributes to implementation difficulty or national need. Third, while objective metrics were utilized when possible, many touch on complex issues, and the magnitude of certain obstacles can only be accurately understood first-hand, increasing the importance of forward deploying NSDD employees in the region.

The significant maritime dimension to Southeast Asian smuggling complicates law enforcement action. Southeast Asia's geography makes maritime detection initiatives paramount to regional R/N security. However, it also makes maritime awareness difficult to achieve, and maritime borders in the region contribute to jurisdictional and coordination issues. NSDD assistance with regional powers will need to keep these issues in mind, whether that entails coordination with regional multilateral organizations; support for the sharing of information, like vessel registration and shipping records, or the standardization of operation procedures between countries;[1] or working through table top exercises to determine responsibilities over maritime policing within partner states.

The effect of corruption on NSDD's ability to cooperate with partner countries depends on the types and levels of system corruption. A more in-depth analysis of corruption in ASEAN nations is beyond the scope of the report, however NSDD should consider levels and types of corruption when working with partner countries. The presence of local or national corruption should not preclude NSDD from sharing R/N smuggling detection and deterrence expertise and capacity as a matter of shared interest in public safety. However, program design must be mindful of the ways in which a partner might use bilateral or multilateral programming and equipment in ways that are antithetical to U.S. values.

[1] From Paul Trask interview

5.2 RECOMMENDATIONS

The research and analysis contained in this report, as well as interviews with experts, yield several recommendations regarding NSDD's engagement with countries in Southeast Asia. These fall into three broad categories, listed below.

1. Do not overburden existing missions.

a. **Focus on breadth rather than depth** while maintaining NSDD's rigorous programming standards. R/N material smuggling is a low-occurrence, yet high-threat, event. Furthermore, Southeast Asia's geography, among other factors analyzed above, creates many smuggling vulnerabilities. NSDD should maximize regional protection by developing a baseline understanding of R/N smuggling among many different stakeholders, thereby casting a wide rather than deep net. NSDD's ISLE programming is particularly valuable, as local law enforcement and security agencies have the broadest reach and authority for anti-smuggling operations.

b. **Support local law enforcement priorities and "be additive to the mission without changing the mission space."** Analysis of the Southeast Asian threat environment suggests that resource-constrained law enforcement agencies will likely prioritize confronting common illicit activities, like drug smuggling, over R/N material interdiction. NSDD should cultivate a baseline knowledge of R/N material interdiction and safety among frontline personnel, including counter-drug and counterterrorism forces. One way to creatively and unobtrusively build R/N material detection into existing interdiction missions is by supporting the IAEA's rollout of the TRACE app in countries like Vietnam or Malaysia, which have expressed interest. As one expert interviewee suggested, "build [a] training architecture that doesn't require them to suddenly be R/N experts but [instead to] know who they should call."

CASE STUDY: AUSTRALIA LAW ENFORCEMENT FINDS NARCOTICS AND URANIUM

In 2009, Australian authorities arrested a man allegedly involved in the manufacture and sale of drugs including amphetamines, as well as potential distribution of confidential police documents. In the course of the raid on the individual's storage facility and drug laboratory, police discovered a glass jar containing uranium powder. Forensic analysis on the sample tied the uranium to a former uranium mine in Queensland.

This incident highlights the fact that illegally-acquired R/N material are not always found by sophisticated intelligence operations or at border crossings. Other security forces, such as ordinary police officers or maritime law enforcement agents, can unexpectedly find these materials. This poses an even higher safety risk to both personnel and the public if local law enforcement is not equipped with proper safety training and equipment. This incident supports this report's recommendations to equip and better train internal security and law enforcement. Doing so will simultaneously increase the probability of detecting and disrupting R/N trafficking by casting a broader net, and support. Law enforcement personnel confronted with potentially dangerous materials without overburdening them.

c. **Prioritize the deployment of mobile detection resources.** While these are less powerful than RPMs and may not detect all R/N material, they are more easily added to the toolkits and missions of local law enforcement. In addition, their comparatively low cost allows broader distribution and more flexibility over time given different departmental budgets. As analyzed above, Southeast Asia's

countless and often porous green *and* blue borders, coupled with the volume of trade passing through them, pose distinct challenges to interdiction and demand flexibility and mobility.

2. **Focus on capacity and organizational structure.**

    a. **Seek opportunities to test potential partners' capacities and will before fully dedicating NSDD resources and programs.** One strategy for accomplishing this is adopting a phased approach to new engagements in Southeast Asia. Whether agencies and security forces have successfully interdicted other forms of smuggling may indicate the potential partner's ability to absorb NSDD technology and training. Additionally, previous participation in IAEA programs and GICNT may indicate willingness to partner with NSDD. The "Programs and Current Participation" category of the analytical framework above may be a helpful starting point for assessing this. NSDD could also contact other U.S. government agencies who have previously engaged with the potential partner to learn whether the collaboration was fruitful.

    b. **Frequently stress-test NSDD and partner capacity** through tabletop or on-the-ground exercises that simulate an instance of R/N material detection and the appropriate response. More than one expert interviewee noted the importance of these exercises. They should include personnel from various agencies and countries to facilitate cross-sector and international detection cooperation. Most ASEAN governments experience regular government turnovers, which may lead to changes in how certain agencies and programs are politically and budgetarily prioritized. Frequently stress-testing partner capacity allows NSDD to adapt to these evolutions.

    c. **Assist partner countries in delineating R/N smuggling responsibilities within partners' counterterror and counter-smuggling apparatuses.** Desk research and interviews indicate that many countries do not specifically assign responsibilities for the interdiction of trafficked R/N material, which could cause confusion in the event of an R/N incident. When working with partner countries, NSDD should help partners define the responsibilities of each law enforcement and security agency operating in this field. Table-top activities mimicking R/N detection incidents may prove useful in helping partner states delegate tasks and standard operating procedures for efficient response to R/N material smuggling.

3. **Pursue multi-faceted outreach initiatives.**

    a. **Prioritize engagement with organizational leaders and management**. Front-line personnel carry out detection activities, but their superiors make it an institutional priority and direct resources toward this mission. Though potentially difficult, involving organizational leadership and management in simulations may solidify their commitment to R/N material detection and facilitate cross-agency cooperation. One expert noted that disjointed government responses are frequently attributable to differences among principals rather than among personnel on-the-ground. The above-average level of corruption in Southeast Asia, analyzed above, compounds the value of ensuring mission cohesion throughout organizations' chains of command.

    b. **Seek to fill in the gaps in Chinese outreach to the region.** The increasing presence of detection technologies, whether Chinese or American, in Southeast Asia may be overall beneficial to R/N material detection. However, authorities from multiple countries have implicated Nuctech in poor business practices, and China provides little training to accompany its R/N detection technology.

Based on geopolitical analysis, Southeast Asian states do not want to feel forced to choose between the United States and China. However, by offering regional actors a superior program than Nuctech does, NSDD can make this a non-choice.

c. **Forward deploy at least one regional expert to Southeast Asia, given its enormous cultural, linguistic, religious, economic, and social diversity**. This person can coordinate with local partners and other U.S. government entities in the region, serving as the "hands and feet" for NSDD country managers. Moreover, as one interviewee noted, the COVID-19 pandemic prevented NSDD personnel from traveling internationally. In case of future global crises, having an expert forward deployed in Southeast Asia may help ensure continuity of NSDD programs and initiatives.

   Determining where to base this expert within Southeast Asia requires additional analysis. However, to facilitate logistics, NSDD should consider locating this person alongside U.S. government entities already operating in the region. An example for this is the close collaboration between the Department of State and the United States Agency for International Development; "overseas, the majority of USAID missions are co-located in U.S. embassy buildings."

5.3 CONCLUSIONS AND FURTHER AVENUES OF RESEARCH

Based on this report's findings, Vietnam is the optimal Southeast Asian country for NSDD to effectively implement programs in a high-needs setting. Prioritizing Vietnam will allow NSDD to identify and address potential challenges or friction points. It can then refine its approach before moving on to other countries with similar levels of need but more complex implementation environments.

The initiative could be significantly bolstered by additional research conducted in a Capstone format. Potential topics include an in-depth analysis of Nuctech, its influence in Southeast Asia, and the challenges this might pose to NSDD's program implementation. Furthermore, a comprehensive review of the logistical aspects of forward deploying an NSDD employee to Southeast Asia could prove beneficial. Each of these projects would serve to advance NSDD's missions of collaborating with partner countries to detect, disrupt, and investigate the smuggling of R/N material.

6. APPENDICES

6.1 APPENDIX A: INTERVIEWEES

Mike Connor, *Senior Advisor for the Office of Nuclear Smuggling Detection and Deterrence within the Department of Energy*

Hugo German, *Regional Advisor for the Office of Nuclear Smuggling Detection and Deterrence within the Department of Energy*

Heather Ivy, *Retired Special Agent for the Critical Incident Response Group at the Federal Bureau of Investigation*

Neil Kuhn, *Former Director of Analysis for the OGA CWMD*

Charles Massey, *Senior Nuclear Security Officer for the Department of Nuclear Security at the International Atomic Energy Association*

Rebecca Miller, *U.S. government contractor who supports INTERPOL's Incident Tracking Database*

Aaron Mosby, *Senior Project Manager for the Radiological and Nuclear Terrorism Prevention Unit at INTERPOL*

Darsie Rogers, *Former Deputy Director for the Defense Threat Reduction Agency within the Department of Defense*

Scott Sagan, *Senior Fellow at the Center for International Security and Cooperation and the Freeman Spogli Institute at Stanford University*

Bryceon Shulman, *NSDD, Senior Nonproliferation Advisor at Culmen International*

Paul Trask, *NSDD, Maritime Vectors Subject Expert, Sandia National Laboratories*

Kevin Wickel, *Acting Policy Team Chief for the Office of Weapons of Mass Destruction Terrorism within the Department of State*

Erica Wolf, *Foreign Affairs Specialist for the National Nuclear Security Administration within the Department of Energy*

6.2 APPENDIX B: CATEGORICAL BREAKDOWN OF ANALYTICAL FRAMEWORK

The Capstone team ranked each category in the framework according to rigorous research analysis. The color ranking for each category and sub-category described in Section 4 of this report can be found here: Capstone Research Analytical Framework

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This report would not have been possible without a great deal of reporting, analysis, academic work, and database maintenance on the part of a great many authors. Our bibliography is included in this document, but is large enough to be unwieldy. Because of this, our team has compiled our sources into a Source Tracker, which can be more easily searched through. It can be found here: Capstone Research Source Tracker.

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