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Enhancing Energy Security, Underpinning Development: The Future of Nuclear Energy in ASEAN

If ASEAN intends to meaningfully enhance its energy security, take greater steps to protect itself from instabilities in the international energy market, and effectively underpin its continued development, it should move beyond simple public pronouncements, to begin a serious consistent debate on developing nuclear power in the region whilst ensuring its effective governance. Several ASEAN states have already taken concrete policy measures; the effectiveness of which can be assessed and built upon for the betterment of the entire region.

By Ryan Clarke, Collin Koh, and Kevin Punzalan



While nations such as China, the Philippines and Vietnam are investing in renewables, not all nations are able to adopt them economically.

Source: Ryan McD. Available at: <http://www.flickr.com/photos/mcdnry/2488756769/>.

Introduction

Nuclear energy is a controversial topic in Southeast Asia, which tends to solicit strong views both in favour as well as against its introduction into the region. This division was also witnessed during the recent workshop on 'Nuclear Energy and Human Security' hosted by the RSIS Centre for Non-Traditional Security Studies on 23 April 2010 at Traders Hotel in Singapore. This conference brought together a wide range of policy and security scholars, scientists, economists, civil society leaders, and practitioners from Asia and the West to discuss the potential role of nuclear technology in safeguarding ASEAN's energy security.



Given the currently unsustainable growth in the use of oil and natural gas in the electricity and transport sectors in the ASEAN region, coupled with uncertainty over future prices, nuclear energy is very likely going to figure into Southeast Asia's energy mix. Nuclear energy should be considered an integral part of the portfolio of options to enhance ASEAN's energy security. It should be viewed as an interim solution that can address the current challenge more quickly and efficiently than other renewable sources of energy such as wind, solar, and geothermal. Notwithstanding the controversies around nuclear projects in some Southeast Asian countries, it would

appear that the decision to go forward with nuclear power generation is highly likely in the medium term. While renewable energy technologies remain an attractive long-term option for countries that seek to increase their energy independence and to reduce their carbon footprint, nuclear technology is mature by comparison and can generate large amounts of power from a limited number of installations. These characteristics make new nuclear installations attractive in comparison to fossil fuel plants (though fossil fuels will still form the bulk of energy mixes of most ASEAN countries in the near future). As the technology associated with nuclear energy is established, it is better able to generate and consistently deliver electricity. It is also more compatible with current electricity grids in the region. Further, while renewable energy technologies have become increasingly affordable, their widespread implementation remains limited by relatively low economies of scale. While far from being an all-encompassing solution, when these technologies are applied to conventional, centralised electricity grids, nuclear energy can play a productive role in reducing ASEAN dependency on oil and natural gas for electricity generation thus enhancing the region's energy security as well as its leverage when dealing with the international oil and natural gas market.

[^ To the top](#)

Cost-Benefit Analysis of Nuclear Energy

Despite being the source of considerable public apprehension, nuclear energy has several advantages over oil and natural gas. For example, nuclear reactors primarily use uranium as their fuel source, which can be purchased and warehoused in multi-year quantities, thus greatly enhancing price as well as supply stability. While negotiations over the one-off pricing for uranium can be intense, it is not plagued by the massive price swings witnessed in the international oil market due to uncertainty or lack of clarity over global demand, gluts in supply, and geopolitical tensions. Further, countries that have the largest uranium deposits, such as Australia and Canada, tend to be more politically stable with democratic systems of governance and a culture of openness and transparency. This differs greatly with most of the world's largest oil and natural gas producers, which are often authoritarian, have questionable judicial standards, and are increasingly prone to engage in resource nationalism at the expense of market efficiency.

In terms of climate impact, nuclear energy has substantial advantages over fossil fuels. Compared to renewable sources, nuclear energy has matured as an energy source capable of generating large amounts of electricity from limited amounts of fuel. Further, while the nuclear fuel cycle is not completely carbon neutral, it nevertheless generates much less carbon and airborne pollutants than fossil fuel-based energy technologies. In addition, renewable energy technologies at present are best suited to decentralised or fragmented grids. This is why countries with vast empty expanses, such as China or archipelagic countries like the Philippines and Indonesia will likely be able to implement them at a local level in a more cost effective manner. However, not all of ASEAN is characterised by this type of geography, and as such, this cannot be viewed as a realistic option for the entire bloc at this point in time.

Despite its obvious advantages, there is considerable apprehension amongst security analysts, environmentalists, as well as the general public regarding nuclear energy. Some security analysts have expressed concerns that nuclear power plants that are located in areas of high population density could become attractive terrorist targets and often cite public statements and known discussions amongst terrorist groups to support their concerns. However, while certain terrorist groups would no doubt like to target a nuclear power plant, it is important to distinguish between fantasy and reality and to note that intent is only a part of the equation that also includes the critical variables of capability and opportunity. Nuclear power plants (especially the newest designs) are extremely complex and secure facilities and have a wide variety of containment and shutdown mechanisms in case of any kind of emergency. While this does not suggest that vigilance is not necessary or downplay the devastating consequences of an attack, if successful, terrorist groups tend to be risk averse and attack targets that have a high probability of success and a low probability of disruption or of its members being apprehended. The probability of a successful attack is very low while the risks quite high and as such, it can be rationally argued that a terrorist attack on a nuclear power plant is a rather remote possibility. In order for an attack to be successful, a terrorist group would have to be able to infiltrate the highest levels of a nuclear establishment, which would invariably mean recruiting the leading scientists. While speculation has been rife and there has been a worrying trend of 'possibilistic' over 'probabilistic' reasoning, there is one empirical example. Al-Qaeda made several attempts

to infiltrate Pakistan's nuclear establishment in the 1990s but despite its financial resources and the presence of a considerable portion of Islamist-leaning scientists and generals, the organisation was unable to procure any nuclear material. Further, it must be noted that despite the for-profit black market for nuclear and missile technology established by the 'father' of Pakistan's nuclear programme, Dr Abdul Qadeer Khan, Al-Qaeda was still unable to access these materials even though it was in Pakistan.

There are other concerns amongst environmentalists as well as the general public regarding radiation poisoning and nuclear waste. When discussing radiation poisoning, they refer to the unfortunate incidents of Chernobyl (1986) and Three Mile Island (1979) and state that untold numbers of people died painfully from the leakage of radiation while others suffered from mysterious illnesses, birth defects, and other ailments. However, these were both atypical cases. Chernobyl was caused by a faulty Soviet reactor design as well as serious operational errors, a direct consequence of Cold War isolationism and the lack of safety culture. Regardless, technology has vastly improved since this period and modern-day reactors that are being offered on the international market are generations ahead of their predecessors. Further, Dr Michael Quah noted during the RSIS NTS workshop on nuclear energy and human security in April that we are exposed to considerable radiation from a wide range of sources on a daily basis, which we otherwise appear willing to tolerate^[1]. This point was seconded by Dr T. S. Gopi Rethinaraj^[2] who noted that radiation is not inherently harmful provided humans receive it in moderate doses and as such, most fears surrounding the

The inactive Bataan Nuclear Power Plant, the first built in Southeast Asia.



Source: I. Rotaru/IAEA. Available at:

<http://www.iaea.org/NewsCenter/News/2008/bataannpp.html>.

construction and operation of nuclear power plants are unfounded and are the result of a lack of knowledge on this complex subject. He also stated that there can be 'islands of excellence' when it comes to ensuring security standards regarding nuclear industries even if the country as a whole falls short in other aspects of its national security; India being the clearest example of this.

[^ To the top](#)

The ASEAN Challenges

Aside from these concerns, nuclear energy development in the ASEAN region is potentially inhibited by at times tumultuous geopolitics, in which outstanding interstate discords continue to exist, as well as tenuous governance, especially in relation to lack of transparency in policymaking and problems of corruption. Nuclear energy is also characterised by rather high initial overhead costs, which is compounded by the fact that energy investments are already not always forthcoming in some ASEAN states. Further, others such as Dr Kelvin S. Rodolfo of the University of Illinois have drawn attention to geographical and seismic risks, as the region is prone to natural disasters that can pose physical harm to nuclear facilities. Lastly, concerns have been voiced over the potential for nuclear proliferation in the region.

While these issues deserve the full attention of ASEAN member states, they should be viewed as hurdles rather than roadblocks. All of these challenges can be overcome by sound public policy and consistent enforcement, adhering to international treaties, effectively harnessing scientific expertise, and prioritising greater regional interests over lower-level bilateral disputes. While this may sound somewhat idealistic, it is necessary if ASEAN wants to enhance its energy security and leverage when dealing with the international oil and gas market.

[^ To the top](#)

ASEAN's Collective Stance on Nuclear Energy

It is important to first acknowledge that socio-economic development constitutes the bedrock of nation-building and that energy diversification is an indispensable component of any strategy. However, socio-economic impetus aside, the general recognition among regional states about climate change consequences brought about by the use of fossil fuels, as well as the volatility of such primary sources as shown during the oil price crunch in 2004, aptly demonstrated the need to diversify fuel sources. Nuclear energy therefore began to be considered as an attractive option in that it provides a technologically-mature and viable alternative energy source that can be a medium to long-term solution towards reducing reliance on hydrocarbons.

Pressured by the oil price crunch, which started in 2004, and the increasing calls for action against climate change, in November 2007 ASEAN leaders issued a joint statement supporting civilian nuclear power regardless of whether or not each member state institutes its own programme. ASEAN has reiterated its stance that, while it supports nuclear power, it should only be meant for civilian energy purposes and not weaponisation. As early as July 2007, there were calls among ASEAN members for the creation of a regional nuclear watchdog to ensure the security of nuclear materials.

[^ To the top](#)

What is in Store for ASEAN?

The use of nuclear power in the ASEAN region is very likely in the medium term. First, the utilisation of renewable energy sources is not deemed a total panacea to contemporary energy security problems. Moreover, as past and recent events have shown, while public debates continue to flare up and, in certain cases, have stifled progress in nuclear policymaking in some ASEAN countries, it would appear that for the pragmatic reasons stated above, nuclear aspirants in the region are not likely to rule out the option even if other renewable sources are available and economically viable.

Despite the public opposition to date, there is no sign that ASEAN governments intend to abandon the nuclear option. Even in democratic and democratising ASEAN states, where public opinion is deemed as more likely to beset nuclear plans, policymakers continue to devote consistent efforts towards convincing the public about the benefits of nuclear power, notwithstanding the potential risks involved. For example, while Bangkok has repeatedly faced public opposition, it continues to adapt its nuclear public outreach strategies. The current focus on accelerating nuclear public education testifies to the fact that Thailand is quite keen to retain its nuclear option. Recently, some Thai energy officials have even appeared to postulate an 'all or nothing' scenario when they stated that the country needs to build more coal-fired power plants (which are obviously more polluting) if the nuclear energy plans fall through.

In Indonesia, a parliamentary decision in mid-March 2010 to urge speedy development of nuclear energy is seen as a major new policy direction. This could have given the incumbent administration in Jakarta a boost in pushing ahead with its nuclear plans and also suggests that socio-economic and environmental imperatives appear to trump public concerns. For example, in March 2010, during a seminar on 'Prospects of Nuclear Electric Power in Indonesia', the Indonesian Minister for Research and Technology Suharna Surapranata remarked that energy security is crucial for national security, and he deemed nuclear technology as 'a necessity' if Indonesia was to transform into a developed country. At present, nuclear policymaking is not simply the exclusive preserve of Jakarta; other provincial governments such as East and West Kalimantan are requesting for nuclear power plants to be built in their regions.

In summary, ASEAN nuclear aspirants appear to adopt a hedging strategy for energy security; not putting all eggs into one basket by emphasising renewable developments while still pushing ahead with exploring nuclear energy despite public opposition. Policy statements and moves in Indonesia, Malaysia, the Philippines and Thailand have demonstrated such intent. Nuclear energy might very well be perceived as a form of insurance against the fiscal and technical uncertainties associated with renewable developments. More realistically, nuclear energy will most probably feature, if not predominantly, in national energy mixes of some ASEAN countries alongside sizeable portions of renewable and hydrocarbon sources. Put simply, the use of nuclear energy in the region appears almost inevitable.

[^ To the top](#)

Vietnam – De Facto Leader in ASEAN Nuclear Energy Development

To date, Vietnam has shown the most progress in its nuclear energy plan. However, Vietnam is particularly unique. Financially and technologically, it seemed unlikely that Vietnam, less developed and wealthy than some of its neighbours in the region, would pioneer nuclear energy generation given its costs and technical complexities. What has helped Vietnam get a headstart is that its nuclear policymaking is exclusively 'siloe'd' at the highest levels of the political apparatus in Hanoi. In addition, there is virtually zero public consultation and, at the same time, very low opposition (at least officially) among the Vietnamese public. It could be argued that Vietnam benefits from an ideal political environment to advance its coveted nuclear energy plans, and this is not just restricted to the absence of groundswell opposition but also includes the political will demonstrated by Hanoi's leadership. It appears that continued progress in socio-economic development, seen as pivotal to Vietnam's national security, remains arguably the singular justification for nuclear energy development.

Hanoi is seeking to demonstrate that it possesses a coherent governance strategy for its nuclear programme. In an apparent effort to stave off criticisms of excluding public consultation and lack of transparency, Hanoi instituted a series of measures, one of which was the enactment of an Atomic Energy Law in 2008, which outlined a development strategy as well as safety and security measures for nuclear power. To bolster its implementation, in late January 2010, it was reported that Hanoi had issued an official decree stressing the need for stringent regulatory controls on nuclear safety through the establishment of a national observation and early warning network against environmental radiation.

The Vietnamese authorities appear to also devote attention towards proper human resource management. In a July 2009 interview, the Director of the Vietnam Atomic Energy Institute, Dr Vuong Huu Tan stated plans for the organisation to set up domestic training facilities and offer overseas training opportunities for aspiring Vietnamese nuclear specialists in preparation for the development of nuclear power plants. These plans were taken a step further in March 2010, when the Russian nuclear power engineering firm Atomstroyexport announced plans to construct a nuclear research centre in Vietnam by 2012 and begin operating it in 2017. Also, Russian state nuclear corporation Rosatom signed a memorandum of intent with the Vietnamese Ministry of Education and Training for the grooming of local nuclear specialists.

Vietnamese authorities have always reiterated consistent policy stances on nuclear energy. For instance, during a press briefing in Washington in April 2010, Vietnamese Minister of Science and Technology Hoang Van Phong stated the country's commitment towards treating nuclear security and safety as their top priority. Past and recent government statements have also consistently indicated full support for nuclear disarmament and non-proliferation, and stressed on the country's commitment to international treaties and guidelines on civilian nuclear energy development.

[^ To the top](#)

The 'Vietnam Model' for Nuclear Energy in ASEAN

Vietnam enjoys the domestic political climate that facilitates nuclear development but the Vietnamese leadership does not view this issue through a narrow nationalistic lens. Considerable efforts have been made by Hanoi to ensure that its nuclear energy programme does not spark security concerns amongst its neighbours, or the international community at large, despite its political culture and system of governance. It has not attempted to 'export' its approach and it has committed to cultivating a nuclear safety and security culture. Past and recent policy statements and actions highlight this double-pronged strategy of stressing economic imperatives while providing reassurances through practical measures, such as the enactment and effective implementation of the Atomic Energy Law.

In contrast, while past and recent policy statements and actions of other nuclear aspirants in the ASEAN region have continued to place enormous focus on the economic imperative for having nuclear energy, they have not followed up with policy initiatives. What is required are tangible policy measures, backed by firm actions, which could give reassurance to both domestic and international audiences. Vietnam not only repeatedly stressed its commitment towards nuclear safety and security, but has also implemented measures to provide definitive substance to its policy pronouncements. The domestic political environment in some other ASEAN nuclear aspirants, however, would certainly be more tenuous given the nature of public involvement in the nuclear debates. As such, these countries would have to devote greater attention to implementing tangible policy actions, more so than words, in their nuclear energy plans.

[^ To the top](#)

The Centrality of Regulatory Frameworks

Legal frameworks and the establishment of regulatory institutions remain a vital component of nuclear energy programmes because they maintain oversight on the safety of construction and operation of nuclear plants. A national nuclear watchdog that has real enforcement power not only ensures the safety of the country that has established it, but the safety of neighbouring countries as well. Because of this, the independence of the nuclear regulatory body must be non-negotiable and guaranteed by law. Even in countries that have extensive experience with nuclear energy, such as France, a body combining the mandates of both ensuring the safety of nuclear installations and protecting the public from radiological exposure was only created in 2006. The World Nuclear Association reports that the new body, the Nuclear Safety Authority (Autorité de Sûreté Nucléaire or ASN), still needs government approval for major licensing decisions.

In the Philippines, the Philippine Nuclear Research Institute (PNRI) combines the functions of both promoting scientific research in nuclear energy and regulating it. However, a Senate bill (SB 2395) has recently been filed proposing the establishment of an independent Philippine Nuclear Regulatory Authority, which would consolidate the functions presently separated under the PNRI (which regulates nuclear and radioactive materials used in all fields) and the Bureau of Health Devices and Technology (which regulates electrically generated radiation emitting devices used in all fields). The bill also sets measures and regulations consistent with international treaties and conventions on the management of radioactive waste and spent fuel, emergency preparedness, radiation protection, and nuclear security.

In order for a state to establish a fully functional nuclear energy programme, it must develop the necessary human, legal and technological infrastructure to maintain that programme. Each of these factors must be developed to ensure high standards of safety, and competence in managing nuclear power stations. In a study on the development of the Philippine Nuclear Energy Programme, it has been estimated that it takes at least 10 years to locally develop the scientific and technical expertise needed to operate a nuclear plant. To address this, a bill has been filed in the Philippine Senate (SB 3171) to establish a pool of nuclear scientists and engineers through the provision of scholarships to study overseas. In addition, domestic universities must establish relevant academic departments in order to expand the field and to remain up-to-date with technological developments and international best practices. Despite the current public debates on whether nuclear energy should be adopted, measures such as these are intended to lay the groundwork for a nuclear industry, should the public decide to accept it.

[^ To the top](#)

Prospects and Challenges for Regional Governance

Philippine Foreign Secretary Alberto G. Romulo meets IAEA Director-General Mohamed ElBaradei. The IAEA would later send a team to advise on the assessment of reactivating the BNPP.



Source: Dean Calma/IAEA. Available at:

http://www.iaea.org/NewsCenter/Imagebank/SearchResult_Preview.jsp?page=5.

For nuclear energy to be adopted in ASEAN, there likely is a need for a regional regulatory framework to be established to complement already-existing international arrangements. Frameworks not only ensure the safe operation of nuclear power plants, but they also enable individual countries to purchase nuclear fuel and technology from abroad in a systematic and reliable fashion. As the nuclear fission process relies on uranium, a material that can also be used for the production of nuclear weapons, compliance with international conventions regulating the nuclear fuel cycle will ensure cooperation by supplier states. In addition, ASEAN states will need to purchase most of the technology for nuclear reactors abroad, so strict compliance with the standards set out by the International Atomic Energy Agency (IAEA) is an absolute necessity. Given this reality, any regional framework must have a strong enforcement mechanism, as non-compliance by one ASEAN state can potentially undermine the interests of the entire bloc.

Besides safety standards, multilateral cooperation on nuclear energy provides the opportunity to build trust at the regional level itself while also distributing costs and risk, and avoiding unnecessary and wasteful duplication. As international concerns about nuclear non-proliferation have grown with the development of North Korea's illicit nuclear weapons programme, and with concerns that Iran is doing the same, multilateral cooperation in the areas of nuclear fuel enrichment and nuclear waste processing provide an avenue for ensuring that nuclear materials and technology do not end up in the wrong hands. This cooperation should take the form of agreements to distribute control over nuclear fuel enrichment multilaterally to allay fears that individual states may seek to weaponise nuclear fuel, and agreements providing for regional nuclear waste management and disposal.

[^ To the top](#)

Concluding Thoughts

If ASEAN intends to meaningfully enhance its energy security, take greater steps to protect itself from instabilities in the international energy market, and effectively underpin its continued development, it should move beyond simple public pronouncements and begin a consistent and serious debate on developing nuclear power in the region, ensuring its effective governance. Further, developing a regional framework for nuclear waste enrichment and waste disposal will lend credence to the viability of the nuclear programmes of ASEAN aspirants. Unlike other regions, several ASEAN states have taken concrete policy measures whose effectiveness can be assessed and built upon for the betterment of the entire regional bloc.

Through the use of nuclear energy, ASEAN can provide a systems solution for the unsustainable increases in its oil and natural gas consumption while simultaneously buying itself time to research economical methods of incorporating renewable sources into its energy portfolio. However, given the challenges involved in market organisation, developing effective regulatory frameworks, and cultivating domestic scientific and technical capabilities, time is not a resource that is in ample supply.

[^ To the top](#)

Selected Bibliography

'Chernobyl Accident', World Nuclear Association, November 2009. Available at <<http://www.world-nuclear.org/info/chernobyl/inf07.html>>

'Health Effects of the Chernobyl Accident and Special Health Care Programmes', Report of the UN Chernobyl Forum, Expert Group 'Health', World Health Organization, 2006.

'The International Chernobyl Project, 1990-91 – Assessment of Radiological Consequences and Evaluation of Protective Measures', Summary Brochure, International Atomic Energy Agency, 1991.

'The International Chernobyl Project, An Overview, Assessment of Radiological Consequences and Evaluation of Protective Measures', Report by an International Advisory Committee, International Atomic Energy Agency, 1991.

'The International Chernobyl Project Technical Report, Assessment of Radiological Consequences and Evaluation of Protective Measures', Report by an International Advisory Committee, International Atomic Energy Agency, 1991.

'Backgrounder on the Three Mile Island Accident', United States Nuclear Regulatory Commission, August 2009. Available at <<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html>>

'Population Dose and Health Impact of the Accident at the Three Mile Island Nuclear Station', NRC Annual Report NUREG 0690, United States Nuclear Regulatory Commission, 1979.

'Southeast Asian leaders back nuclear energy', *AFX Asia*, 20 November 2007.

'No to nuke arms – ASEAN', *Manila Bulletin*, 11 April 2010.

Phil Chaffee, 'Nuclear-Smitten Asean Planners Must Contend with Opposition, Costs and Geography', *Uranium Intelligence Weekly*, 8 February 2010.

'Most Asean members want nuclear power', *Manila Standard*, 27 February 2009.

'Thailand: Energy Ministry to focus on giving people knowledge on nuclear power plant', *Thai News Service*, 2 February 2010.

'Thailand Will Need More Coal-Fired Power Plants If Atomic Plants Opposed', *Dow Jones International News*, 31 March 2010.

'Indonesia parliamentary panel urges speedy move into nuclear power', *Platts Commodity News*, 16 March 2010.

'Four nuclear power plants planned for operation in 2017', *The Jakarta Post*, 20 March 2010.

'Nuclear energy inevitable, Chin tells OBG', *The Edge Financial Daily*, 27 January 2010.

'Napocor drops plans to revive BNPP; wants to build two other nuke plants', *Philippines News Agency*, 28 March 2010.

Eva Visperas, 'Pangasinan board approves construction of nuke plants', *The Philippine Star*, 17 February 2010.

'PCCI favors nuclear power as long-term option', *Manila Standard*, 13 March 2010.

'S'pore to still consider use of nuclear energy', *Straits Times*, 15 April 2010.

'Decree sets nuclear safety fine levels', *Vietnam News Summary*, 11 January 2010.

'Industry: Vietnam Issues Decree on Atomic Energy Law', *Vietnam News Brief Service*, 28 January 2010.

'More Attention Paid toward Workers in Vietnam's Nuclear Industry', *Asia Pulse*, 21 July 2009.

'Rosatom will help Vietnam train specialists for nuclear energy sector', *Interfax: Russia & CIS Energy Newswire*, 17 March 2010.

'Atomstroyexport to build nuclear research center in Vietnam', *Prime-TASS News*, 23 March 2010.

'Vietnam regards nuclear security as top priority', *Vietnam News Agency Bulletin*, 14 April 2010.

'VN supports nuclear disarmament, non-proliferation', *Vietnam News Agency Bulletin*, 31 March 2010.

'Safety and Security Conventions and Codes', International Atomic Energy Agency, 2010. Available at <<http://www-ns.iaea.org/conventions/>>

Pasimio, Jr., Harry, and Peter S. Turingan. *Powering the Future: Are We Ready for Nuclear Energy*. Policy Brief, Senate Economic Policy Office, Senate of the Philippines, Pasay: Senate Economic Policy Office, 2009.

'Nuclear Power in France', World Nuclear Association, 13 April 2010. Available at <<http://www.world-nuclear.org/info/inf40.html>>

Footnotes

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About the Centre:

The Centre for NTS Studies, based in the S. Rajaratnam School of International Studies, was inaugurated by the Association of Southeast Asian Nations (ASEAN) Secretary-General Dr Surin Pitsuwan in May 2008. The Centre maintains research in the fields of Climate Change, Energy Security, Health Security, as well as Internal and Cross Border Conflict. It produces policy-relevant analyses aimed at furthering awareness and building capacity to address NTS issues and challenges in the Asia Pacific region and beyond. The Centre also provides a platform for scholars and policymakers within and outside Asia to discuss and analyse NTS issues in the region.

In 2009, the Centre was chosen by the MacArthur Foundation as a lead institution for the MacArthur Asia Security Initiative, to develop policy research capacity and recommend policies on the critical security challenges facing the Asia-Pacific.

The Centre is also a founding member and the Secretariat for the Consortium of Non-Traditional Security (NTS) Studies in Asia (NTS-Asia). More information on the Centre can be found at www.rsis.edu.sg/nts