



# The Asia–Pacific Nuclear Governance Architecture Part I: Assessing the Need

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## Summary

*This two-part study examines the governance architecture of the Asia–Pacific region for the peaceful uses of nuclear energy as it pertains to non-proliferation, safety and security. Part 1 first considers the widely touted growing demand for nuclear-generated electricity and other types of peaceful uses of nuclear energy in the Asia-Pacific to approximately 2030. This is followed by consideration of how global nuclear non-proliferation, safety and security governance arrangements, notably those managed by the IAEA, are implemented in the Asia–Pacific region and to what extent regional states participate in them. The paper discusses both the extent to which Asia-Pacific is embedded in the global arrangements, as well as the contribution that the region makes to such arrangements. Part II (Policy Brief 41) assesses the existing regional arrangements for nuclear governance and the extent to which they dovetail with and buttress, or whether they compete or even conflict with, the global system.*

## The Nuclear Energy Outlook for Asia–Pacific to 2030

1. A compelling reason for strengthening nuclear governance<sup>1</sup> in Asia–Pacific<sup>2</sup> is that the

region's economic dynamism is continuing to sustain interest and investment in the use of nuclear energy for peaceful purposes.<sup>3</sup> At the turn of twenty-first century there was much talk of a global “nuclear renaissance” in which the Asia–Pacific region would play a vanguard role. Since then more restrained estimations have emerged. Today, the overall outlook for increased use of nuclear energy in the Asia–Pacific region, at least to 2030, is mixed, depending on the particular country and on the type of peaceful uses envisaged. There is no overall trend identifiable for the region as a whole. This makes the situation more complex, but no less deserving of attention in ensuring that effective governance arrangements, both international and regional, are put in place.

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that combine to govern and regulate the peaceful uses of nuclear energy, including norms, treaties, other agreements and arrangements, organizations (whether formal or informal), mechanisms, programs, and documents such as standards and guidelines. These may occur at the international, regional, bilateral and national levels.

<sup>2</sup> For the purposes of this paper Asia–Pacific is defined as encompassing North Asia (including Mongolia, but excluding Russia), and Southeast Asia, as well as Australia and New Zealand, Timor Lesté and Papua New Guinea. Other South Pacific island states and the United States are excluded. India, Pakistan and Bangladesh will only be mentioned when they have a clear relevance to the Asia–Pacific region, for example in respect of nuclear weapons proliferation or the acquisition of nuclear power reactors.

<sup>3</sup> The author is grateful to his project research assistants Jenna Parker and Anthony James Heath for contributing to the research for this paper. The work was conducted as part of a project on Asia–Pacific Regional Nuclear Governance funded by the Carnegie Corporation of New York. For further details see [www.nucleargovernance.com](http://www.nucleargovernance.com)

<sup>1</sup> Nuclear governance is taken to mean all of the elements

2. Nuclear energy for generating electricity is growing in the region, but is restricted to a few countries that have long had such programs, notably China, where the pace of nuclear energy development is faster than in any other country in the world. Following Vietnam's sudden cancellation of its "new build" in 2016 it is unlikely, though, that any Southeast Asian state will have nuclear-generated electricity flowing into its grid by 2030. In between these extremes is a mixed picture, with Japan and Taiwan facing decreased reliance on nuclear energy. China, Japan and South Korea are all seeking to export nuclear reactors. In all states the use of radioactive sources is growing, commensurate with economic growth.

#### *Nuclear Power Plants for Generating Electricity: A Mixed Picture*

3. In late 2016 Vietnam suddenly announced that its parliament had voted to scrap its planned acquisition of nuclear power plants. Until this decision Vietnam was seen as likely to be the first Southeast Asian state to acquire such capabilities, thereby paving the way for other, less decisive states in the sub-region. Russia and Japan were expected to provide two reactors each, providing 4,000 MW of electricity by 2030.<sup>4</sup>

4. Behind Vietnam's about-face was the vaulting cost of full-size plants (\$US 18bn each) compared to other energy sources, the loans for which would have breached the country's debt ceiling.<sup>5</sup> The head of the State-run Electricity of Vietnam Group, Duong Quang Thanh was quoted as saying that "Currently power demand growth is not high, while domestically generated and imported sources of energy are sufficient for social-economic development. In particular, prices of imported sources of energy are much cheaper now."<sup>6</sup> Specifically, the

rapidly dropping price of renewables, the low price of oil and gas, and the possibility of importing hydro-electricity from Laos, were contributing factors.

5. In addition, the International Atomic Energy Agency (IAEA) had reportedly urged Vietnam in 2014 to delay the project to "allow fuller preparation."<sup>7</sup> Ta Minh Tuan of Vietnam's Fatherland Front told the 2017 Carnegie International Nuclear Policy Conference in Washington DC that his country had sent 200-300 students abroad for training to support the planned nuclear power program, but had estimated that ultimately it needed more than 2000.<sup>8</sup> He confirmed that the cancellation of the nuclear program was not due to proliferation or security concerns.

6. Vietnam's decision has reverberated through the sub-region, casting a pall over prospects for nuclear energy. Vietnam reneged on hosting the 8<sup>th</sup> annual Nuclear Power Asia conference in Hanoi in March 2017 and Malaysia offered Kuala Lumpur at short notice. Vietnam then declined to send representatives to the meeting, no doubt due to embarrassment at its program's demise.

7. The conditions cited by Vietnam in reaching its decision are likely to affect all the Southeast Asian states which have been seriously contemplating nuclear energy in recent years. In view of the 10-year lead time and large upfront capitalization required, there is little chance that other Southeast Asian states could be ready to connect nuclear reactors to their grids by 2030.

8. The next likely candidate after Vietnam is Malaysia. Its government has proceeded carefully and systematically to put in place the necessary institutions, governance and practical arrangements, in line with the IAEA's Milestones document.<sup>9</sup> Phase 1 of the Integrated

<sup>4</sup> For background see Tanya Ogilvie-White, "Nuclear Power in Vietnam: International Responses and Future Prospects," American Academy of Arts & Sciences, Cambridge, MA, 2014,

<https://www.amacad.org/multimedia/pdfs/publications/researchpapersmonographs/nuclearPowerVietnam.pdf>.

<sup>5</sup> Ta Minh Tuan, Vietnam Fatherland Front, Concurrent Session II, Carnegie Nuclear Policy Conference, Washington DC, 20-21 March 2017.

<sup>6</sup> "Vietnam's nuclear implosion," [www.nuclearforum.asia](http://www.nuclearforum.asia), Special print edition, March 2017, p 3.

<sup>7</sup> <http://www.world-nuclear.org/information-library/country-profiles/countries-t-z/vietnam.aspx>

<sup>8</sup> Ta Minh Tuan, Vietnam Fatherland Front, Concurrent Session II, Carnegie Nuclear Policy Conference, Washington DC, 20-21 March 2017.

<sup>9</sup> IAEA, "The Milestones Approach," <https://www.iaea.org/NuclearPower/Infrastructure/milestone/index.html>.

Nuclear Infrastructure Review conducted by the IAEA has reportedly concluded that “Malaysia is thoroughly prepared and has developed a considerable base of knowledge to make an informed decision about introducing nuclear power.”<sup>10</sup> But this does not mean that Malaysia is ready for nuclear power, as reported by the press, but only that it is in a relatively good position to make an informed decision about it.

9. The report made nine recommendations and ten suggestions, indicating that there are steps still to be taken. The government has not yet committed to eventually proceeding with nuclear power and will certainly not be in a position to have plants in operation by 2030. Malaysian delegates at the Asia Nuclear Power conference stressed that the country continues to require strengthening of its human capacity in the nuclear field and to ensure that public opinion approves of or at least acquiesces in any decision to proceed.<sup>11</sup> Meanwhile, the international corruption scandal swirling around Prime Minister Najib Razak calls into question the country’s political stability, a bedrock condition for establishing a nuclear power program.

10. Contrary to the Thailand Power Development Plan 2010–30, which envisaged five reactors operating by 2028,<sup>12</sup> the current Thai Prime Minister, General Prayut Chan-o-cha, assured the author personally that his country would not be pursuing nuclear energy for the present due to the cost and safety concerns.<sup>13</sup> Thailand did not make a presentation, nor was it noticeably represented at the Nuclear Power Asia conference in March 2017.

11. While Philippines President Rodrigo Duterte has announced he will revisit the possibility of nuclear power for his country, it is difficult to imagine that an attempt to resuscitate the mothballed Bataan project will be any more successful than previously.

12. Indonesia’s decades long dalliance with nuclear energy appears no closer to realization, if only because of the difficulty of finding suitable non-seismically active sites and the growing cost of ensuring safe operation of nuclear facilities in such areas. Its future plans, at least according to Indonesian presenters at the Nuclear Power Asia conference, were limited to deployment of a small “experimental” power reactor, which would also have non-power uses. A site licence for this facility was submitted in 2014 but no decision has been made.<sup>14</sup> The Russian State Atomic Energy Corporation (Rosatom) has offered to develop turnkey nuclear power plants in Indonesia in regions where there is no threat of earthquakes, such as Bangka in Sumatra and East Kalimantan. Typically cautious, Coordinating Maritime Affairs Minister Luhut Pandjaitan told Rosatom officials that “we are not ready yet. We need to raise public awareness, which takes time.”<sup>15</sup>

13. While delegates at the Nuclear Power Asia conference repeatedly touted Asia-Pacific as witnessing the greatest nuclear power expansion anywhere in the world, this masked the fact that almost all of this is due to China’s breakneck deployments, while Southeast Asia is contributing nothing. All the Southeast Asian delegates were careful to insist that public opinion was critical, especially since the Fukushima disaster, in any decision to proceed with nuclear power.

14. Even in the wider Asia-Pacific region the picture is quite mixed. South Korea is proceeding with significant so-called “new build,” but for the other current operators of nuclear

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<sup>10</sup> “Phase 1 of INIR report concludes that Malaysia is ready for nuclear power, minister says,” *The Malay Mail Online*, 7 March 2017, <http://www.themalaymailonline.com/malaysia/article/phase-1-of-inir-report-concludes-malaysia-is-ready-for-nuclear-power-minist>.

<sup>11</sup> See Opening Address by Dato Sri Hajah Nancy Haji Shukri, Minister, Prime Minister’s Department, Malaysia, Nuclear Power Asia conference, Kuala Lumpur, 7–8 March 2017. Available on request from [info@clarionevents.com](mailto:info@clarionevents.com).

<sup>12</sup> World Nuclear Association, “Asia’s Nuclear Energy Growth,” <http://www.world-nuclear.org/information-library/country-profiles/others/asias-nuclear-energy-growth.aspx>.

<sup>13</sup> Conversation at Nuclear Security Summit awards luncheon, Washington DC, 31 March 2016.

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<sup>14</sup> According to Prof. Dr Djarot S. Wisnubroto, Chair, National Nuclear Energy Agency (BATAN), Keynote discussion: ASEAN development, Nuclear Power Asia conference, Kuala Lumpur, 7–8 March 2017.

<sup>15</sup> “Russia offers turnkey nuclear plants to Indonesia: Luhut,” *The Jakarta Post*, 31 May 2017, <http://www.thejakartapost.com/news/2017/05/09/russia-offers-turnkey-nuclear-plants-to-indonesia-luhut.html>.

power, future trajectories are downward. Japan has experienced the *force majeure* of the Fukushima accident and is unlikely to be the nuclear energy giant it once was. Taiwan has announced it, too, will begin to lessen its dependence on nuclear energy. North Korea began construction in 2010 of an “experimental” 25-30 MWE light water reactor, reputedly for generating electricity, but it is so small and behind schedule that it is unlikely to provide power to the country’s grid any time soon.<sup>16</sup> A Royal Commission<sup>17</sup> in 2015 ruled out nuclear energy for the Australian state of South Australia, largely on the grounds of questionable economics, lack of public acceptance and the current sub-optimal configuration of the national electricity grid. It did recommend, however, that hosting a long-term deep geological high-level nuclear waste repository be kept under consideration. Overall, though, the report did not augur well for Australia reversing its longstanding aversion to nuclear energy.

15. While South Asia is not directly the concern of this paper, its nuclear energy plans are of interest and concern to the Asia–Pacific states, particularly from the safety and security perspective. India and Pakistan are undertaking considerable expansion in their capacity, while newcomer Bangladesh has signed a contract with Russia for two large nuclear power reactors, the first projected to be in operation from 2022. In view of Bangladesh’s regulatory and domestic governance vulnerabilities and the cost and schedule over-runs faced even by experienced nuclear energy powers like France and the United States, this timetable seems impossible. Bangladesh’s plans may yet meet the same fate as Vietnam’s.

### Nuclear Fuel Cycle Facilities

16. As to the wider nuclear fuel cycle, only the existing nuclear energy states have or are planning such capabilities (see Figure 1). Currently China, Japan and North Korea have uranium enrichment facilities and each is likely to

expand them. China and Japan seem intent, notwithstanding specious technical and economic underpinnings, on pursuing a “plutonium economy” – reprocessing spent fuel to produce plutonium for mixed oxide (MOX) or plutonium fast-breeder reactors. Similar projects, in France, the United Kingdom and the United States, have all proved prohibitively expensive and technologically challenging and ultimately failed to produce commercial amounts of electricity. South Korea continues to have ambitions to reprocess spent fuel using a technology it claims will not produce weapons-usable material. However, it is currently prevented from doing so by its 123 Agreement with the United States, renewed in April 2015.<sup>18</sup> Nuclear fusion technology remains as elusive as ever, including in the Asia–Pacific region.

17. Sales of nuclear reactor technology by Asian countries to countries outside the region have been inaugurated by South Korea, with its successful contract with the United Arab Emirates (UAE). The UAE project is a unique one (large amounts of finance and an ability to recruit an entire nuclear regulatory, management and operational staff from other countries) that may not be replicable elsewhere. Japan and China (and Russia) are also seeking both regional and extra-regional customers for their nuclear reactors, so far with little success. The financial collapse of Toshiba-Westinghouse in March 2017 does not augur well for Japan’s reactor export business.<sup>19</sup>

18. Other nuclear electricity generating technologies frequently mentioned include small modular reactors. All models are still under development or in the pilot phase. Mass production technologies, which in theory would make them much cheaper per kilowatt hour, have yet to be developed. As yet there are no internationally agreed standards or, in many cases, national regulations for small modular reactors that employ novel technologies, in

<sup>16</sup> Nuclear Threat Initiative, “Experimental 25-30 MWE Light Water Reactor,” <http://www.nti.org/learn/facilities/769/>.

<sup>17</sup> Report of the South Australia Nuclear Fuel Cycle Royal Commission, Adelaide, 6 May 2016, <https://nuclearrc.sa.gov.au/>.

<sup>18</sup> Mark Fitzpatrick, “South Korea Nuclear Cooperation Deal not as simple as 123,” International Institute of Strategic Studies blog, 23 April 2015,

<https://www.iiss.org/en/politics%20and%20strategy/blog/sections/2015-932e/april-ea11/south-korea-nuclear-cooperation-deal-not-as-simple-as-123-a371>.

<sup>19</sup> “Toshiba’s Westinghouse files for US bankruptcy,” BBC, 29 March 2017, <http://www.bbc.com/news/business-39424634>.

order to ensure they are safe, secure and proliferation-resistant. Russia and China are building floating reactors which, in the very unlikely event a country was interested in this technology, could be towed through and stationed in the region – an eventuality which would face even greater regulatory challenges.

#### *Other Peaceful Uses of Nuclear Energy – Research and Radioisotopes*

19. A different picture emerges with regard to non-power uses of nuclear energy. Research reactors are common throughout the region. While the number of research reactors has declined globally since the 1970s, there has been an increase in Asia-Pacific.<sup>20</sup> Currently 34 are in operation in Southeast Asia and the Pacific and what the IAEA calls the “Far East,” as well as one in Taiwan.<sup>21</sup> There is widespread recognition that many of these facilities are underutilized and have been built as national prestige projects without consideration of overall regional capacity. According to at least one observer there is a regional consensus that there is a need for regional “reactor sharing.”<sup>22</sup> This would appear to be the perfect issue on which to build regional collaboration and governance.

20. Radionuclides or radioactive sources, much of which is produced in research reactors, have a vast number of uses, in mining, manufacturing, medicine and agriculture.<sup>23</sup> Increased use of radionuclides, especially for the burgeoning health sector in Asia-Pacific, means that most states are much more interested in this technology than in nuclear electricity. The demand for agricultural applications of radioactive

sources is also increasing as rural development spreads to Mongolia, Myanmar, Cambodia and Laos.

21. Any radioactive material, including sources, may be used as a radiological weapon or “dirty bomb” and needs to be secured, tracked and disposed of properly. Orphaned sources, left on-site or disposed of in regular waste disposal facilities may be hazardous, as demonstrated by an infamous incident in Brazil in 1998.<sup>24</sup>

22. Due to their short half-life, most radionuclides are transported by air, mostly from outside the region. Canada has traditionally supplied more than half of the global market, but Australia, Germany, Russia and South Africa are also suppliers. Radionuclides are customarily produced in nuclear reactors, both in dedicated facilities and research reactors. Increasing attention is being paid to the use of cyclotrons on-site at facilities, such as hospitals, that require a ready supply of radioactive sources. Asia-Pacific states may yet seek to enter this lucrative market.

#### *Spent Fuel and Nuclear Waste*

23. A major nuclear legacy issue looming over North Asia is the growing amount of spent fuel and waste being accumulated. China, Japan, South Korea and Taiwan all have increasing volumes of high-level radioactive waste and no current plans for long-term storage or disposal. All except China (at this stage) face political opposition to long-term high-level waste repositories being constructed on their territory. Currently they store such materials at nuclear power plants or interim storage facilities. Most research reactors in the region now use low-enriched uranium (unsuitable for nuclear weapons) but all produce radioactive spent fuel and waste, including high-level waste, the long-term storage and disposition of which must also be dealt with at some stage. This situation has environmental, political and non-proliferation implications.

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<sup>20</sup> Jun Byung-Jin, “Research reactor collaboration in the Asia-Pacific region,” Proceedings of the FNCA 2003 Workshop on the Utilization of Research Reactors, <http://dx.doi.org/10.11484/IAEA-Conf-2006-00>. See also IAEA INIS repository, [https://inis.iaea.org/search/search.aspx?orig\\_q=RN:37103210](https://inis.iaea.org/search/search.aspx?orig_q=RN:37103210).

<sup>21</sup> IAEA, Research Reactor Database, <https://nucleus.iaea.org/RRDB/Reports/Container.aspx?Id=A2>.

<sup>22</sup> Jun, “Research reactor collaboration in the Asia-Pacific region.”

<sup>23</sup> Australian Nuclear Science and Technology Organization, “Industrial applications,” <http://www.ansto.gov.au/NuclearFacts/BenefitsofNuclearScience/IndustrialApplications/>.

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<sup>24</sup> IAEA, “The Radiological Accident in Goiania,” STI/PUB/815, Vienna, September 1988, [http://www-pub.iaea.org/mtcd/publications/pdf/pub815\\_web.pdf](http://www-pub.iaea.org/mtcd/publications/pdf/pub815_web.pdf).

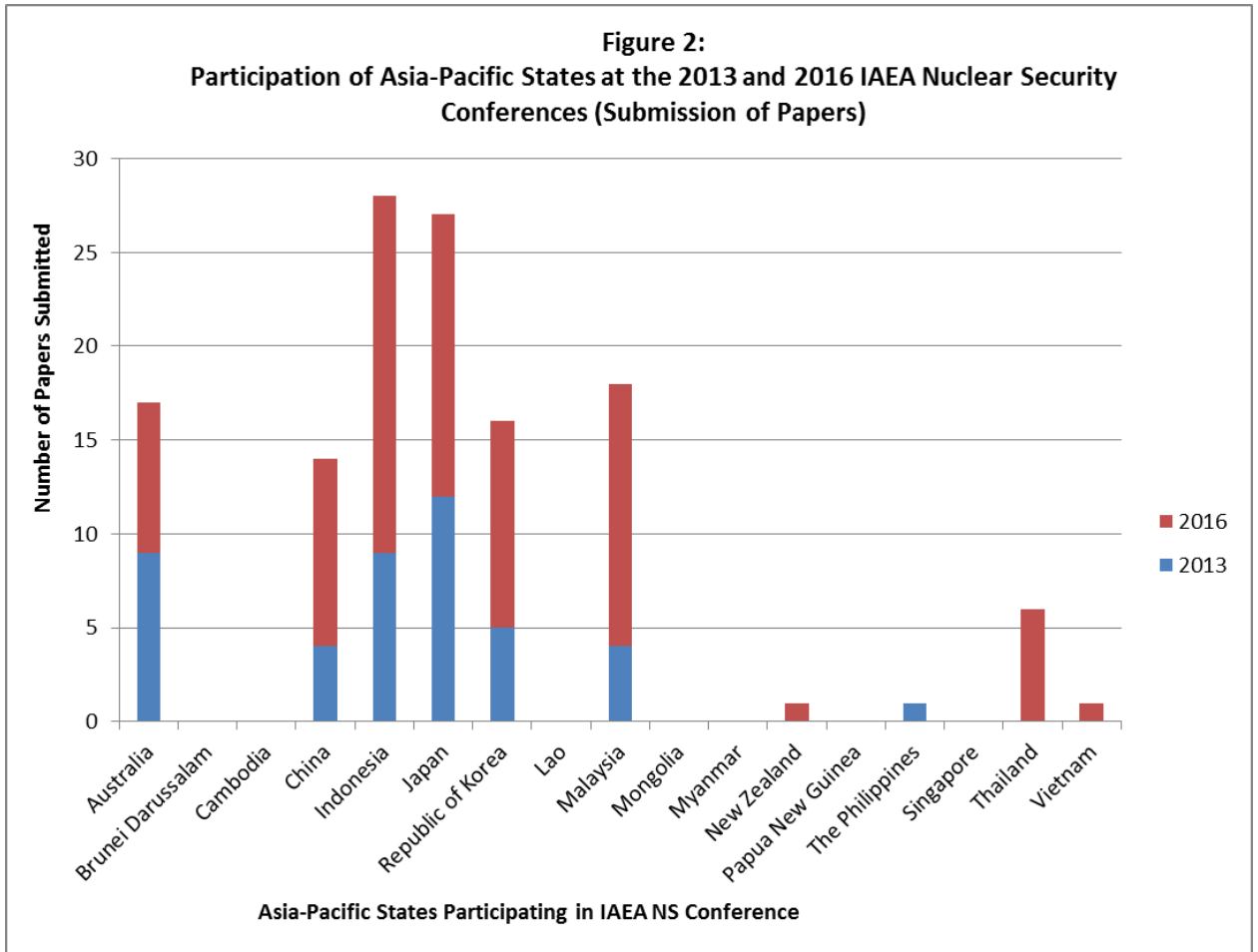


**Figure 1: Nuclear Power in Asia-Pacific and South Asia**

	<i>Power Reactors Operable or in Operation</i>	<i>Power Reactors Under Construction</i>	<i>New Power Reactors Planned</i>	<i>Research Reactors</i>	<i>Other Stages of the fuel Cycle</i>
Australia				1	UM
Bangladesh			2	1	
China	30	24	40	16	UM, C, E, FF
India	21	6	22	4	UM, FF, R, WM
Indonesia			1	3	FF
Japan	43 (only 2 in operation in March 2017)			14	C, E, FF, R, WM
South Korea	25	3	8	2	C, FF
North Korea			1	1	UM, C, E, FF, R
Malaysia				1	
Pakistan	3	2	2	1	UM, E, FF
Philippines				1	
Taiwan	6	2		1	
Thailand				1 (+1 under construction)	
Vietnam				1	
<b>Total</b>	128	40	76	49	

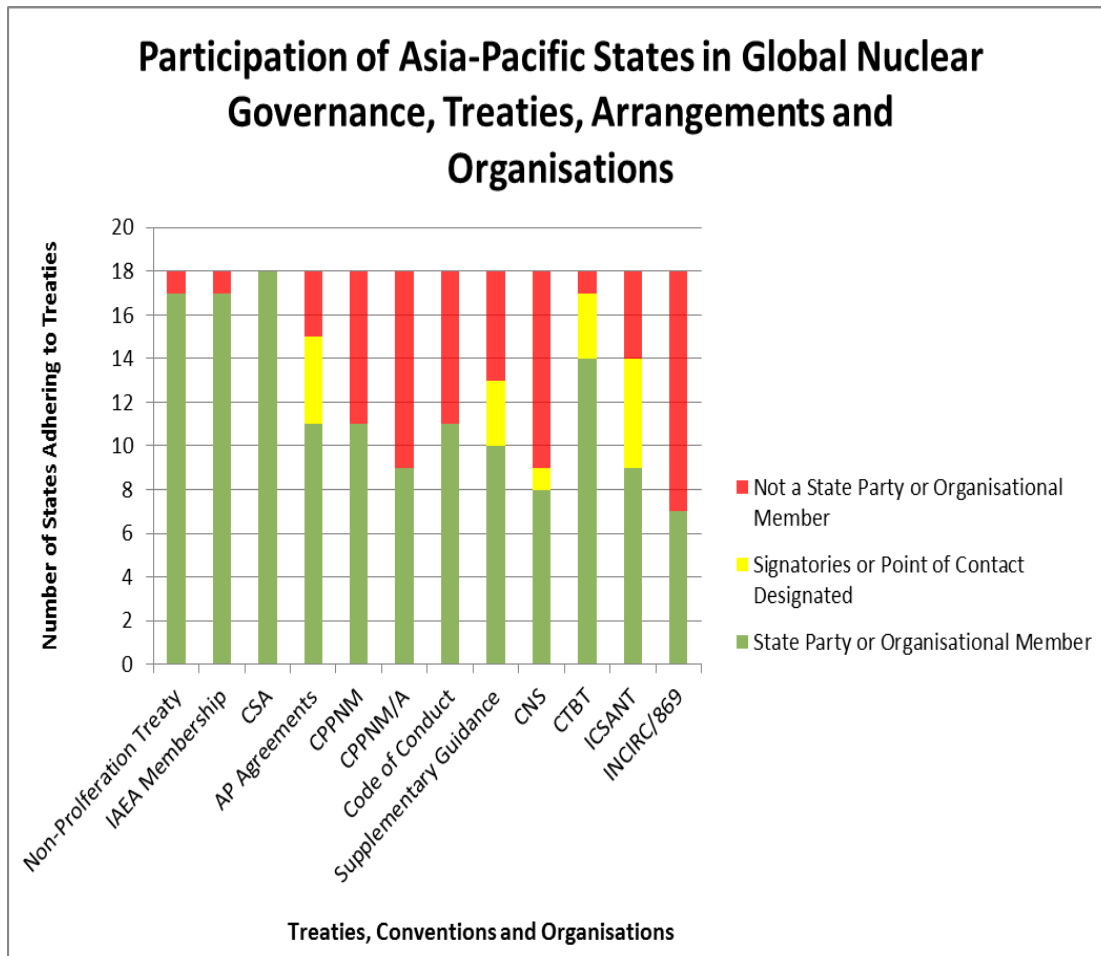
**Key:** UM Uranium Mining, C Conversion, E Enrichment, FF Fuel Fabrication, R Reprocessing, WM Waste Management facilities for used fuel away from reactors

**Adapted from:** World Nuclear Association, "Asia's Nuclear Energy Growth," <http://www.world-nuclear.org/information-library/country-profiles/others/asias-nuclear-energy-growth.aspx>



**Sources:** Official programs for IAEA Nuclear Security Conferences in 2013 and 2016. The level of participation was determined by submission of papers, invited speakers and panel sessions. Posters and interactive content pieces were included if submitted alongside a corresponding paper.

Figure 3

**Key**

**CSA:** Comprehensive Safeguards Agreement\*

**AP Agreements:** Additional Protocol Agreements with IAEA

**CPPNM:** Convention on the Physical Protection of Nuclear Materials (CPPNM)

**CPPNM/A:** Convention on the Physical Protection of Nuclear Material and Amendment

**Code of Conduct:** Code of Conduct on the Safety and Security of Radioactive Sources

**Supplementary Guidance:** Supplementary Guidance on the Import and Export of Radioactive Sources

**CNS:** Convention on Nuclear Safety

**CTBT:** Comprehensive Test Ban Treaty

**ICSANT:** International Convention for the Suppression of Acts of Nuclear Terrorism

**INFCIRC/869:** IAEA Information Circular

\*The DPRK has not officially notified the IAEA of its withdrawal from its CSA.



24. Globally, only Finland is ready to deal with this issue, being well advanced in constructing a deep geological repository. Sweden is next in line, with Canada some way behind. No Asian country is squarely facing this issue. The decision by the South Australian government not to proceed at this stage with establishing a facility that would accept shipments from other countries is a blow to those who saw a potential solution emerging. Although a decision to proceed at some stage in the future has not been ruled out, the current South Australian plan is to simply continue public debate and consultations.

25. Transport of spent fuel and nuclear waste in and through the region has been an issue for decades. Shipments of spent fuel and reprocessed plutonium between Japan and the United Kingdom and France have proceeded through Asian waters without incident for decades, but not without political controversy. This practice will likely end as France and the United Kingdom wind down their reprocessing capacities.

### Risks of Nuclear Energy Future

26. One way of considering the adequacy of nuclear governance arrangements in the region is to assess the risk of likely adverse developments in the three areas of concern – nuclear weapons proliferation, safety and security – and to determine how effectively Asia-Pacific states engage with the global governance arrangements to minimize the risks.

#### *Nuclear Safeguards and Non-Proliferation*

27. In Southeast Asia, the risk of states acquiring nuclear weapons is exceedingly low, almost to the point of being non-existent. The 1995 Southeast Asia Nuclear Weapon Free Zone (Treaty of Bangkok) represents a strong commitment to sub-regional non-proliferation. It is reinforced by universal adherence by ASEAN states to the 1968 Nuclear Non-Proliferation Treaty (NPT) and comprehensive safeguards agreements with the IAEA. In addition, all states, with the exception of Brunei, have adopted an Additional Protocol. While there were proliferation concerns some years ago about Myanmar, it has now helped allay

these by signing (but not yet bringing into force) an Additional Protocol, thereby opening itself up to greater transparency and more intensive inspections.

28. In the broader Asia-Pacific region the presence of states with nuclear weapons (China and North Korea), as well as in the immediate vicinity (India, Pakistan, Russia and the United States), complicates non-proliferation efforts, regionally and globally. All of these states are enhancing their nuclear weapon capabilities and delivery systems. With the exception of North Korea, however, none is likely to proliferate weapons or nuclear materials to other states, either within the region or outside it. While remnants of the A.Q. Khan nuclear smuggling ring may be extant abroad, Pakistan itself is no longer the proliferation risk it once was. However, there are continuing concerns about nuclear security in Pakistan and the potential for non-state actors to gain illicit access to the country's nuclear material or even weapons.<sup>25</sup> This has implications for Pakistan's neighbours in the Asia-Pacific region as well as globally.

29. As for the non-nuclear weapon states in the region, all are NPT parties with comprehensive safeguards agreements and Additional Protocols (including Taiwan). All are in good standing with the IAEA in terms of their compliance with agreements that have entered into force (some Additional Protocols have yet to do so). Open debate in Japan and South Korea about acquisition of nuclear weapons following Donald Trump's comments during the November 2016 US Presidential election caused alarm in some quarters. These have been dampened down by subsequent reassuring statements by the Trump administration and by the two states concerned. Moreover, the global governance, strategic and domestic restraints on both states are strong and enduring. Japan's continued stockpiling of plutonium, notwithstanding its generally good compliance with nuclear safeguards, needs to be addressed.

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<sup>25</sup> See "Pakistan," *Nuclear Security Index 2016*, Nuclear Threat Initiative, Washington DC, January 2016, p. 83, [https://www.nti.org/media/pdfs/NTI\\_2016\\_Index\\_FINAL.pdf](https://www.nti.org/media/pdfs/NTI_2016_Index_FINAL.pdf)

30. North Korea presents a continuing proliferation drama, but there is increasing acceptance that it is a *de facto* nuclear-armed state and the system will need to adjust, presumably by ensuring – to the extent possible – the robustness of nuclear and conventional deterrence. An abiding danger is that North Korea supplies materials or weapons to other countries, or non-state actors, to gain hard currency as sanctions tighten further.

31. India and Pakistan remain a proliferation cause of concern to the Asia-Pacific region by engaging in a nuclear rivalry that is leading to further vertical proliferation. There is an urgent need to deal with this challenge through a negotiated, verifiable, bilateral arrangement, including a bilateral nuclear test ban. The obstacles to such an outcome are formidable and Asia-Pacific countries have little to no leverage in the case. China's nuclear modernization plans naturally provide a justification for India's own expansion plans, quite apart from the perceived threat from Pakistan's accelerating production of fissile material and weapons.

32. From a regional governance perspective, the Six-Party Talks on North Korea that lasted from 2003 to 2009 come closest to an institutional negotiating framework for disarmament but of course they focused only on disarming North Korea. North Asia has no equivalent of the Southeast Asian Nuclear Weapon Free Zone and is unlikely ever to have one. Non-proliferation and disarmament governance for the region, such as it is, comes through the perpetually fraught NPT Review Conferences, which naturally have a global rather than regional focus (apart from the Middle East). The ASEAN Regional Forum (ARF) and the track-two Conference on Security and Cooperation in Asia-Pacific (CSCAP) provide "talking shops" but little else at this stage (see Part II of this study, Policy Brief 41).

### **Nuclear Safety**

33. A devastating nuclear accident at a nuclear power plant or other facility is a low-likelihood, high-consequence event, demanding extensive preventive and ameliorative measures. Without more transparency about the region's nuclear operations the risk is impossible to calcu-

late. Lessons have been learned from the 2011 Fukushima accident by all states in the region with nuclear power plants. All states in the region have undertaken stress tests to assess and improve nuclear safety, although a lack of transparency prevents, in most cases, independent assessment of the results. Japan shut down all its plants pending national regulatory and local government approval. To date, only two have been restarted and begun providing power to the grid.<sup>26</sup> Japan has also reorganized its nuclear regulator to ensure greater independence from industry and undertaken other governance reforms.

34. The IAEA has made available increased advice, training and assistance to states in the region and enhanced its own capacity to respond to nuclear disasters. But the global regime is still not legally binding and standards represent the lowest common denominator. There are major gaps in regional adherence to the post-Chernobyl treaties: the 1986 Convention on Early Notification of a Nuclear Accident; the 1986 Convention on Assistance in the Case of a Nuclear Accident or Radiological Incident and the 1994 Convention on Nuclear Safety (CNS). The last, the most important of the three, commits states to ensuring nuclear safety and provides for regular reviews of states' nuclear safety arrangements. Unfortunately, it does not require mandatory compliance with IAEA safety standards.

35. Reassuringly, all the states that currently operate nuclear power reactors in the region, with the exception of Taiwan, are party to the each of the three nuclear safety conventions. Most Asia-Pacific states with research reactors are also party to all three. However, Malaysia has only signed the Early Notification and Assistance Conventions, not ratified them. Malaysia and Thailand are not party to the CNS, while the Philippines, which has toyed with the idea of nuclear power for decades, has only signed it. Mongolia, which has considered the construction of a research reactor, is party to the Early Notification and Assistance Conventions, but not to the CNS. It is alarming that so many

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<sup>26</sup> Nuclear Energy Institute, "Japan nuclear update," 12 January 2017, <https://www.nei.org/News-Media/News/Japan-Nuclear-Update>.

states in the region that have given serious consideration to nuclear power plants or which host research reactors or want to obtain them have not fully committed themselves to all the relevant treaties.

36. Since Fukushima, the World Association of Nuclear Operators (WANO), of which every operator of a nuclear power plant in the world is a member, has begun conducting four-yearly peer reviews of nuclear power plant safety, “with a follow-up at the two-year point.”<sup>27</sup> Hence all operators of power reactors in the Asia-Pacific have had at least one WANO peer review. These are a useful supplement to those organized by the IAEA, although the results are not shared outside the organization.<sup>28</sup> WANO is organized regionally, so the Asia-Pacific has its own regional governing board and a regional centre located in Tokyo, all of which encourages the habit of regional cooperation on nuclear safety. But a lack of transparency prevents a comprehensive assessment of the true safety of nuclear facilities in the region, not least those in the nuclear weapons sectors of China and North Korea (and in neighbouring states India, Pakistan and Russia).

### *Nuclear Security*

37. The threat that terrorists may obtain nuclear material for a nuclear weapon or radiological material for a “dirty bomb,” or a nuclear weapon itself, is another of the low-likelihood, high-consequence events that nuclear governance needs to deal with. Nuclear security, like nuclear safety, is always a work in progress, a reality which many states do not seem to understand. In the case of nuclear security, terrorists will seek the weakest link in the governance and implementation chain.

38. Despite the progress made by the four Nuclear Security Summits (2010 through 2016), the enhanced role of the IAEA, and the resulting improvements made to nuclear security, the global governance arrangements are patchy and not legally binding in their detailed implementation. Eighty-three per cent<sup>29</sup> of nuclear material is possessed by the military, and transparency about those stocks and the security applied to them is virtually non-existent. Since 2001 the IAEA has geared up to better assist states; funding has steadily increased through the voluntary Nuclear Security Fund; and more peer reviews are available. Nuclear security is starting to be incorporated into Technical Cooperation projects for developing countries.

39. Participation by Asia-Pacific states in the global nuclear security regime is, however, spotty. In comparison to other regions, Asia-Pacific was generously represented at the four invitation-only nuclear security summits, an indication of the relevance of this issue to the region and their political importance to the US.<sup>30</sup> However, the level of states’ engagement varied. South Korea played a leading role by hosting the 2012 summit in Seoul and has been consistently active on the issue, both regionally and internationally (for instance it chaired the IAEA Nuclear Security Conference in December 2016). But several Asian participants did not commit themselves to achieving the highest level of nuclear security possible by associating themselves with the “gift basket” of the “vanguard group” at The Hague Summit in March 2014 (INFCIRC/869).<sup>31</sup> From the Asia-Pacific, only Australia, Japan, New Zealand, the Philippines, South Korea and Vietnam joined at the time. China (and India) joined later.

<sup>27</sup> WANO, “Peer reviews: the heart of WANO’s many programmes,” <http://www.wano.info/en-gh/programmes/peerreviews>.

<sup>28</sup> Operational Safety Review Teams; Peer Review of Operational Safety Performance Experience; Integrated Regulatory Review Service Safety Culture Review Team; Period Safety Review; International Regulatory Review Teams; Engineering Safety Review Services; International Probabilistic Safety Assessment Review Teams; Review of Accident Management Programmes; Transport Safety Appraisal Service; and various radioactive waste management services.

<sup>29</sup> *Bridging The Military Nuclear Materials Gap*, NTI, Military Materials Study Group, Nuclear Threat Initiative (NTI), Washington DC, November 2015, [http://www.nti.org/media/pdfs/NTI\\_report\\_2015\\_e\\_version.pdf?\\_id=1447091315](http://www.nti.org/media/pdfs/NTI_report_2015_e_version.pdf?_id=1447091315).

<sup>30</sup> The Asia-Pacific summitters were Australia, China, India, Indonesia, Japan, New Zealand, Pakistan, the Philippines, South Korea, Singapore, Thailand, and Vietnam.

<sup>31</sup> IAEA, Communication from the Netherlands, concerning Strengthening of Nuclear Security Implementation, Joint Statement on Strengthening Nuclear Security Implementation, INFCIRC/869, Vienna, 22 October 2014.

40. A slightly different group of Asian nuclear “summitteers” has joined the post-summit Nuclear Security Contact Group, which met for the first time in Vienna in September 2016 on the margins of the IAEA General Conference. Australia, China, New Zealand, Singapore, South Korea, Thailand and Vietnam participated. Disappointingly, several important summit participants from the region declined to be involved: Indonesia, Malaysia and the Philippines. This is the same group, except for the Philippines, that declined to associate itself with INFCIRC/869.<sup>32</sup> All of this illustrates how inconsistent and tentative regional states are in their commitment to nuclear security, even when exposed to the international spotlight of a world summit.

41. It is not entirely clear why this should be the case. One factor could be solidarity among the non-aligned countries about exclusive membership groups, dominated by the West, that have been periodically established to deal with security issues, including the Nuclear Suppliers Group, the Proliferation Security Initiative, the Australia Group (for chemical and biological weapons-related export controls) and the Missile Technology Control Regime. The Non-Aligned Movement, of which all Southeast Asian states are members and in which Indonesia is an influential player, argues that the IAEA is the proper place to consider all aspects of the governance of the peaceful uses of nuclear energy, not special summit meetings of select states.

42. One bright spot is the increasing involvement of Asia-Pacific states in the IAEA’s biennial nuclear security conferences (the IAEA is also inaugurating a separate International Conference on Physical Protection in November 2017). Now that the nuclear summits have ended, these are most important and widely attended nuclear security gatherings. Figure 2 shows the dramatic increase in submission of papers by Asia-Pacific attendees at the 2016 conference compared to that held in 2013. Particularly impressive are the performances of

Indonesia, Japan, Malaysia and Thailand, at least in terms of numbers if not substance.

43. The main treaty governing nuclear security is the 1980 Convention on the Physical Protection of Nuclear Material (CPPNM), now known as the Convention on the Physical Protection of Nuclear Materials and Facilities (CPP) after its 2005 Amendment entered into force in 2016. Asia-Pacific adherence, either to the original convention or the amended version, is by no means universal. Now that the amended treaty requires nuclear security measures to be applied to domestic nuclear activities, not just international transport as previously, it is important that its universality be promoted in the region. The 2005 International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT), the other major treaty in this area, which seeks to criminalize nuclear terrorism preparations and acts, is also missing several important Asia-Pacific parties.

44. Even with regard to the governance of radioactive sources, which would seem to be a high priority for Asia-Pacific states,<sup>33</sup> the picture is surprisingly mixed. While there is no legally-binding treaty covering this area, the voluntary Code of Conduct on the Safety and Security of Radioactive Sources and the Supplementary Guidance on the Import and Export of Radioactive Sources<sup>34</sup> have not been universally accepted in the region. Laos, Mongolia, Myanmar, North Korea and Papua New Guinea have not committed themselves, while Brunei and Cambodia have only provided the IAEA with a “point of contact” on the issue.

45. In addition to the global multilateral organizations that provide elements of nuclear security governance, there are also several non-treaty-based global arrangements, initiated mostly by the United States, sometimes in partnership with Russia, that have benefited Asia-Pacific states. These have added a further layer of governance in the sense of applying rules and obligations, however voluntary, as

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<sup>32</sup> See Trevor Findlay, “Managing the Global Nuclear Security Architecture after the Summits,” Presentation to the International Conference on Nuclear Security: Commitments and Action, Vienna, 5-9 December 2016, document CN-244-045.

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<sup>33</sup> The dataset for the Code defines Asia-Pacific as all the ASEAN states, Australia, New Zealand, Papua New Guinea, China, Japan, North and South Korea and Mongolia.

<sup>34</sup> See <http://www-ns.iaea.org/tech-areas/radiation-safety/code-of-conduct.asp>.



well as providing substantial technical and other assistance. These include the Global Partnership against the Spread of Weapons and Materials of Mass Destruction; the Global Initiative to Combat Nuclear Terrorism; the Proliferation Security Initiative (PSI); and the Megaports initiative of the US National Nuclear Security Administration.

46. The Megaports Initiative has led to Memoranda of Understanding with several Asia-Pacific countries on collaboration in detecting illicit shipments of nuclear and other radioactive materials coming into and through major world ports. At last count it had led to the installation of sophisticated nuclear detection technology at the ports of six Asia-Pacific countries (Malaysia, Philippines, Singapore, South Korea, Taiwan and Thailand).<sup>35</sup> Additionally, the US National Nuclear Security Administration is seeking to deploy installations in Hong Kong and Japan and at additional ports in Malaysia.

47. The PSI, which seeks to detect the illicit shipment of materials and equipment related to the production of weapons of mass destruction of all types (nuclear, chemical and biological), also has significant Asia-Pacific participation. Asia-Pacific states are also well represented in the Global Initiative to Combat Nuclear Terrorism and the Global Partnership. Such programs not only create awareness of potential threats and risks but also engender collaborative mindsets among states which may otherwise not be so inclined. Leadership by the United States (and in the case of the Global Partnership, by Canada) has been key to the success of all of these initiatives.

48. Some global non-governmental organizations also provide an additional layer of governance for Asia-Pacific. The World Institute for Nuclear Security (WINS) provides advice and training and engenders voluntary standards for improving nuclear security. The WINS website lists Australia, China, Indonesia, Japan,

South Korea, Mongolia, Malaysia, New Zealand, the Philippines, Singapore, Thailand, and Vietnam as countries in which there are WINS members, but it does not reveal whether they are individuals, institutions or industry groups.<sup>36</sup>

49. Finally, several states in the region are now hosting or establishing Centres of Excellence on Nuclear Security, including Japan, China, and South Korea.<sup>37</sup> Indonesia hosts the ASEAN Centre for Energy, which includes a nuclear component. Encouragingly, such centres are increasingly collaborating with each other and reaching out to other states in the region to offer training, advice and collaborative projects.<sup>38</sup> The IAEA's International Network for Nuclear Security Training and Support Centres is offering support and guidance. The Asia-Pacific region is setting the pace globally with such centres and is one area where the region could provide models and lessons-learned to other regions and at the global institutional level.

## Conclusion

50. Although Asia-Pacific states are, across the board, extensively embedded in global nuclear governance arrangements, there are significant gaps in coverage and participation (Figure 3). The involvement of the smaller, less developed states is incomplete, unenthusiastic and in some cases dilatory. While all Asia-Pacific states are members of the IAEA (except North Korea, which withdrew in 2003) not all participate actively in the various governance bodies of the IAEA or take advantage of the wide range of assistance available.<sup>39</sup> Not all delegations and capitals have the time or resources to brief themselves on what is available. Some states, like Singapore, Japan (its influence increased by the current Director General Yukiya Amano being Japanese) and South Korea, are active, as are semi-permanent Board of Gover-

<sup>35</sup> See "Megaports Initiative," National Nuclear Security Agency, US Department of Energy, Washington DC, <https://nnsa.energy.gov/aboutus/ourprograms/non-proliferation/programoffices/internationalmaterialprotectionandcooperation/-5>

<sup>36</sup> See [https://www.wins.org/index.php?article\\_id=61](https://www.wins.org/index.php?article_id=61).

<sup>37</sup> As well as India and Pakistan.

<sup>38</sup> See <http://www-ns.iaea.org/security/nssc-network.asp?s=9&l=76>.

<sup>39</sup> To be fair, the number of programs the Agency takes is mind-boggling, not least due to the proliferation of acronyms, requiring the full-time attention of at least one member of a mission accredited to the Agency.

nors members like Australia and China (and India). But others like Indonesia, Malaysia, Myanmar, Philippines and the Indochinese states (with the occasional exception of Vietnam) are not.<sup>40</sup> The involvement of Asia-Pacific states in the various nuclear treaties, codes of conduct and other multilateral agreements is solid, especially compared to Africa, the South Pacific and the Caribbean. But there are still significant gaps that need to be plugged, notably with regard to nuclear safety and security, especially on the part of states that have ambitions to acquire nuclear power plants.<sup>41</sup>

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<sup>40</sup> This may change for Malaysia, now that one of its nationals, Raja Adnan, is head of the Nuclear Security Division.

<sup>41</sup> See "Is Southeast Asia ready for nuclear power?," RSIS Roundtable at the Singapore International Energy Week 2015, S. Rajaratnam School of International Studies, Singapore, 29 October 2015, [www.rsis.edu.sg](http://www.rsis.edu.sg).

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The **Centre for Nuclear Non-Proliferation and Disarmament (CNND)** contributes to worldwide efforts to minimize the risk of nuclear-weapons use, stop their spread and ultimately achieve their complete elimination. The director of the Centre is Professor Ramesh Thakur. See further <http://cnnd.anu.edu.au>.

The **Asia Pacific Leadership Network (APLN)** comprises over eighty former senior political, diplomatic, military and other opinion leaders from fifteen countries around the region, including nuclear-weapons possessing states China, India and Pakistan. The objective of the group, founded by former Australian Foreign Minister and President Emeritus of the International Crisis Group Gareth Evans, is to inform and energize public opinion, and especially high level policy-makers, to take seriously the very real threats posed by nuclear weapons, and do everything possible to achieve a world in which they are contained, diminished and ultimately eliminated. The co-Convenors are Professors Chung-in Moon and Ramesh Thakur. The Secretariat is located at the East Asia Foundation in Seoul, Republic of Korea. See further [www.a-pln.org](http://www.a-pln.org).

### Funding Support

APLN gratefully acknowledge the generous support of the Nuclear Threat Initiative, Washington DC.

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