

**Nuclear Power Expansion and its Safety and Security Risks in East and South Asia:  
Regionally Based Comparison with European Union.**

**Thomas Jonter  
Professor of International Relations  
Stockholm University Graduate School of International Studies  
Stockholm University  
June 2015**

Thomas Jonter, Director of Stockholm University Graduate School of International Studies and professor of international relations at the Department of Economic History. His research focuses on nuclear non-proliferation and energy security. He is currently completing a book manuscript, *The Key to Nuclear restraint: The Swedish Plans to Acquire Nuclear Weapons during the Cold War* for Palgrave MacMillan. During spring and summer of 2015, he was Visting Scholar at Judith Reppy Institute for Peace and Conflict Studies. Copyright

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## 1. Introduction

In 2011, shortly after the Fukushima accident, many international observers believed that nuclear power would not have any future at all. The German government announced a three-month shutdown of seven of its 17 nuclear power plants and commissioned a review of its nuclear strategy. As a result of this review process, the German Bundestag decided to phase out nuclear power by 2022. Many believed that several other states would follow the German example.<sup>1</sup> However, a quick look at the latest global data on states' ongoing and future nuclear power plans shows that these predictions were inaccurate. In the year 2015 there were about 437 nuclear power reactors in the world and 60 new ones under construction.<sup>2</sup> In addition, more than 100 new reactors are planned to be built all over the world and many of these states have little or no experience in the nuclear field.<sup>3</sup>

It seems that states do not currently see other viable alternative to meet the growing demand for energy. The World Nuclear Industry Report, for example, estimates that the global population growth combined with industrial development will lead to a 45 percent increase of electricity consumption by 2035.<sup>4</sup> Another reason for the renewed interest and increase in nuclear energy is the acceleration of climate change, which has resulted in countries trying to reduce dependence on fossil fuels to mitigate greenhouse gas emissions. Europe and Asia are by no means exceptions to this global trend; quite the opposite. Within the European Union there are currently 131 reactors in operation in 14 of the 27 EU member states, and several new nuclear power plants are under construction or planned.<sup>5</sup> In Asia today there are 119 nuclear reactors in operation, 49 under construction, about 100 more planned, and proposals for many more have been put forward, according to the World Nuclear Association. In fact, building nuclear power reactors is a key energy strategy component in many Asian countries. The largest increases in nuclear activity are in China, South Korea and India.<sup>6</sup> This makes Asia the most expansive nuclear power region in the world.

One consequence of expanding nuclear power is a corresponding increase in trade and movement of fissile fuels via land, air, and sea, between states and within national borders. The task of the global non-proliferation system is to control and ensure that nuclear material is not used for nuclear weapons manufacture (the nuclear proliferation dimension). Furthermore, the growing numbers of nuclear energy facilities, and the storage of uranium, plutonium, and other fissile material across the world require measures to prevent these materials falling into terrorist hands or theft (the nuclear security dimension).<sup>7</sup> The Nuclear Security Summits in Washington, D.C. 2010, in South Korea in 2012, and in Hague in 2014 have demonstrated that the international community perceives the nuclear terror threat as a growing concern. These summits also recognized that nuclear terrorism could significantly damage the political, security, and economic interests of all countries, regardless of the specific target and location.<sup>8</sup>

Is the present global nuclear non-proliferation system, the so-called NPT regime, consisting of the Treaty on the Non-proliferation of Nuclear Weapons (NPT) and its appurtenant export control regimes and the IAEA, strong enough to handle the enormous work and responsibility involved in ensuring a safe and secure nuclear power development? Today the NPT regime is being questioned by many. Some critics even claim that it has or is in the process of losing its preventive force. They assert that the NPT regime has failed to prevent North Korea from conducting nuclear weapons tests, or Iran from pursuing nuclear weapons capability and may lead to a proliferation spiral.<sup>9</sup>

The purpose of this paper is to discuss the nuclear renaissance in East and South Asia, its potential safety and the security risks, against the backdrop of the experiences and hindsight of the European Union (EU) experience in developing a functioning and effective nuclear non-proliferation and nuclear security system. The central argument in this paper is that in order to allow an expanded role for nuclear power, a new system of global non-proliferation is needed. A central component in such a new system would be a greater role and responsibility for the regional bodies. A division of responsibility between the IAEA and other regional bodies will have to be instituted, since the IAEA cannot handle this task on its own. A new approach is needed, one that is capable of going beyond the complex legal and regulatory arrangements based on international regimes to create a more effective and flexible system. In this proposed

flexible system, a reformed NPT regime will form the core. Regional bodies must assume greater responsibility to ensure that effective measures are taken to prevent the spread of nuclear material. The EU with its European Atomic Energy Community (EURATOM) can in many respects serve as a model for how such regionally based systems can be developed and work effectively. EURATOM has in many respects played an important role as a building block in the European integration process, and today a coherent non-proliferation system with common strategies and regulations are binding the member states' nuclear activities together. It is, of course, not realistic to believe that regional bodies in Asia could play the same role as EURATOM did and does for economic and political integration in Europe. Asia is a huge continent with different regions with their own geographical and historical traditions making an overarching, single, functioning, regional body controlling the nuclear development and its proliferation and security issues a utopian and naïve goal. However, it is worth mentioning that many small steps have already been taken in some Asian regions to create nuclear energy communities that could be considered as important building blocks in a process to stimulate a broad regionally based cooperation in Asia. In order to move forward, the regionalization process has to be strengthened. This paper presents a couple of ideas on how this process can be promoted.

## **2. The European Union**

Currently, almost 30 per cent of the electricity consumed in the EU comes from nuclear power.<sup>10</sup> Eleven EU member states are among the fifteen countries in the world with the highest share nuclear energy in their total national electricity generation, making the EU the most nuclear power-dependent region in the world. Furthermore, the EU is now planning an energy policy that will determine its strategy until 2050, and according to these plans nuclear power will account for 20 per cent of the electricity production by then. Needless to say, many things can happen that could change the outcome. On the other hand, since the EU has decided to secure energy needs and simultaneously cut down the greenhouse gases, many member states seem to be reconciled to the fact that they have to be dependent on nuclear power for an unforeseeable future.<sup>11</sup>

From a nuclear non-proliferation point of view, the situation in the EU is satisfactory. The EURATOM Treaty has, for example, a supranational power that includes ownership of nuclear material and the power to carry out sanctions on EU states that violate the safeguard rules and norms. After many years of fruitful collaboration between EURATOM and the IAEA, the two organizations are carrying out inspections in cooperation with national authorities to avoid duplication of work tasks.<sup>12</sup> In 2003, an overarching common EU non-proliferation strategy was adopted which in many respects has strengthened the structures to prevent the spread of illegal nuclear-related technology within the EU.<sup>13</sup> A nuclear non-proliferation community involving governmental bodies, supranational entities, and non-government organizations has emerged over the years, to create an effective system. Regulatory authorities within EU, companies, universities, and research institutes collaborate in a number of organizations and networks in the nuclear energy field to solve common problems.

It is, however, important to understand that this nuclear community is a product of 60 years of efforts to integrate Europe against the backdrop of the challenges from Second World War, the political tensions during the Cold War, and the breakdown of the Soviet Union. The Treaties of Rome and the creation of EURATOM in 1957 became two of the key factors in a strategy to integrate Europe and create a common market with one energy system. The first step in this process of integration was taken in 1952 when the European Coal and Steel Community was founded with the goal to bind the arch-enemies France and Germany together with Belgium, Luxemburg, Netherlands and Italy in a peaceful cooperation that would ensure lasting peace and economic prosperity.<sup>14</sup> EURATOM established the grounds for the development of nuclear power and at the same time guaranteed that a system of surveillance and control of nuclear material and technology was established. Through a number of vital objectives such as promoting research, establishing uniform safety standards, and ensuring regular and equitable supply of nuclear material to all users, EURATOM guaranteed that nuclear material would not be diverted.

Since the signing of EURATOM Treaty, a road to a well-functioning nuclear community has been paved by overcoming many challenges and obstacles. During the first period, between 1958 and 1968, the main task was to launch the EURATOM Treaty, a work that met severe resistance from the member states. In the period 1969-79, Euratom supported ambitious

programs to build nuclear reactors, and between 1980 and 1990 much of the work was focused on how to design and develop safer and secure systems following the nuclear accidents at the Three Mile Islands (1979) and Chernobyl (1986). Following the demise of the Soviet Union in 1991, the tasks have in many respects been oriented towards assisting the newly established states in Eastern Europe to develop new nuclear infrastructures and to make the enlargement of EU possible, with the goal to open up an internal market of electricity within EU and also to tackle environmental problem due to climate change.<sup>15</sup> As a result, no one today would seriously believe that a nuclear renaissance within the EU would increase the risk of spreading nuclear weapons.

This success story does not mean that there are no problems in the EU in the nuclear area. Europe as a hub of global nuclear commerce would have a great deal to lose from nuclear terrorism directly or indirectly. Indeed, the EU has long recognized this vulnerability, dating back to the Ghent European Council meeting of October 2001 following the terrorist attacks on the United States. In December 2002, the EU adopted the 'Programme to improve cooperation in the European Union for preventing and limiting the consequences of chemical, biological, radiological or nuclear (CBRN) terrorist threats.' Later, EU initiatives have taken the agenda forward, such as the European Commission's 2009 CBRN Action Plan, which focuses on the core competencies of prevention, detection, preparedness and response.<sup>16</sup> Through joint actions by its Council and through contributions from its member states, the EU is one of the main contributors to the IAEA's Nuclear Security Fund (NSF). Established in 2002, the NSF is designed to support the implementation of nuclear security activities to prevent, detect, and respond to nuclear terrorism.<sup>17</sup> The European Commission (EC) and several member states have also made substantial contributions to nuclear security work in Russia and other former Soviet Republics through the G8 Global Partnership threat reduction initiative.<sup>18</sup> Preparing recovery strategies in the event of a nuclear terror attack is also a key part of the challenge confronting policy makers. Central to this task will be determining the extent to which European infrastructure and society can be made resilient, where resilience is defined as the 'capacity to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks'.<sup>19</sup>

### 3. How to create a nuclear community in East and South Asia

The following figures and data show clearly that nuclear power is considered as an important present and future energy source in states energy strategies in East and South Asia.

- Mainland China has 26 reactors in operation, 24 new reactors that are under construction, and many more that are planned.<sup>20</sup>
- India has 21 reactors running and six under construction with plans to build 20 to 30 new reactors by 2020 as part of its national energy policy. India is trying to develop the necessary technology to allow the country's abundant thorium reserves to be used in the civilian nuclear power reactors.<sup>21</sup>
- South Korea's 24 reactors produce one third of the state's electricity, and under its strategy to increase the capacity of nuclear power by 59 % by 2022, it has plans to construct additional new reactors. Moreover, South Korea plans to be a major exporter of nuclear technology. For example, recently South Korea won a contract to supply the United Arab Emirates with four reactors.<sup>22</sup>
- Taiwan has six reactors in operation. After the Chernobyl accident the future of nuclear power was questioned in Taiwan as in many states.<sup>23</sup> Given what happened at Fukushima many voices within the country now demand the abolishment of nuclear power or a review of its future role in Taiwan. On the other hand, Taiwan, as is the case with Japan, does not have alternatives if the goal is to be less dependent on coal, gas, and oil.
- Vietnam has signed agreements with Japan and Russia to build nuclear power reactors. If these plans materialize exactly as they exist on paper, Vietnam will have 14 reactors running by 2030.<sup>24</sup>
- The future of nuclear power in Japan is unsure. However, it is difficult to imagine an energy profile without any role for nuclear power, given that the country has few natural resources of its own and imports 84 percent of its energy.<sup>25</sup> Until recently Japan had ambitious plans to build 15 new reactors to meet its estimated future energy needs and to reduce its dependence of imported energy and to decrease CO2 emissions. The present Prime Minister, Shinzo Abe,

is also pushing hard to restart the dormant nuclear plants and to keep nuclear power as an essential part of the future Japanese energy system. For example, in the country's new energy plan, nuclear power is described as an important "baseload" electricity source which is to produce electricity at a constant rate at a lower cost than alternatives like solar and wind power.<sup>26</sup>

Since the end of the cold war, globalization has generated a larger process of global structural change, one in which regional cooperation and regionalism play a more important role than in the past. In several parts of the world regional bodies have taken over functions that were the responsibility of international and national institutions during the cold war. This transformation process has been most extensive in the EU area. It is true Asia is not Europe, and it would be naive to uncritically replicate a EU model of nuclear community for a number of reasons. First, the actual risks of proliferation of nuclear weapons are much higher in Asia compared with Europe, where this problem hardly exists. The nuclear weapons states of India and Pakistan, which are not parties to the NPT, have been in conflict with each other for many years, and nobody can guarantee that nuclear weapons will not be used in a future war if conflicts between the two governments cannot be settled. When North Korea withdrew from the NPT in 2003 and carried out nuclear weapons tests in 2006, 2009, and 2013, thereby becoming the ninth nuclear weapons state, many international security experts feared a chain-reaction of proliferation among neighboring states. Japan and China have their border disputes that, according to some security analysts, might trigger a nuclear weapons program in Japan. Second, many states in Asia have serious domestic problems with ethnic, political and religious conflicts. For example, Pakistan is considered to be one of the most dangerous places on earth due to the fragile political situation combined with a weak regime that possesses nuclear weapons and is not able to cope with the religious and political problems that the state is facing.<sup>27</sup> Indeed, the tensions and ongoing and potential conflicts in Asia are manifold.

On the other hand, when Europe started its long march towards an integrated Europe with the goal to develop a common nuclear energy market, the continent had experienced the worst war in history. In fact, major parts of Europe lay in ruins when the first ideas about integrating Europe were discussed. The Association of Southeast Asian Nations (ASEAN) was



founded in 1967 to promote economic and political cooperation, and a comparison with Europe shows that the institutionalism of political cooperation (or regionalism) has been much slower in Asia. The process to promote regional collaboration in Asia did not take off until the late 1990s when China, Japan and South Korea started to organize regular meetings with the goal to stimulate economic collaboration within ASEAN. The end of the cold war and the new geopolitical situation opened doors for such a regional cooperation. In that respect, one can compare this to the early integration process in Europe, where the driving force for the process came from outside Europe, namely the foreign policy of United States in the immediate post-second world war period and the cold war dynamics.<sup>28</sup>

If, however, the causes for a greater role for regionalism are first and foremost to be found in the changes in the international system after the cold war, it does not mean that ideas and political actions have no impact whatsoever. The structural and geopolitical preconditions can be viewed as the outer limits for how far cooperation within a region can reach. Björn Hettne and Fredrik Söderbaum distinguish between *de jure* forms of cooperation, which are characterized by formal political undertakings, and a *de facto* regional process, in which the forms are based on informal collaboration without expressed political agendas.<sup>29</sup> The EU cooperation is based on *de jure* forms, which means that decisions made are legally binding, and over the years this collaboration has developed a sense of regional identity, which is not the case in Asia. The EU is a grand demonstration that a regional identity transformation is possible, but it is important to stress that shortly after the Second World War such a development seemed most unlikely. How can East and South Asia move from *de facto* forms of regional cooperation to a situation where more integration of a formal character takes place?

Is it really realistic to expect more of integration in Asia given the troubles and conflicts the huge continent faces? Yes, there are good reasons to believe that now is the time to take a step further, but the areas chosen for potential progress in cooperation are crucial. In Europe, the vision to create a common energy market and use nuclear energy as the vehicle became a starting point for a successful integration process. Given that Asia's energy demand will increase dramatically in the future, and that response to such a development needs to be

coordinated among several states in order to be successful, the energy sector evidently constitutes a potential strategic area of integration.<sup>30</sup>

In fact, some initiatives have already been taken in different regions of Asia over the last ten years. ASEAN has promoted collaboration, and other organisations and network communities have been created to push for extended nuclear collaboration. Worth mentioning are the Forum for Nuclear Cooperation in Asia (FNCA), Asia Pacific Regional Cooperative Agreement (RCA), Asia Nuclear Safety Network, and Asia Pacific Safeguards Networks (APSN). However, positive results have been hampered due to rather poor interest and short-sightedness by governments.<sup>31</sup>

Furthermore, the prospects for an extended collaboration among the Asian states have increased after the Fukushima accident, which highlighted the need for stronger international cooperation. The Fukushima safety issue, which occurred in the highly technologically advanced and well-organized Japan, clearly demonstrates that nuclear power development cannot be treated as only a national affair. Nuclear accidents have regional and even international impacts, and states have to cooperate to prevent them from happening or mitigate their effects. How can a successful regional collaboration for safety and security be designed and what is needed to put such a framework in place?

A new regional collaborative framework has to be instituted with the capacity to meet the nuclear non-proliferation and nuclear security challenges that will arise when nuclear power acquires a dominant role in Asia. If we start with the non-proliferation aspect, a new approach has to be introduced to tackle the problem from an angle that facilitates and promotes a greater role for regional cooperation to replace nation-centred policies.<sup>32</sup> This strategy will need to focus on the individual nations' abilities to develop nuclear non-proliferation structures and subscribe to international treaties and control regimes. A starting point in this direction is nuclear power development based on cooperation among states to promote *multilateral arrangements* regulating the development and/or ownership of technology and fissile materials. The main idea behind this type of an arrangement is to either set up a globally-controlled common nuclear materials bank, or to promote cooperation among states to prevent any one actor from achieving exclusive control. The concept of a common bank

could not be realized during the Cold War because of the absence of the necessary political and historical preconditions.<sup>33</sup> One can ask whether the preconditions are better today. It could be argued that the conditions ought to be more favorable in today's world, when the demand for energy intensifies by the day and states need to be more willing to consider pooling their nuclear sovereignty to ensure greater control and access to the much needed energy supply. In the event this idea of creating a common bank cannot be realized, however, there is the somewhat less stringent option of a *multilateral arrangement* where several states sign up to a joint use arrangement for obtaining nuclear energy from a common nuclear energy system. It may be a question of three or four states jointly owning a reactor and/or an enrichment facility. Since several nations would be cooperating in this way there would be less risk of diversion, because the different parties will monitor each other and have a collective interest in not breaching the NPT regulations. There has been a trend in recent years for discussions on such arrangements. For example, Poland and the Baltic countries are currently planning a common nuclear energy system. The fact that all four states are members of the European Union would facilitate such a solution, since they would be in a position to receive assistance from EURATOM. This example shows the value of having a network of multilateral institutions with overlapping membership.

Another way to mitigate the proliferation risks would be obtain nuclear power without owning any nuclear facilities. From a non-proliferation perspective, it is more feasible to have an arrangement where a regional or international organization assumes the responsibility for nuclear energy production, while a state merely buys the energy. Alternatively, another state under international control and enjoying widespread respect for its non-proliferation commitment might produce and supply the energy. In these two scenarios, the energy importing state, is not a potential nuclear weapons proliferator because it neither owns nuclear facilities nor has the need to possess nuclear materials. In this context, Turkey is an interesting example. Russia is planning to build, own, and run a nuclear power plant in Turkey.<sup>34</sup> Turkey has no nuclear infrastructure of its own, and to construct an entire nuclear power system from scratch at the cost of enormous resources in the form of capital and technical development does not make sense. It can be argued that many states do not consider this approach as especially attractive today, given the recent Russian occupation of Crimea and Russia's use of its energy supply as an economic weapon to exert political

influence. However, there are other potential states in Asia that can play a similar role as Russia does in Turkey. What if China and South Korea took the same initiative with states in Asia as Russia is doing in relation to Turkey, for example?

A second approach lately discussed by experts consists of investing in new proliferation-resistant nuclear fuel and technologies. The technology that exists today has been developed within the framework of a military paradigm, since nuclear power was originally used for military purposes. It was not until the 1960s that nuclear power came to be used for civilian power production. Nuclear technology is said to be “dual-use” – in other words, equipment, facilities, and fissile fuel may be used both for civil and military purposes. Some experts are of the opinion that it might be possible to develop nuclear power systems where each step in the process of nuclear power production would be specifically designed to reduce or eliminate proliferation risks. However, it is important to stress that even if this new technology was developed on a large scale, and was adopted, it would not suffice to make nuclear facilities absolutely proliferation-proof.<sup>35</sup>

Besides the proliferation risks, the growing threat of terrorism, theft, and sabotage owing to the expanded role of nuclear power is an issue that has to be taken seriously. When more states opt for new or renewed nuclear power programs in Asia, one of the main challenges over the coming decade will be to ensure that new nuclear facilities are integrated into robust plans for nuclear security from inception, and not just safety and safeguards against state-level proliferation. The Asian states, however, are characterized by different security traditions, threat perceptions, and views on how to deal with nuclear and other forms of terrorism. This creates a challenge in terms of the prioritization of threats as well as the strategies for their mitigation. Preparing recovery strategies in the event of a nuclear terror event is also a key part of the challenge confronting policy makers. A first goal would therefore be to determine to which extent the Asian states’ infrastructure and societies can be made resilient.<sup>36</sup> To date, resilience in the context of nuclear security is a relatively unexplored field, which the Fukushima accident has demonstrated. The states in East and South Asia have to collaborate to coordinate collective efforts to design a more resilient nuclear security system.

A second goal would be to ensure that all states comply with international agreements. For example, not all Asian states have implemented UN resolution 1540 which is legally binding on all UN members and notes that all member states have to provide “appropriate effective” nuclear security for all nuclear material and related technology, and to “to establish domestic controls to prevent the proliferation of nuclear, chemical and biological weapons. The resolution also encourages enhanced international cooperation on such efforts, in accord with and promoting universal adherence to existing international non-proliferation treaties.”<sup>37</sup> If the words “appropriate effective” mean anything, as Matthew Bunn argues in an article, “they ought to mean that security measures must be put in place that can effectively defeat the threats that terrorists and criminals in that country have shown they can pose.”<sup>38</sup>

The third goal would be to make sure that the states in East and South Asia meet world standards in management of nuclear technology even if international obligations do not require that. The Convention on the Physical Protection of Nuclear Material and Nuclear Facilities and other efforts to strengthen nuclear security by the IAEA has many weaknesses. For example, the Convention on the Physical Protection of Nuclear Material and Nuclear Facilities is very generally formulated and leaves much room for states to interpret how the physical protection should be designed, which most likely may result in insufficient systems.<sup>39</sup> A regional collaboration such as the EURATOM system could serve as a model along which such a standardization system could be designed. Finally, in order to achieve the above mentioned goals to create an Asian nuclear community, one important and decisive factor has to be added: the regional collaboration has to be based on a real decision-making authority that makes the cooperation formally binding. In this context, the nuclear industry in the region has to be more extensively involved in these efforts.<sup>40</sup> The more collaboration among Asian companies dealing with nuclear-related production and services that could be stimulated, the greater the possibilities that such a development would lead to more regional interdependence: for example, joint investments in building of reactors and sharing power grids etc. Such a positive development might lead to a situation where the political leadership in different Asian states are more or less forced to enter cooperation which is formally binding. Only the future, however, can tell whether there is a willingness among East and South Asian states to move in such a direction.

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<sup>1</sup> Caroline Jorant (July 2011). "[The implications of Fukushima: The European perspective](#)". *Bulletin of the Atomic Scientists* 67 (4); Mycle Schneider (9 September 2011). "[Fukushima crisis: Can Japan be at the forefront of an authentic paradigm shift?](#)". *Bulletin of the Atomic Scientists*.

<sup>2</sup> <http://www.world-nuclear.org/info/current-and-future-generation/plans-for-new-reactors-worldwide/> (Updated May 2015).

<sup>3</sup> International Status and Prospects for Nuclear Power 2012, 5 August, 2012, IAEA, [http://www.iaea.org/About/Policy/GC/GC56/GC56InfDocuments/English/gc56inf-6\\_en.pdf](http://www.iaea.org/About/Policy/GC/GC56/GC56InfDocuments/English/gc56inf-6_en.pdf).

<sup>4</sup> <http://www.worldnuclearreport.org/Who-we-are.html>, 8 June, 2015.

<sup>5</sup> World Nuclear Association, October 2014, <http://www.world-nuclear.org/info/Country-Profiles/Others/European-Union/>, 22 May, 2015.

<sup>6</sup> World Nuclear Association, <http://www.world-nuclear.org/info/Country-Profiles/Others/Asia-s-Nuclear-Energy-Growth/>, October 2013.

<sup>7</sup> The related concept of 'nuclear security' encompasses any activity or system that contributes to the protection of nuclear (highly enriched uranium and plutonium) and high hazard radioactive materials and associated expertise from unauthorized access, theft, diversion or sabotage by terrorists or other non-state actors, including, *inter alia*, guarding, physical protection, facility design, personnel vetting, information technology security, and technical measures, among other things. It also incorporates any activity or system that can contribute to detecting preparations for the perpetration of a nuclear terrorist event, and responding to and recovering from the after effects of such an event if prevention fails.

<sup>8</sup> 'Nuclear Security Summit: Countering New Global Threats'. <http://www.america.gov/relations/nonproliferation.html>; Tariq Rauf, "Looking beyond the 2014 Nuclear Security Summit 2014", SIPRI, March 2014, [http://www.sipri.org/media/expert-comments/rauf\\_mar2014](http://www.sipri.org/media/expert-comments/rauf_mar2014).

<sup>9</sup> William Walker, *A perpetual Menace: Nuclear Weapons and International Order* (Routledge, 2011); Joseph Pilat, "The End of the NPT regime?" [http://www.chathamhouse.org/sites/default/files/public/International%20Affairs/2007/83\\_3469-482.pdf](http://www.chathamhouse.org/sites/default/files/public/International%20Affairs/2007/83_3469-482.pdf).

<sup>10</sup> <http://ec.europa.eu/energy/en/topics/nuclear-energy>, 8 June, 2015.

<sup>11</sup> Ian Anthony, 'Exports of dual-use chemicals to Syria: an assessment of European Union export controls', Non-proliferation Paper No. 35, Jan. 2014, 13 pp. <http://www.sipri.org/research/disarmament/eu-consortium/publications/non-proliferation-paper-32>.

<sup>12</sup> Piotr Szymanski, The EURATOM regional safeguards system, <http://www.iaea.org/newscenter/focus/iaeanwfz/euratom211111.pdf>

<sup>13</sup> 'EU Strategy Against Proliferation of Weapons of Mass Destruction', Council of the European Union, Brussels, 10 December 2003, <<http://register.consilium.europa.eu/pdf/en/03/st15/st15708.en03.pdf>>.

<sup>14</sup> Gunnar Skogmar, *The United States and the Nuclear Dimension of European Integration* (Basingstoke, Palgrave Macmillan, 2004).

<sup>15</sup> *Euratom: 50 years of nuclear energy serving Europe*, European communities, 2007.

<sup>16</sup> 'Communication from the Commission to the European Parliament and the Council on Strengthening Chemical, Biological, Radiological and Nuclear Security in the European Union: An EU CBRN Action Plan', Brussels, 25 June 2009, COM(2009) 273 final, <[http://ec.europa.eu/home-affairs/summary/docs/com\\_2009\\_0273\\_en.pdf](http://ec.europa.eu/home-affairs/summary/docs/com_2009_0273_en.pdf)>.

<sup>17</sup> 'Nuclear Security Fund', International Atomic Energy Agency, <<http://www-ns.iaea.org/security/nsf.asp>>.

<sup>18</sup> Alan J. Heyes and Wyn Q. Bowen, 'Silent Partnership: The G8's Nonproliferation Program', *The Bulletin of the Atomic Scientists*, 66/2 (March-April 2010), pp. 17–26; 'G8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction', US Department of State, <<http://www.state.gov/t/isn/c12743.htm>>.

<sup>19</sup> Brian Walker, C. S. Holling, Stephen R. Carpenter, and Ann Kinzig, 'Resilience, Adaptability and Transformability in Social-ecological Systems', *Ecology and Society*, 9/2 (2004).

<sup>20</sup> <http://www.world-nuclear.org/info/current-and-future-generation/plans-for-new-reactors-worldwide/>

<sup>21</sup> Ibid.

<sup>22</sup> "Nuclear Power in South Korea", <http://www.world-nuclear.org/info/Country-Profiles/Countries-O-S/South-Korea/> (Updated May 2015).

<sup>23</sup> <http://www.world-nuclear.org/info/Country-Profiles/Others/Nuclear-Power-in-Taiwan/> (Updated May 2015).

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- <sup>24</sup> Nuclear Power in Vietnam, <http://www.world-nuclear.org/info/Country-Profiles/Countries-T-Z/Vietnam/> (updated May 2015).
- <sup>25</sup> “Nuclear Power in Japan”, <http://www.world-nuclear.org/infoCountry/-Profiles/Countries-G-N/Japan/> (Updated May 2015).
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- <sup>27</sup> Ramesh Takur, “The Global Governance Architecture of Nuclear Security”. The Stanley Foundation Policy Analysis Brief, March 2013.
- <sup>28</sup> Mark Breson, “Re-thinking Regionalism. Europe and East Asia in Comparative Historical Perspective”. Paper presented at the Oceanic Conference on International Studies, Canberra, July 14-16, 2004.
- <sup>29</sup> Björn Hettne and Fredrik Söderbaum, “Theorizing the Rise of Regionness”, in *New Political Economy*, Vol 5, No 3 (December), pp. 457-473.
- <sup>30</sup> For example, the International Energy Association (IEA) estimates that the electricity demand in the ASEAN region will increase 76 % between 2007 and 2030, Nuclear Renaissance in Asia, <http://www.prlog.org/10941323-nuclear-renaissance-in-asia.html>.
- <sup>31</sup> Asia Pacific Leadership Network for Nuclear Non-Proliferation and Disarmament. Discussion Paper: The Concept of an Asian-Pacific Nuclear Energy Community, 18 February 2013. <http://a-pln.org/sites/default/files/apln-analysis-docs/APLNEnergyCommunityPaper18ii13.pdf>.
- <sup>32</sup> Vitaly Fedchenko, “Appendix 13C. Multilateral control of the nuclear fuel cycle” in *SIPRI Yearbook 2006: Armaments, Disarmaments and International Security*. Oxford: Oxford University Press, 2006.
- <sup>33</sup> However, the 1956 IAEA Statute provides for the creation of an international nuclear fuel bank that could guarantee the supply of fuel to those states that need it but don’t want or are not able to produce nuclear material themselves. See Fedchenko (2006): 691.
- <sup>34</sup> <http://www.panarmenian.net/eng/world/news/69440/>.
- <sup>35</sup> Fedchenko 2006.
- <sup>36</sup> Brian Walker, C. S. Holling, Stephen R. Carpenter, and Ann Kinzig, ‘Resilience, Adaptability and transformability in Social-ecological Systems’, *Ecology and Society*, 9/2 (2004).
- <sup>37</sup> 1540 Committee, UN <http://www.un.org/sc/1540/>.
- <sup>38</sup> Bunn, G. (2003), ‘The Nuclear Non-proliferation Treaty: History and Current Problems’ in *Arms Control Today*, December <[http://www.armscontrol.org/act/2003\\_12/Bunn.asp](http://www.armscontrol.org/act/2003_12/Bunn.asp)>.
- Bunn, M. (2005) “Incentives for Nuclear Security, Conference Paper at the conference Incentives for Nuclear Security, Belfer Center, Harvard University, 30 August, 2005, ”, <http://belfercenter.ksg.harvard.edu/files/inmm-incentives2-05.pdf>.
- <sup>39</sup> Ibid.
- <sup>40</sup> Gretchen Hund and Amy Seward have argued that the industry can be more effective in preventing spread of nuclear material and technology and be a strong ingredient in the efforts to enhance the nuclear security aspects of the non-proliferation regime. Gretchen Hund and Amy Seward, “Broadening Industry Governance to include Nonproliferation”, Pacific Northwest Center for Global Security Publication, 11 November 2008, [http://cgs.pnnl.gov/pdfs/IndustryCorporateGovernance-Security\\_11-12-08Final.pdf](http://cgs.pnnl.gov/pdfs/IndustryCorporateGovernance-Security_11-12-08Final.pdf).