

## **A Pakistani perspective on WMD terrorism: is it really a threat?**

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**T**he prospect of terrorists acquiring chemical, biological, radiological, and/or nuclear weapons (CBRN) - generally termed as WMD terrorism - has haunted the world since at least the late sixties. Chemical and biological warfare is now an old phenomenon, and in the current environment, the focus is primarily on terrorism through nuclear and radiological dispersal devices (RDD).

The threat of RDD terrorism also includes the production of a yield of many kilotons using highly enriched uranium (HEU) or reactor grade plutonium. An early nuclear weapon designer pointed out that when fissile material is available in quantity, barriers in manufacturing highly destructive bombs are lowered dramatically.<sup>1</sup> The end of the Cold War offered hope that the nuclear arsenal built by the United States and other countries might now stand redundant; however, a new threat quickly arose as the Cold War bandits, who had been built up to enable states to engage in low intensity conflict, began posing threats to global security. Indeed, in the last two decades or so, terrorist organisations have repeatedly demonstrated willingness to engage in extreme violence through various means, including WMD when possible.<sup>2</sup>

There are claims that organisations like al-Qaeda have the capability to build nuclear weapons. These are however only conditionally true since they may be valid under a set of assumptions that are generally very restrictive and thus make it almost impossible for untrained terrorists to meet the requirements of developing crude or sophisticated devices. It is, however, conceivable if this occurs through a nationally supported program.<sup>3</sup> U.S. officials have been underscoring the likelihood of terrorism through the use of WMD for quite some time as well.<sup>4</sup> The UN Secretary General has labelled nuclear terrorism as “one of the most serious threats of our time” and President Obama has also noted that “there is no graver danger to global security than the threat of nuclear terrorism.” And this goes beyond rhetoric; as indicated by Rolf Mowatt-Larssen, an esteemed American expert on nuclear terrorism, “The threat is

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not being hyped for political purposes. The world is too interconnected and too vulnerable.”<sup>5</sup>

The prospect of terrorists producing and replicating the ‘gun type’ nuclear bomb cannot be ruled out. Since 1995, there have been several cases that confirm the danger of access to substances with the potential for mass killings to people who have no scruples about using them. There is a risk that terrorists could produce RDD - generally termed as ‘dirty bomb’ – by combining conventional explosives with radioactive material.<sup>6</sup> The most pessimistic and oft-cited estimates have been those put forward by Harvard University’s Graham Allison, who has been arguing since the mid-

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1990s that a major terrorist nuclear incident is more likely than not, or at least significantly likely “within the next ten years”. Siegfried Hecker, former head of the Los Alamos National Laboratory, says that “the general consensus of nuclear weapons experts is that terrorists would face significant but not insurmountable challenges to build a primitive but devastating nuclear device.” Others are much more sceptical; John Mueller, for instance, concludes that “the likelihood that a terrorist group will come up with an atomic bomb seems to be vanishingly small – perhaps very substantially less than one in a million.” Just because the odds are small, however, does not mean that there is no cause for concern.<sup>7</sup>

The fears have been greatly compounded due to the huge global stockpile of nuclear material and new trends in energy program expansions all over the world.<sup>8</sup> The radioactive materials needed to build a dirty bomb can be found in almost every country in the world, as indicated by the International Atomic Energy Agency (IAEA). The U.S. has one of the best registration systems for radioactive material and yet every year the U.S. Nuclear Regulatory Commission (NRC) receives 200 reports of lost, stolen or abandoned radioactive sources.<sup>9</sup> While other countries cannot afford to lower their guards, the U.S. and Russia, with over 90% of global nuclear activities, need to be cautious as they can be sources, as well as targets for terrorists.<sup>10</sup>

The discourse remains inconclusive; Jeffrey M. Bale and Gary A. Ackerman point out that “almost every author couches his or her

conclusions in conditionality, and hardly anyone definitely rejects or else argues for inevitability of WMD terrorism. Instead opinions range from highly unlikely to extremely probable”.<sup>11</sup> A onetime mainstay of science fiction, the conjunction of technology and terrorism makes for an uncertain and frightening future.<sup>12</sup> Realizing that WMD terrorism may pose a real threat, recent years have seen increased international cooperation on nuclear security, including improvement in accounting procedures and increased funding for security-related initiatives; still, much work remains to be done in order to lock down all nuclear materials to Fort Knox standards.

This paper focuses on a number of key interrelated issues in this debate. After defining WMD terrorism and assessing whether terrorists possess the capability to acquire and use WMD, it carries out a net assessment and suggests preventive measures to safeguard the world. In essence, this paper focuses on the political and security aspects of WMD terrorism, a term that has been used interchangeably with “nuclear terrorism” without taking into account the technicalities involved.

### **Defining nuclear terrorism**

Terrorism is a multifaceted concept and difficult to define as a tangible phenomenon. Thirty years ago, Brian Jenkins articulated the conventional wisdom that “terrorists want a lot of people watching ... not a lot of people dead.” Mass casualty incidents began to increase in the 1980s, but the events of 9/11 took terrorism to an entirely new level so that we have a case of “a lot of people watching and a lot of people dead.”<sup>13</sup> Michael Darnell asserts that the 9/11 attacks amounted to a ‘paradigm shift’ that demonstrated the new power and capability that information technology has given to non-state actors.<sup>14</sup> The U.S. Department of Defence defines terrorism as “the calculated use of violence or threat of violence to inculcate fear; intended to coerce; or to intimidate governments or societies in the pursuit of goals that are generally political, religious, or ideological.”<sup>15</sup> If it involves WMD or the threat of WMD, it is generally termed as “WMD terrorism” or “nuclear terrorism”.

Nuclear terrorism is not restricted solely to the use of explosive nuclear devices. According to Ferguson, in its broad definition it includes: the seizure and detonation of an intact nuclear weapon; theft or purchase of HEU or plutonium leading to the fabrication and detonation of a crude nuclear weapon or an improvised nuclear device (IND); attacks against, and sabotage of, nuclear facilities to try to cause the release of large amounts of radioactivity; and the unauthorized acquisition of radioactive

materials contributing to the construction and detonation of a radiological dispersion device (RDD) popularly known as a 'dirty bomb,' or a radiation emission device.<sup>16</sup>

The IAEA identifies four major dimensions of nuclear terrorism. These are "malicious acts" that include: one, the detonation of a stolen or purchased nuclear weapon; two, the detonation of an IND made from stolen or purchased nuclear material; three, sabotage of, or attacks on, installations, locations, or transports containing nuclear material which could result in dispersal; and finally the detonation of an RDD. Of these threats, experts consider the detonation of an IND a more likely occurrence than the detonation of an actual nuclear weapon.<sup>17</sup>

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It is believed that any attempt to develop or acquire chemical or biological weapons to endanger human lives also falls under WMD terrorism. Whether or not terrorists have the capability to use such technology is not the issue here; the mere intent to use the material can also be considered terrorism and thus requires the international community to take extensive safeguards to secure and protect WMD-related material.

#### **WMD-related material: is it within the reach of terrorists?**

Terrorist organisations may be able to use WMD-related material in a number of ways. For nearly all practical purposes, the concern is that a huge stockpile of nuclear weapons and corresponding usable material is maintained using extremely varied accounting systems; moreover, the conditions for storing and protecting them from hijacking or sale are far from reliable. Global stocks of HEU and separated plutonium present a serious danger since as little as 50 kg of HEU and 5 kg of separated plutonium may be enough to build a sufficiently powerful bomb.<sup>18</sup>

Massive quantities of fissile material exist around the globe but the prime source remains Russia. Despite significant assistance from the U.S. in the last decade, many of its nuclear facilities are poorly secured and

there is no comprehensive and verifiable system of accountancy. Another problem is Russian naval fuel; there are indeed confirmed incidents of Russian-origin fissile material turning up for sale on the black market.<sup>19</sup> A memorandum from the country on April 13, 2010 acknowledges that the industry requires “a high level of physical nuclear security”, but gives assurances that “reliable physical protection is being provided for all nuclear materials and related facilities” on Russian territory and that there are no “vulnerable nuclear materials and facilities with the level of physical security that would cause any concern.”<sup>20</sup>

With conventional sources of energy fast depleting, several countries have embarked upon nuclear energy programs. In addition to 443 NPPs as of December 2005, an additional 27 NPPs are under construction in 11 countries. These produced around 255,000 tons of spent fuel by 2003, which will increase to about 457,000 by 2020. If there is no significant change in back-end policies, we could be witnessing a total of nearly one million tons of spent fuel in storage by 2050, with a content of close to 10,000 tons of plutonium, with the U.S., U.K., Canada, France, Russia, Japan and Germany being the main contributors. In addition to NPPs, there are also research reactors (approximately 550 in the world) and the use other nuclear technologies, particularly sealed radiation sources.<sup>21</sup>

In many countries, security amounts to little more than an unarmed guard and a chain-link fence perimeter. No less shocking, an ABC News report in 2005 found guards sleeping on duty as security doors propped open with books at nearly all twenty-five of the United States university-based research reactors. The problem goes beyond state control; the U.S. administration notes that roughly half of the world’s nuclear materials are in the hands of the private industry. Vice President Joe Biden, after a meeting with industry officials on April 14, 2010 on the sidelines of a nuclear security summit, challenged the nuclear industry to prepare a set of best practices by the next summit planned for 2012.<sup>22</sup> According to the IAEA Illicit Trafficking Data Base (ITDB), there have been 827 confirmed incidents of illicit trafficking since December 31, 2005, including incidents involving nuclear materials and other radioactive sources. Lyudmila Zaitseva estimates that the real amount of missing weapons-grade material could in fact be ten times higher than official figures.<sup>23</sup>

There are three types of weapons that can be built with basic ingredients. The amount of fissile material required for one 15 kt atomic bomb built to a “gun-type” design would be around 50 kg of HEU and an implosion-type weapon of the same yield would require far less fissile

material – around 5 kg of plutonium. While a gun assembly is less sophisticated, the likelihood of terrorists developing and using RDD is higher since, as a report by the Institute for Science and International Security concludes, the latter involves fewer barriers than the acquisition or use of nuclear weapons.<sup>24</sup>

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The easily available nuclear materials are isotopes with widespread commercial application in industry, medicine and research. These sources are found in the tens of thousands of hospitals, research centres and universities around the globe and are virtually unprotected. Isotopes used for industrial purposes may be particularly at risk since they are frequently transported to and from sites. There are numerous disused radioactive ‘orphan’ sources that are unaccounted for even in advanced countries; the IAEA points out that more than 100 countries lack the control and monitoring programs necessary to prevent or even detect the theft of these materials. Many countries do not even have a central register of radioactive materials; indeed, the danger is that, "If they don't know what they have, they don't know what they've lost".<sup>25</sup> Despite having one of the best registration systems for radioactive material, U.S. companies have lost track of nearly 1,500 radioactive sources within the country since 1996, with more than half never recovered. In the European Union (EU) too, about 30,000 disused sources held in local storage at the users' premises are at risk of being lost from regulatory control. RDD is undoubtedly among the most easily attainable additions to terrorist arsenal.<sup>26</sup>

The weaknesses of Russian nuclear installations are well-documented, but protection levels of many western facilities are also inadequate, as has been exhibited through shortcomings in the U.S. nuclear-weapons complex. Current U.S. Nuclear Regulatory Commission (NRC) security regulations do not address the magnitude of threat demonstrated by the September 11 attacks. Under the current weak standards, armed guards at nearly half of the NPPs tested in NRC-supervised security exercises failed to repel mock terrorist attacks or prevent simulated destruction of redundant safety systems that could, in real attacks, have caused severe core damage, meltdown, and catastrophic radioactive releases. Therefore,

NPP security is too important to be left to the industry's self-assessed level of protection.<sup>27</sup> According to John Barry, the bad news is that nuclear threats are growing as more states are seeking nuclear technologies, power, and weapons; the production, transportation, and storage of nuclear materials is, moreover, likely to expand throughout the century.<sup>28</sup>

In a subcommittee hearing on April 27, 2004, an official of the National Nuclear Security Administration (NNSA) of the U.S. Department of Energy (DoE) admitted that Y-12, where the U.S. manufactures and maintains the world's largest repository of 400 MT of HEU, has "some of the most difficult security problems in the complex" as its facilities were built in the early days of the Cold War, since when the threat levels have changed drastically. Richard Levernier, a security specialist with the DoE, in an interview in 2003, said that, "In more than 50% of our tests at the Los Alamos facility, we got in, captured the plutonium, got out again, and in some cases didn't fire a shot because we didn't encounter any guard".<sup>29</sup>

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### **Terrorists' intentions and capacity**

The 9/11 attacks exhibited that terrorists are willing to inflict mass civilian casualties. Contemporary history indicates that terrorist groups also aim to buy, build or steal nuclear weapons and could look to approximately 40 countries with nuclear materials where they could link up with rogue individuals who run black markets selling nuclear materials and technology. If terrorists manage to get their hands on enough HEU, the consequences could be catastrophic.<sup>30</sup>

The threat of nuclear terrorism is no longer fiction; terrorists have both the intention and the potential material to inflict damage on human life, property and the environment and this offers a great challenge to global security.<sup>31</sup> Nonetheless, it should be noted that despite the fear of an RDD attack, it is very hard to assess whether the actual risk of such an event has increased significantly. This is a matter that needs to be clarified further through statistics, qualified speculation and some comparable scenarios, as this paper now attempts to do.

Former Secretary General of the United Nations Kofi Annan once noted that “nuclear terrorism is still often treated as science fiction. I wish it were. But, unfortunately, we live in a world of excess hazardous materials and abundant technological know-how, in which some terrorists clearly state their intentions to inflict catastrophic casualties...” William C. Potter and Charles D. Ferguson argue that a nuclear terrorist attack is more likely to happen now than at any other time in the past. The rationale behind this is that, firstly, NSAs in the form of terrorist networks have the urge to use nuclear weapons for furthering their agendas, and secondly, crude but real nuclear weapons, as distinct from RDD, are well within the technical reach of some terrorist organisations.<sup>32</sup> Such is the threat that speaking to reporters at the close of a nuclear security summit, President Obama encouraged participating nations to seize the opportunity “to make concrete commitments and take tangible steps to secure nuclear materials.” This is essential because there have been several cases since 1995 that confirm the danger of nuclear devices and substances falling in to the hands of dangerous non-state actors.<sup>33</sup>

A terrorist organisation can, however, acquire a nuclear explosive only through two means - either by obtaining an intact nuclear weapon from a national stockpile, or by obtaining fissile material from stocks that were produced in highly advanced industrial facilities to be made into a nuclear explosive. It is widely assessed that it would most likely opt for the simpler gun design, provided that the necessary infrastructural facilities are made available by nuclear capable states or agencies.<sup>34</sup>

There are contradicting views regarding terrorists’ capabilities to acquire or build a nuclear weapon and deliver it to the intended target. According to Dr Sonia ben Ouagrham-Gormley, possession is not the key factor; in fact, there are powerful obstacles facing terrorists. These include nuclear knowledge, which is "specialized know-how... [that] is difficult to come by" and "tacit knowledge" that comes from experience and interactions with others working on nuclear materials. Moreover, the widespread belief that there is "a nuclear black market in the former Soviet Union" is also a myth since there is no established client base and smugglers usually do not get wares to their destinations. Indeed, most materials that are traded have little value in making a nuclear weapon or dirty bomb.<sup>35</sup>

Robin Frost reinforces this stance, arguing that accessing fissile material and consequently assembling an explosive device would prove to be a very difficult task for a terrorist organisation. With the shielding removed, they would emit enough radiation to kill anyone attempting to

combine the radioactive material with conventional explosives in a dirty bomb. However, given the exponential psychological and economic effects of such a weapon, the benefits of deploying one may far outweigh the costs and difficulties encountered in its construction.<sup>36</sup> El-Baradie, the former head of the IAEA, also notes that even if terrorists have nuclear material, it is highly unlikely that they could manufacture and successfully detonate a nuclear bomb. On the contrary, in a study commissioned by the NCI, it was concluded that terrorists would be capable of making an effective first-generation nuclear weapon if they have access to the requisite material. There is as yet, however, no evidence of a nuclear capable terrorist entity.<sup>37</sup>

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In addition, there are several conflicting requirements regarding the properties of the source material. For instance, it should be "sufficiently" radioactive to create radiological damage at the explosion; it should be transportable with enough shielding to protect the carrier but not so much that it is too heavy to be transported; and finally, it should be sufficiently dispersible to effectively contaminate the area around the explosion.<sup>38</sup> Because of these constraints, even RDDs might still be defined as "high-tech" weapons. Nonetheless, the impact of even a symbolic attack would be that of any weapon of terror and its purpose would presumably be to create a psychological rather than physical effect. For this reason, dirty bombs are sometimes called "weapons of mass disruption".

According to a Federation of American Scientists' (FAS) study, a small amount of radioactive material detonated along one pound of TNT in New York City would require the evacuation of 20 city blocks in half an hour.<sup>39</sup> Accidental contamination in the past, including one in Brazil during 1987 that required the monitoring of some 112,000 persons and led to a massive cleanup, exemplifies the potential for traumatizing an unsuspecting population.<sup>40</sup> Similarly, the two unfortunate incidents of Chernobyl in 1986 and the 1984 Bhopal gas tragedy in India also point to the need for a very serious approach to protect such facilities against terrorist attacks. Similarly, the deadly leakage of nuclear radiations from a plant near New Delhi in the recent past has also sounded a wakeup call for global nuclear watchdog agencies.<sup>41</sup>

Due to commercial liberalization, a massive amount of international trade and commerce occurs every day. Given the sheer volume of goods

entering all states, the chance of detecting illicit commodities is low. Meanwhile, globalization means that "new threats cannot be contained and controlled by one state" and will consequently require international solutions.<sup>42</sup> Air transport is risky, but transport by sea might offer some opportunities for terrorist groups, while trucks and especially loaded railcars across land borders are even more attractive options. In the case of the U.S. for instance, as of late 2008, there were 317 entry points into the country, including 31 railways and 33 international airports, making the volume of goods difficult to examine thoroughly.<sup>43</sup>

While many intellectuals are inclined to believe that terrorists will fail in attempting to develop a nuclear device, security experts especially from the U.S. note that, though unlikely, a nuclear terrorist attack is possible. Several episodes in the contemporary history of nuclear proliferation unveil, in particular, al-Qaeda's clandestine efforts to get the bomb. In December 1998, Osama bin Laden expressed his organisation's intent when he stated in an interview that, "Acquiring WMD for the defense of Muslims is a religious duty." He also claimed to possess WMD; bin Laden had tried to acquire nuclear materials back in 1992 when he sought to forge relations with South Africa and was also alleged to have sought a deal with Chechen rebels.<sup>44</sup> It created alarm when two imprisoned al-Qaeda leaders indicated that NPPs were definitely among the targets considered by the terrorists.<sup>45</sup> Frost does not limit the definition of terrorist organisations to al-Qaeda; he includes many other such entities that draw their motivations from multifarious political, spiritual and historical events, like Aum Shinrikyo in Japan, the National Liberation Front of Nigeria and the Irish Republic Army.<sup>46</sup>

### **Attempts of nuclear terrorism**

Since 1995, there have been several cases that confirm the danger of nuclear terrorism. The Aum Shinrikyo attacks in Tokyo in 1995 and the anthrax attacks in the U.S. in 2001 were the first two known cases of the WMD terrorism. The poisoning of Alexander Litvinenko by a former Russian intelligence officer in London in 2006 with Polonium-210 then involved a clean-up cost over £100,000. "All this activity resulted from an amount of radioactive material the size of a grain of salt," says Aloise in a report on nuclear terrorism delivered to a congressional committee.<sup>47</sup>

Though there has been increased media, there have only been two cases of attempted nuclear terrorism – both involving Chechnya. The first attempt was carried out in November 1995 by a group of Chechen separatists who buried a Caesium-137 source wrapped in explosives at the Izmaylovsky Park in Moscow. A rebel leader alerted the media and the

bomb was never activated, the incident amounting merely to a publicity stunt. In December 1998, a second attempt was announced by the Chechen Security Service, which discovered a container filled with radioactive materials attached to an explosive mine. The bomb was hidden near a railway line in the suburban area Argun, ten miles east of the Chechen capital of Grozny. The same Chechen separatist group as above was suspected to be involved in the incident.<sup>48</sup>

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There are other cases as well. On November 8, 2007, four gunmen attacked the Pelindaba nuclear facility in the Republic of South Africa, a "national key point" that is regarded as one of the most secure nuclear facilities in the country. It has hundreds of kilograms of weapons-grade uranium - enough to make an estimated twenty-five nuclear bombs. The national agency that operates the facility revealed that the intruders disabled several security devices, including a 10,000 volt electrified fence, which intimated inside familiarity of the system. Nevertheless, what makes the attack all the more worrisome is that had the intruders been successful they would have achieved the first known theft of fissile materials from a nuclear power plant.<sup>49</sup>

While these incidents might not actually be acts of WMD terrorism, they remind the world that terrorists have the intent and the opportunities, and hence, there needs to be enhanced security and assessment of all nuclear facilities.

### **Nuclear terrorism - a net assessment**

Scholars remain divided on the issue of WMD terrorism. However, it is important to note that while the acquisition and detonation of nuclear devices - both 'gun-type and 'implosion-type' - is beyond the capability of nuclear terrorists, they could still endeavour to build RDD and use it for psychological impact. There is a general consensus that the nuclear industries in most advanced countries are susceptible to attacks as their private sectors lack adequate safeguards.

While terrorist organisations have no boundaries and would never hesitate to use radioactive material, developing and transporting such devices is an uphill task that requires resources and expertise. Conceiving and executing such a plan might have been possible before 9/11, but in the current security environment, such an attempt is likely to fail. This is because, firstly, efforts to control proliferation and ensure security of sensitive materials are more effective now as extraordinary safeguards are being considered. Secondly, there is a greater cooperation at the international level. And finally, stringent rules and regulations and regional and international arrangements are in place; these include the IAEA Nuclear Safety Convention (NSC), Convention on Physical Protection of Nuclear Material (CPPNM), UNSC Resolution 1540, Proliferation Security Initiative (PSI), Container Security Initiative (CSI), Mega Port Initiative (MPI) and other U.S. led efforts including Russia specific Cooperative Threat Reduction Measures (CTRM) and the Global Threat Reduction Initiative (GTRI). Terrorist organisations may not be able to beat the multilayered security measures to muster sources, develop and transport the device to the target country in these circumstances.

Any serious attempt by al-Qaeda to acquire nuclear material has not been proven through independent sources. Similarly, Bin Laden's interaction with Chechen, South Africa and other nuclear possessor states have never been confirmed through a reliable independent source either; these are, one should imagine, attempts to bluff the international community due to political rather than actual security concerns. This does not mean that nothing could potentially happen in the future as there is no dearth of expertise in the advanced world and if al-Qaeda can recruit suicide bombers, it can also hypothetically bring in trained individuals to undertake such adventurous assignments. Additionally, it is unlikely that this will involve large scale transportation across borders.

During the Cold War, the film industries of both the capitalist and communist blocs produced a number of works related to nuclear threat. Since 9/11, media hype has again helped to glamorise the issue. This has been the case in both films and fiction novels, including a 2004 BBC/HBO television film, and the novels *Babylon Rising Book 3: The Europa Conspiracy* (2005) and *A Very Dirty Business* (2006). While such accounts may help to raise awareness, they can also tempt radicalized youth in technically advanced countries; dubbing or translating them in local languages of the underdeveloped world could, moreover, magnify the problem.

The real concern may be with nuclear materials being transported; while this can happen anywhere in the world, the probability is higher in the developed world. Only in the U.S., radioactive waste is located at more than 70 commercial nuclear power sites in 31 states. Much nuclear waste is also transported through long distances, including between continents – for instance, from Japan to Europe and back. This can potentially put millions of people at risk. However, the scientific community is confident that there is sufficient protection and even if cargo is attacked, terrorists are unlikely to cause intended damage.<sup>50</sup> However, even symbolic attacks have serious psychological impact, and cannot be ignored.

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Irresponsible journalism also helps to glorify violence and the scholarly world is expected to be honest in its effort to unite the world on a global issue. Regrettably, many renowned scholars act as front men of various regimes and organisations in order to promote hidden agendas. Consequently, despite extensive safeguards in place, Pakistan's nuclear safety measures are constantly questioned in the international media. The well-known scholar David Albright for instance, opines that the ISI may not hesitate to share nuclear material with terrorists and other scholars including Dr Shaun Gregory, Frederick W. Kegan, Michael O' Hanlen, Douglas Frantz and Catherine Collins have also occasionally expressed controversial views that cause serious trust deficit between Pakistan and the West.<sup>51</sup>

While Feroz Hasan Khan is right that in saying that Pakistan is unstable, with a fledgling and transitioning democracy, and confronted with internal threats, he is incorrect in arguing that the country's security apparatus and nuclear security measures are incapable of preventing the worst from happening. Indeed, the worst can happen anywhere in the world – the 9/11 attacks being a major case. One can also partially subscribe to the views of Bruce Riedel, who notes that growing extremism and political instability in Pakistan should not mean that military relegates its nuclear security priorities.<sup>52</sup> While the safeguards taken by Pakistan may still require improvement, it is not alone in this regard as security arrangements around many NPPs in the U.S. too are well below desired

standards. Some of the measures taken by Pakistan in this regard are briefly covered below.

Since 1998, Strategic Plans Division (SPD), the custodian of Pakistan's nuclear program has mobilized all its resources and brought its safeguard standards to the international level by applying international best practices and availing U.S. cooperation. Pakistan's nuclear weapons and installations are protected through reinforcing layers of security that include a blanket of secrecy, deliberate deception, the separation of warheads from missiles, and security practices including Personnel Reliability Program (PRP) and the Human Reliability Program (HRP) for military and civilian personnel respectively. Pakistan has already put in place a robust regime that includes comprehensive command structures to secure its strategic assets.<sup>53</sup> Its stance has been substantiated by American officials, including the U.S. Joint Chief of Staff Chairman Admiral Mike Mullen who said, "These are the most important weapons in the Pakistani arsenal. That is understood by the leadership, and they go to extraordinary efforts to protect and secure them. These are their crown jewels."<sup>54</sup>

Under a careful secret plan instituted by the SPD, professional guards at static sites and escorts follow tight security procedures during transportation using special theft and tamper-proof vehicle and containers. Operational secrecy precludes specific discussion of management of nuclear arsenal, but a two-man rule and in some cases a three-man rule is followed, with physical safety and firewalls built into weapon systems to prevent any unauthorized launch.

In addition, the setting up of the Nuclear Security Action Plan (NSAP) by the Pakistan Nuclear Regulatory Authority (PNRA), an independent body for civil program that coordinates closely with SPD, was an important development.<sup>55</sup> A Nuclear Security Emergency Coordination Centre has also been established in Islamabad, and it is the focal point of coordination between various government agencies. Regional offices in all major cities were established during December 2008, creating a network of six emergency-response mobile laboratories. The primary job of this network is to track and respond to any threat of illicit nuclear material, radioactive source, or an RDD. In one study, Abdul Mannan, Director Transport and Waste Safety, PNRA, indicated that the controls around various nuclear installations and radiation facilities in Pakistan are enough to deter and delay a terrorist attack and any modified diversion would be detected in its early stages.<sup>56</sup>

Finally, the NSAP has established border controls at major crossing points. Pakistan abides by nuclear safety and security-related international conventions in letter and in spirit, and besides issuing a comprehensive export control regime and domestic legislation on the Chemical Weapons Convention, it has taken the lead by drafting a bill on domestic legislation for the Biological and Toxic Weapons Convention, which will be moved in Parliament following Cabinet approval.<sup>57</sup>

**Many Pakistanis believe that without foreign sponsorship, terrorists would not be able to get close the country's nuclear assets; there are also theories that foreign intelligence agencies, including Mossad, might concoct a dramatic story of nuclear arsenal being in danger and thus engage in coercive diplomacy.**

This does not mean that there is no threat of nuclear terrorism; as the threat of global terrorism has grown, so has the threat to Pakistan's nuclear program. Besides NPPs, Pakistan also possesses two research reactors, one commercial irradiation plant (PARAS), and numerous high activity radioactive sources for use in research and development, commercial, industrial, and medical purposes. The vulnerability of these facilities cannot be ignored, especially in the context of Pakistan's active participation in the war on terror. Like many other countries, Pakistan anticipates an expansion of its nuclear power program from its current production capacity of 437 MWe to 8,800 MWe by 2030. It will be decades before the expansion causes safety concerns; however, terrorists could possibly still disrupt processes or seize containers of high activity radioactive sources during 'inland' transport even though the likelihood of such incidents is low due to the security measures in place.

Nonetheless, irresponsible stories about Pakistan continue unhindered, raising anti-American feelings among a population that already perceives its nuclear installations to be under threat from western agencies. The mere firing of a few shots by terrorists at the outer ring of a nuclear facility or even a dummy site attracts the attention of the international media and might even lead to the U.S. implementing contingency plans to 'rescue' Pakistan's arsenal. This would however, create a doomsday scenario that might lead to a serious nuclear accident.

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theories that foreign intelligence agencies, including Mossad, might concoct a dramatic story of nuclear arsenal being in danger and thus engage in coercive diplomacy. Western scholarship has assured the world of the Pakistani scientific community's support of terrorists, and of an 'official policy' of the ISI of supporting the Taliban. Frederick Kegan and Michael O'Hanlen additionally suggest that in case of a take-over of Pakistan by religious extremists, the country's nuclear material should be seized and stashed in some 'safe' place like New Mexico in the U.S. Such irrational ideas also play up Pakistani apprehensions.<sup>58</sup>

It is unlikely that any country will involve itself with nuclear terrorists, who may however, acquire or develop poisonous gas without outside support and cause serious contamination of selected areas. This means that the industrial sector, as a vulnerable target, must ensure proper accounting and disposal. Insider collaboration with terrorists also needs to be considered, especially by industrialized countries that use thousands of tons of schedule chemicals.

Interesting aspects of the issues discussed are evident in the case of Indian nuclear expansion. Prime Minister Manmohan Singh has unveiled an ambitious plan to set up a global centre for nuclear security in India and called for "zero tolerance" for those engaged in trafficking nuclear material. India is facing at least thirteen separatist movements from organisations that would not hesitate to seize any opportunity to acquire and use WMD material. While current levels of Indian nuclear activity are small compared to the industrial world, there have been many incidents of theft of nuclear material. With its projected nuclear program expansion, the possibility of such incidents increases significantly.<sup>59</sup>

### **Way forward**

While the possibility of nuclear terrorism may be less than one in a million, the likely consequences are so catastrophically large that every possible preventive step must be taken. It is worth recalling the words of Michael Levi who said that, "It has often been said that defence against terrorism must succeed every time, but that terrorists must succeed only once. This is true from plot to plot, but within each plot, the logic is reversed. Terrorists must succeed at every stage, but the defence needs to succeed only once."

The most important and effective steps are to secure, reduce, and, where possible, eliminate nuclear weapons and fissile material while enhancing physical security around NPPs. A crucial defence is to end

civilian commerce in plutonium and HEU and to convert military stocks of these nuclear explosives into non-weapon-usable forms. Nuclear facilities should also have penetration-resistant bunkers to protect them from suicide bombers, and protection forces at plants should include sharpshooters.<sup>60</sup>

Such is the importance of nuclear security through including international cooperation that former U.S. Secretary of State Colin Powell once said that, “the president has made it very clear that the kinds of things that will probably be most successful in the campaign against terrorism are intelligence-sharing, controlling people going across borders.”<sup>61</sup> Graham Allison suggests that the ‘thousands of unsecured weapons in Russia should be guarded from being stolen by criminals who could then sell them to terrorists deriving great economic gains’. The U.S. has already taken many initiatives to secure the loose nukes present in Russia and provided protection and incentives to scientists; however, more resources need to be devoted to securing nuclear weapons in storage at 123 sites in Russia where only over fifty percent were adequately protected till 2008.<sup>62</sup>

**The U.S. has taken extensive measures by deploying 1,400 of an anticipated 2,100 radiation monitors; however, all those countries that have not yet installed detection equipment at various entrance and exit points need to act quickly.**

The threat is significantly higher during transportation within the country and across borders. The recommended steps here are the following: Firstly, regulatory bodies should ensure that there are no compromises on safety standards of the container being used for transportation. Secondly, international best practices must be ensured internally and externally. Thirdly, concerned agencies should chalk out effective plans for dealing with emergencies and response procedures. Fourthly, there should be constant monitoring. Fifthly, the most likely threats should be constantly reviewed and sufficient protection designed to ensure a high level of security. And lastly, export control laws should be strictly adhered to.

An effective intelligence network serves as the first line of defence against planned terrorist activities. It should be equipped and resourced enough to deny terrorists access to nuclear sources, and in case of a

breach, be able to track and get hold of the stolen material before it is put to use. International cooperation is of primary importance in this context.

The U.S. has taken extensive measures by deploying 1,400 of an anticipated 2,100 radiation monitors; however, all those countries that have not yet installed detection equipment at various entrance and exit points need to act quickly. It will be even more appropriate if equipment is also installed within the country at various intervals especially at places where maximum transport passes through. Portable detection equipment occasionally used on unfrequented routes will also help in maintaining deterrence against the shipping of unauthorized material.<sup>63</sup>

Extensive work is also needed for protecting spent fuel and other radioactive sources. While technically advanced countries with NPPs are expected to have comprehensive standard operating procedures (SOPs), there are many states that might not have requisite expertise in dealing with such material. Therefore, the IAEA, which usually undertakes awareness programs and arranges workshops, should lay emphasis on the provision of detection equipment. Special teams must be trained to respond effectively to threats and comprehensive SOPs prepared for the developing world.

WMD management requires multilateral effort and must concentrate on fashioning and implementing international legal measures aimed at securing nuclear material, combating nuclear trafficking, and decreasing the quantity of available fissile materials. Serious progress on proposed FMCT while taking due care of member states' security interests and ratification of the CTBT would help in preventing proliferation and strongly encourage disarmament.<sup>64</sup> Finally, there should be 'zero tolerance' for individuals and groups that engage in illegal trafficking.

The already established legal framework dealing with WMD terrorism requires revisions to meet changing circumstances without injecting new controversies impacting negatively on international trade and security of developing nations. Once mutually agreed, the countries should immediately advance their domestic policies in line with international legal frameworks since conventions and treaties can yield results only when they are reinforced with practicable compliance and enforcement mechanisms.

Arguing that the only way to eliminate the threat of nuclear terrorism is to lock down weapons at the source, Allison recommends nothing less than a new international order based on no insecure nuclear material, no

new facilities for processing uranium or enriching plutonium and no new nuclear states. Those policies are achievable, he notes, if they are pursued by a combination of quid pro quos and intimidation in an international context of negotiation and a 'humble' U.S. foreign policy. This would facilitate building a world alliance against nuclear terrorism and acquiring the intelligence necessary for success against prospective nuclear terrorists. "We do not have the luxury," Allison declares, "of hoping the beast will simply go away."<sup>65</sup>

**Globalization also challenges policymakers to rethink jurisdictional issues, define the crime of nuclear terrorism and adopt specific new legal instruments to accommodate and strengthen counter-proliferation efforts.**

Without making the IAEA strong, accurate monitoring of nuclear activities cannot be ensured. As pointed out by El-Baradei during his final UN address, "The IAEA still lacks adequate legal authority to do its job effectively in verification, safety and security". If the IAEA Additional Protocols is not signed by member states, the organisation will continue to face limitations in its quest to achieve desired results.<sup>66</sup>

## **Conclusion**

In the 21<sup>st</sup> century, nuclear terrorism has become the gravest threat to the security of individual states and the international community. The sweeping societal transformations that progressively cause the world to function more as an integrated society make the possibility of nuclear terrorism all the more likely. But they also offer opportunities to confront this menace effectively.

The enormity of this threat weighs heavily on the foreign policies of states and the international legal system. In the aftermath of the 9/11 attacks, special initiatives were taken to repatriate nuclear materials from foreign countries to their points of origin in the U.S. and Russia. Countries are also extending greater cooperation to form a Global Initiative designed to raise awareness of nuclear terrorism, encourage adherence to international legal frameworks, and provide the material and advice necessary to secure global nuclear supplies. Globalization also challenges policymakers to rethink jurisdictional issues, define the crime of nuclear terrorism and adopt specific new legal instruments to accommodate and strengthen counter-proliferation efforts. International agreements are necessary but not sufficient; only through genuine commitment and

political will of most governments, especially the nuclear powers, can the threat be reduced or eliminated.

As long as there are stockpiles of nuclear weapons in the world, the possibility of nuclear terrorism remains; complacency on any front could be fatal. One is reminded of the famous saying, as highlighted by Dr. Mishra, that one ounce of precaution is better than a million tons of cure. Up till now, terrorists have been denied access to bombs or materials, but time is not on our side - it is uncertain when and where the opportunity will present itself, and that possibility, unlikely though it may be, must be considered seriously. It might not come for decades, but if we dismiss the threat or ignore it completely, we will have made the world an insecure place to live in.

### Notes & References

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- <sup>1</sup> Carey Sublette, "The Terrorist Nuclear Bomb Threat", *Nuclear Weapon Archive*, May 18, 2002, [nuclearweaponarchive.org/News/TerroristBombIntro.html](http://nuclearweaponarchive.org/News/TerroristBombIntro.html)
- <sup>2</sup> "Nuclear Terrorism Tutorial", [www.nti.org/h\\_learnmore/nuctutorial/index.html](http://www.nti.org/h_learnmore/nuctutorial/index.html). See also Dr. Rajesh Kumar Mishra, "Nuclear Terrorism: Potential threats in the post cold war world", *South Asia Analysis Group*, November 5, 2001, [www.southasiaanalysis.org/%5Cpapers4%5Cpaper354.html](http://www.southasiaanalysis.org/%5Cpapers4%5Cpaper354.html)
- <sup>3</sup> Carson Mark, Theodore Taylor, Eugene Eyster, William Maraman, "Can Terrorists Build Nuclear Weapons?", *Jacob Wechsler Nuclear Control Institute*, [www.nci.org/k-m/makeab.htm](http://www.nci.org/k-m/makeab.htm); See also Carey Sublette, op. cit.
- <sup>4</sup> "Chemical, Biological, Radiological, and Nuclear Terrorism: The Threat According to the Current Unclassified Literature", *Center for Counterproliferation Research*, National Defense University, May 31, 2002, [http://www.ndu.edu/centercounter/CBRN\\_Annotated\\_Bib.pdf](http://www.ndu.edu/centercounter/CBRN_Annotated_Bib.pdf)
- <sup>5</sup> Rolf Mowatt-Larssen, "Nuclear Security in Pakistan: Reducing the Risks of Nuclear Terrorism", *Arms Control Today*, July/August 2009. See also Report of the International Commission on Nuclear Non-Proliferation and Disarmament, Co-chairs Gareth Evans and Yoriko Kawaguchi, [www.icnnd.org/reference/reports/ent/part-ii-4.html](http://www.icnnd.org/reference/reports/ent/part-ii-4.html); see also Volha Charnysh and Daniel Horner, "World Leaders Vow to Boost Nuclear Security", *Arms Control Today*, May 2010.
- <sup>6</sup> Ibid.
- <sup>7</sup> Report of the International Commission on Nuclear Non-Proliferation and Disarmament, Co-chairs Gareth Evans and Yoriko Kawaguchi, [www.icnnd.org/reference/reports/ent/part-ii-4.html](http://www.icnnd.org/reference/reports/ent/part-ii-4.html)
- <sup>8</sup> 'Weapon of mass disturbance'; [http://news-service.stanford.edu/news/march6/database\\_video-36.html](http://news-service.stanford.edu/news/march6/database_video-36.html). See also [www.stanford.edu/dept/news/pr/02/database36.html](http://www.stanford.edu/dept/news/pr/02/database36.html).  
See also: Matthew Bunn and Anthony Wier, "Securing the Bomb", *John F. Kennedy School of Government Harvard University*, July 2006, <http://www.nti.org/securingthebomb>.
- <sup>9</sup> David Honour, "Dirty Bombs-The Risk and the Impact", [www.continuitycentral.com/feature042.htm](http://www.continuitycentral.com/feature042.htm).

- 
- <sup>10</sup> “IAEA Nuclear Power Reactors in the World”, *Reference Data Series*, No.2, April 2006, [http://www.pub.iaea.org/MTCD/publications/PDF/RDS2-26\\_web.pdf](http://www.pub.iaea.org/MTCD/publications/PDF/RDS2-26_web.pdf)
- <sup>11</sup> Stephen M. Maurer, 2009, *WMD Terrorism, Science and Policy Choices*, The MIT Press: Massachusetts, p. 36.
- <sup>12</sup> Walter Laqueur, 2000, *The New Terrorism: Fanaticism, and the Arms of Mass Destruction*, Phoenix Press: London, p.254.
- <sup>13</sup> Michael Dartnell, “Electronic ‘Hearts and Minds’: Web Activism and Global Security”, presented at *Terrorism, Asymmetric Warfare and Homeland Security, Centre for Conflict Studies Annual Conference*, October 4, 2000.
- <sup>14</sup> Jeffrey D. Brake, “Foreign Affairs, Defense, and Trade Division Terrorism and The Military’s Role in Domestic Crisis Management: Background and Issues for Congress”, *CRS Report for Congress*, April 19, 2001.
- <sup>15</sup> Ibid. See also Walter Laqueur, op. cit., p.5.
- <sup>16</sup> Charles D. Ferguson et. al., ‘The Four Faces of Nuclear Terrorism’, *The Center for Nonproliferation Studies*, 2004, pp.3, 4. <http://cns.miis.edu/pubs/books/4faces.htm>. See also: Sarah Bokhari, “The United States dealings with nuclear terrorism: cooperation from prevention”, *Journal on Science and World Affairs*, Vol. 2, No. 1, 2006. [www.scienceandworldaffairs.org/PDFs/Vol2No1\\_Bokhari.pdf](http://www.scienceandworldaffairs.org/PDFs/Vol2No1_Bokhari.pdf)
- <sup>17</sup> Nuclear Regulatory Commission Fact Sheet on Dirty Nuclear Weapons, February 2004, <http://www.nrc.gov/reading-rm/doc-collections/faetsheets/dirty-bombs.html>.
- <sup>18</sup> Carey Sublette, op. cit.
- <sup>19</sup> Dr. Bruce G. Blair, “What if the Terrorists Go **Nuclear?**”, *Terrorism Project, Center for Defense Information (CDI)*, updated October 1, 2001, [www.cdi.org/terrorism/nuclear.cfm](http://www.cdi.org/terrorism/nuclear.cfm)
- <sup>20</sup> Charles McCombie and Bengt Tveiten, Nuclear Waste Management Organisation, June 2004. Table 2.1, <http://www.nwmo.ca/Default.aspx?DN=397,211,199,20,1>, Documents. See also Management of Spent Fuel from Nuclear Powers Plants, Proceedings of an International Conference in Vienna, 19-22 June 2006. [www.pub.iaea.org/MTCD/publications/PDF/Pub1295\\_web.pdf](http://www.pub.iaea.org/MTCD/publications/PDF/Pub1295_web.pdf)
- <sup>21</sup> Matthew Bunn and Anthony Wier, op. cit.
- <sup>22</sup> Ibid.
- <sup>23</sup> ‘Illicit Trafficking and Other Unauthorized Activities involving Nuclear and Radioactive Materials’, *IAEA Fact Sheet*, 2005. See also ‘Nuclear Black Markets: Pakistan, A.Q. Khan and the Rise of Proliferation Networks - A Net Assessment’, *IISS Strategic Dossier*, May 2, 2007, pp.130-131, [www.iiss.org/EasysiteWeb/getresource.axd?AssetID=2647&type=full](http://www.iiss.org/EasysiteWeb/getresource.axd?AssetID=2647&type=full)
- <sup>24</sup> Carson Mark, et. al., op. cit. See also Kevin O’Neill, “The Nuclear Terrorist Threat”, *Institute for Science and International Security*, August 1997, [www.isis-online.org/publications/terrorism/threat.pdf](http://www.isis-online.org/publications/terrorism/threat.pdf). See also: Richard G. Lugar, “The Lugar Survey on Proliferation: Threats and Responses”, June 2005, <http://lugar.senate.gov/reports/NPSurvey.pdf>. See also: Momin Iftikhar, “Emerging threats to nuclear security”, *The News*, Thursday, April 22, 2010.
- <sup>25</sup> Ibid.
- <sup>26</sup> Ibid. See also “Analysis: Making a Dirty Bomb,” *BBC Online*, June 10, 2002. See also Frank Gardner, ‘Al Qaeda “was making dirty bomb”’, *BBC News Online*, January 31, 2003.
- <sup>27</sup> “U.S. Nuclear Weapons Complex: Security At Risk”, *POGO Report*, October 15, 2001.

- 28 John Barry, "How to Fight Al-Qaeda Now: An Ex-CIA Analyst Talks About the Terrorists' Power and Their Vulnerabilities," *Newsweek*, October 27, 2008, [www.newsweek.com/id/165952](http://www.newsweek.com/id/165952)
- 29 Reported by the Bulletin of Atomic Scientists, November/December 2006. See also Graydon Carter, "Homeland Insecurity," *Vanity Fair*, November 2003, p.64.
- 30 Valerie Plame Wilson, "Nuclear terrorism is most urgent threat", *CNN*, April 8, 2010, <http://www.cnn.com/2010/OPINION/04/08/plame.wilson.nuclear.danger/index.html>
- 31 'Nuclear Terrorism: Nuclear power plants and "dirty bombs", The threat of nuclear terrorism, The potential impact of a major nuclear attack, security and prevention', *British Medical Journal*, Feb. 9, 2002.
- 32 Secretary-General Kofi Annan, Keynote address, *International Summit on Democracy, Terrorism and Security*, Madrid, Spain, October 3, 2005, UN Press release [www.un.org/News/Press/docs/2005/sgsm9757.doc.htm](http://www.un.org/News/Press/docs/2005/sgsm9757.doc.htm). See also Charles D. Ferguson et. al., op. cit.
- 33 Volha Charnysh and Daniel Horner, op. cit.
- 34 "Nuclear Terrorism", [www.nti.org/h\\_learnmore/nuctutorial/index.html](http://www.nti.org/h_learnmore/nuctutorial/index.html)
- 35 "Nuclear Terrorism Threat Is Skewed by Mistaken Assumptions", [terrorism.about.com/.../nuclear-terrorist-threat-skewed-by-mistaken-assumptions-says-analyst.htm](http://terrorism.about.com/.../nuclear-terrorist-threat-skewed-by-mistaken-assumptions-says-analyst.htm), November 15, 2007.
- 36 <http://www.nci.org/k-m/makeab.htm>. See also IAEAs Acknowledgement of Nuclear Terrorism Risk is Welcome but Long Overdue, [www.nci.org/01nci/10/iaea-ackn.htm](http://www.nci.org/01nci/10/iaea-ackn.htm). See also "Calculating the New Global Nuclear Terrorism Threat", *IAEA Press Release*, November 1, 2001.
- 37 Ibid.
- 38 [www.martinfrost.ws/htmlfiles/.../whatis-dirty-bomb.html](http://www.martinfrost.ws/htmlfiles/.../whatis-dirty-bomb.html)
- 39 David Honour, Op. cit.
- 40 David Shiga, "US dirty bomb attack would bring clean-up chaos", September 23, 2009, [www.newscientist.com/.../dn17838-us-dirty-bomb-attack-would-bring-cleanup-chaos.html](http://www.newscientist.com/.../dn17838-us-dirty-bomb-attack-would-bring-cleanup-chaos.html)
- 41 "Bhopal gas leak case influenced, says CBI officer; Moily terms it 'irresponsible'", *DNA India*, Jun 8, 2010 [www.dnaindia.com/.../report\\_bhupal-gas-leak-case](http://www.dnaindia.com/.../report_bhupal-gas-leak-case) See also "The Chernobyl Reactor Incident" at [www.ourtimelines.com/zchern.html](http://www.ourtimelines.com/zchern.html); and "Chernobyl Accident", *World Nuclear News*, August 2010, [www.world-nuclear.org/info/chernobyl/inf07.html](http://www.world-nuclear.org/info/chernobyl/inf07.html)
- 42 Quan Li & Drew Schaub, 'Economic Globalization and Transnational Terrorism: A Pooled Time-Series Analysis', *Conflict Resolution*, 2004.
- 43 Jonathan Medalia, 'Nuclear Terrorism and Brief Review of Threats and Responses', *Congressional Research Service, Library of Congress*, 2005; <http://www.fas.org/sgp/crs/nuke/RL32595.pdf>
- 44 Rahimullah Yusufzai, "Conversations with Terror," *TIME*, January 11, 1999, [www.time.com/time/world/article/0,8599,174550,00.html](http://www.time.com/time/world/article/0,8599,174550,00.html)
- 45 Gerd Rosenkranz, "Nuclear Power – Myth and Reality, The risks and prospects of nuclear power", *Nuclear Issues*, Paper No. 1; [www.boell-pakistan.org/web/117-291.html](http://www.boell-pakistan.org/web/117-291.html).
- 46 Bill Gertz, "CIA says Al Qaeda ready to use nukes", *The Washington Times*, June 3, 2003.
- 47 "Analysis: Making a 'Dirty Bomb,'" *BBC Online*, June 10, 2002
- 48 Bruce G. Blair, Op. cit.

- 
- <sup>49</sup> Micah Zenko, "A Nuclear Site Is Breached: South African Attack Should Sound Alarms", *Washington Post*, December 20, 2007.
- <sup>50</sup> Bruce G. Blair, Op. cit.
- <sup>51</sup> Amjed Jaaved, "The N-terrorism threat?", *PakistanTalk*, August 27, 2009
- <sup>52</sup> John Barry, Op. cit. See also Feroz Hassan Khan, "Nuclear Security in Pakistan: Separating Myth From Reality", *Arms Control Today*, July/August 2009.
- <sup>53</sup> Ibid. See also Muhammad Khurshid Khan, "Nuclear Technology Proliferation: Challenges and International Response", *IPRI Journal*, Volume VIII, Number 1, pp.33-36.
- <sup>54</sup> Bryan Bender, "Pakistan, U.S. in Talks on Nuclear Security," *The Boston Globe*, May 5, 2009. See also Anwar Iqbal, "Pakistan needs nuclear deterrence, says US", *Dawn*, Jul 1, 2010.
- <sup>55</sup> Muhammad Khurshid Khan, Op. cit. See also Alex Wagner, "U.S. Offers Nuclear Security Assistance to Pakistan", *Arms Control Today*, December 2001.
- <sup>56</sup> Ibid.
- <sup>57</sup> Ibid. See also Rauf Klasra, "Death, life term for biological arms offenders proposed", *The News International*, June 30, 2010.
- <sup>58</sup> "Pakistan govt, ISI still supporting Taliban: Report", *Reuters*, June 13, 2010
- <sup>59</sup> Manish Chand, "Manmohan announces global nuclear security centre in India", *IANS*, April 13, 2010, [blog.taragana.com/.../manmohan-announces-global-nuclear-security-centre-in-india-28650/](http://blog.taragana.com/.../manmohan-announces-global-nuclear-security-centre-in-india-28650/).
- <sup>60</sup> Paul Leventhal, "IAEA Safeguards Shortcomings: A Critique", September 12, 1994, [www.nci.org/nuketerror.htm](http://www.nci.org/nuketerror.htm)
- <sup>61</sup> Muhammad Khurshid Khan, "Analyzing Domestic Terrorism as a Threat to Pakistan's Security and the Policy Response", *IPRI Journal*, Volume IX, Number 2, p.68.
- <sup>62</sup> Sarah Bokhari, Op. cit.
- <sup>63</sup> Martin Matishak, Op. cit.
- <sup>64</sup> "Nuclear terrorism in a globalizing world: assessing the threat and the emerging management regime", Op. cit.
- <sup>65</sup> Graham T. Allison, 2005, *Nuclear Terrorism: The Ultimate Preventable Catastrophe*, Holt Publishers
- <sup>66</sup> ElBaradei's last UN address, *World Nuclear News*, November 4, 2009, [www.world-nuclear-news.org/NP\\_ElBaradeis\\_last\\_UN\\_address\\_0411091.html](http://www.world-nuclear-news.org/NP_ElBaradeis_last_UN_address_0411091.html)