SANDIA REPORT
SAND2014-2607
Unlimited Release
Printed April 2014

Cooperative Measures to Support the Indo-Pak Agreement on Reducing Risk from Accidents Relating to Nuclear Weapons

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Abstract

In 2012, India and Pakistan reaffirmed the *Agreement on Reducing the Risk from Accidents Relating to Nuclear Weapons*. Despite a history of mutual animosity and persistent conflict between the two countries, this agreement derives strength from a few successful nuclear confidence building measures that have stood the test of time. It also rests on the hope that the region would be spared a nuclear holocaust from an accidental nuclear weapon detonation that might be misconstrued as a deliberate use of a weapon by the other side. This study brings together two emerging strategic analysts from South Asia to explore measures to support the Agreement and further develop cooperation around this critical issue.

This study briefly dwells upon the strategic landscape of nuclear South Asia with the respective nuclear force management structures, doctrines, and postures of India and Pakistan. It outlines the measures in place for the physical protection and safety of nuclear warheads, nuclear materials, and command and control mechanisms in the two countries, and it goes on to identify the prominent, emerging challenges posed by the introduction of new weapon technologies and modernization of the respective strategic forces. This is followed by an analysis of the agreement itself leading up to a proposed framework for cooperative measures that might enhance the spirit and implementation of the agreement.

The views expressed in this paper are those of the authors and do not necessarily reflect the position of their respective institutions or Sandia National Laboratories.

Acknowledgements

At the outset, we wish to thank Kent Biringer, Manager of the Cooperative Monitoring Center, Sandia National Laboratories, for providing us with a truly enabling and encouraging environment to conduct research. We are particularly grateful to Adriane Littlefield for her consistent support, guidance and inspiration throughout which helped us to formulate, streamline, and consolidate this study. We are also indebted to the generous feedback and advice extended by Geoffery Forden, Amir H. Mohagheghi, Eric Wallace, Faraj Ghanbari, David Betsill, and Ben Bonin.

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Acronyms

AAT	Assessment and Advisory Team
AERB	Atomic Energy Regulatory Board
AST	Aerial Survey Team
BARC	Bhabha Atomic Research Centre
BT	Bioassay Team
C&C	Command and Control
CARMS	Compact Aerial Radiation Monitoring System
CBMs	Confidence Building Measures
CISF	Central Industrial Security Force
CMG	Crisis Management Group
CNS	Convention on Nuclear Safety
CPPNM	Convention on the Physical Protection of Nuclear Materials
DAE	Department of Atomic Energy
DGMO	Director General of Military Operations
DRDO	Defence Research and Development Organization
ECR	Emergency Communication Room
ERC	Emergency Response Centres
ERT	Emergency Response Teams
ESD	Environmental Sensing Devices
FMT	Field Monitoring Team
HRP	Human Reliability Program
IAEA	International Atomic Energy Agency
IERMON	Environmental Radiation Monitoring Network
MIRV	Multiple Independently Targeted Re-entry Vehicle
MPC&A	Material Protection Control and Accounting
MT	Medical Team
NCA	National Command Authority (Pakistan)
NCA	Nuclear Command Authority (India)
NCBMs	Nuclear Confidence Building Measures
NDMA	National Disaster Management Authority
NEMS	Nuclear Emergency Management System
NESCOM	National Engineering and Scientific Commission
NIM	Nuclear Information Management
NPCIL	Nuclear Power Corporation of India Ltd.
NRECC	National Nuclear Security Emergency Coordination Centre
NSAP	Nuclear Security Action Plan
NUMAC	Nuclear Material Accounting & Control
PAEC	Pakistan Atomic Energy Commission
PAL	Permissive Action Links

PRNA	Pakistan Nuclear Regulatory Authority
PRP	Personnel Reliability Program
QIA	Quick Impact Assessment
RCA	Regional Cooperative Agreement for Research, Development, and Training in Nuclear Science and Technology in Asia
SASA	Strategic Armament Safety Authority
SECDIV	Strategic Export Control Division
SFC	Strategic Forces Command
SPD	Strategic Plans Division
SPS	Strategy Programme Staff
SRT	Source Recovery Team
TNWs	Tactical Nuclear Weapons
WHO	World Health Organization

EXECUTIVE SUMMARY

The India-Pakistan *Agreement on Reducing the Risk from Accidents Relating to Nuclear Weapons*, signed in 2007, is a landmark nuclear confidence building measure (NCBM) despite a history of mutual animosity and persistent conflict between the two countries. This agreement rests on the hope that the region would be spared a nuclear holocaust from an accidental nuclear weapon detonation that might be misconstrued as a deliberate use of a weapon by the other side.

Given their close geographical proximity, a nuclear-related accident on either side would likely result in a trans-boundary release of radiation, affecting the other side. More importantly, a nuclear weapons-related accident on one side could also be misinterpreted by the other as a deliberate or unauthorized use and may result in inadvertent escalation. . Recognizing the risk, the Indian Prime Minister A.B. Vajpayee and Pakistani Prime Minister Nawaz Sharif agreed in the Lahore Declaration of 1999 to "take immediate steps for reducing the risk of accidental or unauthorized use of nuclear weapons…with a view to elaborating measures for confidence building."

In February 2012, India and Pakistan extended the 2007 Agreement for another five years and reportedly "discussed proposals for additional measures in areas where two countries could make forward movement." There is, however, no public information available on the implementation of or any further developments in this regard, thus the impetus for the current study. Based on the mandate in Article 1 of the Agreement – "to maintain and improve…existing national measures … to guard against accidents related to nuclear weapons" – this study first considers the strategic landscape of nuclear South Asia and examines the context and possible areas of cooperation in the field of nuclear safety, security, information management, communications, etc.

As per open source information, nuclear warheads of India and Pakistan are stored in a disassembled state (not on hair-trigger alert), with the fissile core kept separate from the physics package and the delivery systems. Moreover, the number of warheads in both countries put together constitutes only a fraction of the global inventory. Therefore, the magnitude and extent of Cold War dangers cannot be extrapolated or compared to the South Asian context. The assumption that India and Pakistan will always keep their weapons in the basement cannot be assured. In terms of protecting the warheads, India and Pakistan are believed to have developed their own Permissive Action Link (PAL) mechanisms to block critical arming signals intended to prevent unauthorized use. Nonetheless, during a crisis situation, the assembly of dispersed components would come under extreme stress, which would demand very high managerial and material safety and security competencies. In the decade following overt nuclearization, India and Pakistan are known to have developed their own command and control systems, strategic force management mechanisms, and deployment structures. Given that there is always room for improvement, as a myriad of possibilities such as design errors and component malfunctions can

potentially lead to accidents. Both countries are also having laid down comprehensive measures to protect nuclear materials during movement and storage along with stringent personnel reliability programs. Unfortunately, personnel are also not immune to mental illness, subordination, or invulnerable to a bad actor's influence, etc. The few reported instances of personnel misconduct in India, and the history of Khan's clandestine proliferation network have highlighted the utmost significance of eternal vigilance. Moreover, a number of new nuclear developments in South Asia such as the development of battlefield nuclear weapons, sea-based assets, short-range nuclear capable missiles, expanding fissile material production capacities, etc. have accident implications. The imperative, therefore, is to ponder over these issues bilaterally.

The 2007 India-Pakistan Agreement is certainly a realization by both countries regarding the probability of an accident taking place, the risks involved in the event of such an accident, and the countries' duties in such a scenario. The Agreement is farsighted, as it unambiguously bestows responsibilities on both countries "to guard against accidents related to nuclear weapons" *under their jurisdiction or control*. The two countries are obliged to notify each other only of such accidents that may result in international, trans-boundary release or have security implications.

However, certain provisions in the agreement appear to be open-ended, leaving ample scope for follow up measures. For example, Article 3(i) prescribes that "each Party shall act in such a manner as to reduce the possibilities of its actions being misinterpreted by the other Party." To eradicate chances of misinterpretation, both Parties must first devise certain mechanisms and interact at successive intervals to cooperate on less sensitive issues relating to nuclear weapons safety and security. Article 3(ii) enumerates that "in case of likely impact of the accident on the other Party, the first Party shall inform the other Party forthwith with relevant information." This necessitates an institutional mechanism to decide what specific information needs to be obtained. In pursuance of the information obtained, the measures to be undertaken have to be ascertained as well. Lastly, Article 4 says that in addition to using the hotline links between the two Foreign Secretaries and Directors-General Military Operations (DGMOs) for information sharing, "the Parties may also make use of any other communication channels..." It would be prudent, therefore, to identify or put in place alternative information management and communication sharing mechanisms to better facilitate the process.

In view of the foregoing, this study attempts to suggest a framework of cooperative measures for consideration. Since both countries have acknowledged the "nuclear dimension of the security environment" and "their responsibilities," a few follow-up measures within the purview of this agreement would further strengthen the nuclear CBM process. The study identifies mainly three broad areas – emergency response, extending nuclear CBMs already at work, and an appraisal of past nuclear related accidents elsewhere – to explore possible cooperation by initiating a process of periodic dialogue among working groups, coordinating agencies of both countries, and

facilitating exchange of views on different issue areas to promote the ethos stipulated in the Agreement. This study recommends the establishment of a Track 2 initiative, involving scholars, experts, think tanks, journalists, environmentalists, retired scientists and government officials; initiate a collaborative study on nuclear weapons-related incidents and safety-security aspects by centers of excellence to undertake joint studies; initiate a dialogue on feasibility of establishing specialized communication links; examination of models of advanced countries in emergency management and response; strengthen medical response capabilities of both countries; create a collaborative framework for a nuclear information management system, among other measures.

This study acknowledges the fact that some of the suggested measures may not be feasible or agreeable by the two parties at this juncture; however, keeping in mind the sensitivities of the issue and future implications, an attempt has been made only to explore potential areas of further cooperation within the ambit of the Agreement in force.

1.0 INTRODUCTION

The existence of nuclear weapons in South Asia has evoked a sense of awe for various reasons, the most prominent being the fact that India and Pakistan are de-facto nuclear weapon states with a history of conflict and competition. So far, both countries have largely refrained from escalation, nor has there been any incident involving nuclear weapons – intentional or inadvertent – on either side, that could lead to catastrophe; however, being cognizant of the consequences of such an event taking place, both countries have adopted two nuclear-related confidence building measures (NCBMs), in addition to other CBMs. The first is the agreement on "the Prohibition of Attack Against Nuclear Installations and Facilities,"[1] which entered into force in December 1990. This agreement is considered largely successful in its objectives. The second agreement, signed in 2007, pertains to "Reducing Risk from Accidents Relating to Nuclear Weapons,"[2] which bestows onus on both countries "to notify each other immediately in the event of any accident (which may result in an international, trans-boundary release) relating to nuclear weapons, under their respective jurisdiction or control..." (Article 2). This second agreement is simply referred to as "the Agreement" throughout this report. The full text of the Agreement is given in Appendix 1.

The necessity of such agreements was driven by the complex regional security situation, marked by mutual mistrust and the enduring rivalry between India and Pakistan. The apprehension that each other's nuclear facilities could be targeted during a crisis or a conflict situation led them to agree to the non-attack agreement in December 1988, which stipulates the yearly exchange of the list of their respective nuclear facilities. This practice is being consistently followed, each January, since 1990. Notwithstanding the fact that both countries might not have exchanged or declared the complete list of their respective classified facilities each year, the initiative has been an effective effort in restoring some trust in the Indo-Pak nuclear discourse.

The 2007 agreement on "Reducing Risk from Accidents Relating to Nuclear Weapons" did not come about in a vacuum, however. Since overt nuclearization in 1998, both countries have been engaged in the process of expanding their strategic nuclear forces, establishing command and control structures, and diversifying their means of delivery. Given their close geographical proximity, a nuclear-related accident on either side would likely result in a trans-boundary release of radiation, affecting the other side. More importantly, a nuclear weapons-related accident on either side could be misinterpreted by the other as a deliberate or unauthorized use and may result in the outbreak of a nuclear war. Recognizing the risk, the Indian Prime Minister

[1] "Agreement on the Prohibition of Attack Against Nuclear Installations and Facilities," http://www.fas.org/nuke/guide/india/doctrine/nucl.htm

[2] ."Agreement between the Islamic Republic of Pakistan and the Republic of India on Reducing the Risk from Accidents Relating to Nuclear Weapons,, New Delhi, February 21, 2007 in India's Foreign Relations– 2007, http://www.mea.gov.in/images/main_2007.pdf, p.1379.

A.B. Vajpayee and Pakistani Prime Minister Nawaz Sharif agreed in the Lahore Declaration of 1999 to "take immediate steps for reducing the risk of accidental or unauthorized use of nuclear weapons…with a view to elaborating measures for confidence building."[3]

In February 2012, India and Pakistan extended the 2007 Agreement for another five years and reportedly "discussed proposals for additional measures in areas where two countries could make forward movement."[4] There is, however, no public information available on the implementation of or any further developments in this regard, thus the impetus for the current study.

1.1 The Current Study

This study focuses on identifying possible cooperative measures to support the Agreement between India and Pakistan on reducing risks from nuclear weapons accidents. Keeping in mind the sensitivities of the issue, an attempt is made only to explore potential areas of cooperation within the ambit of the Agreement in force and draw inferences from nuclear weapons related accidents/incidents elsewhere. This study in no way intends to equate the incidents that have happened in other countries or regions with the India-Pakistan scenario. Rather, it takes into account the specificities of the South Asian strategic environment and emerging trends thereof.

Considering the mandate in Article 1 of the Agreement – "to maintain and improve…existing national measures including organizational and technical arrangements, to guard against accidents related to nuclear weapons" – the sections that follow examine the context and propose possible areas of cooperation in the field of nuclear safety, security, information management, communications, etc. Constrained by the culture of secrecy in nuclear issues and lack of availability of any precedent of nuclear weapons accidents and consequent joint measures, this analysis is based purely on open source information, mainly to identify measures that may help both countries in "reducing risk."

[3] "Lahore Declaration," http://www.mea.gov.in/in-focus-article.htm?18997/Lahore+Declaration+February+1999
[4] "India, Pak Agree to Extend Nuclear Risk Reduction Pact for 5 Years," *The Hindu*, February 21, 2012.

2.0 THE SOUTH ASIAN CONTEXT

India, the first country in South Asia to go nuclear as early as 1974, has adopted a doctrinal posture of 'no-first-use' but 'second-strike' capability with "punitive retaliation…to inflict damage unacceptable to the aggressor."[5] Pakistan, on the other hand, has reserved the option of first-use as "the last resort…if Pakistan is threatened with extinction." [6] Both countries are steadily acquiring the force levels perceived to be sufficient for achieving a credible, minimum deterrent. India is in the process of developing its third leg of the nuclear triad, and Pakistan is also in the process of adding a third leg of the triad, along with the introduction of tactical/battlefield nuclear weapons (TNWs). This process of evolution may take a decade at best to complete. Therefore, we can assume that the South Asian deterrent force postures are in their formative phase, and it is an opportune time to propose CBMs related to the Agreement.

2.1 Nuclear Force Management

As per open source information, nuclear warheads of India and Pakistan are stored in a disassembled state (not on hair-trigger alert), with the fissile core kept separate from the physics package and the delivery systems. With regard to Pakistan's nuclear arsenal, Samar Mubarakmand, former Member (Technical), Pakistan Atomic Energy Commission (PAEC) and head of the nuclear test team in 1998, states that, "The weight of a launchable nuclear warhead is between 25 and 30 tons [combined delivery system], which is assembled only at the eleventh hour if [it] needs to be launched. It is stored in three to four different parts at three to four different locations. If a nuclear weapon doesn't need to be launched, then it is never available in assembled form."[7]

According to Raj Chengappa, the former Indian Prime Minister P.V. Narasimha Rao had asked A.P.J. Abdul Kalam, then scientific advisor to the Minister of Defence and the chairman of the Defence Research and Development Organization (DRDO) to establish a command and control system on the following four principles: (1) the nuclear core should be stored at several strategic sites across the country and not just at Bhabha Atomic Research Centre (BARC), Trombay; (2) arrangements should be made for mating the core with its assembly in the shortest possible time when the need arises; (3) it should be ensured that the command to trigger the bomb remains

[5] "Draft Report of National Security Advisory Board on Indian Nuclear Doctrine," August 17, 1999, http://www.mea.gov.in/in-focus-article.htm?18916/Draft+Report+of+National+Security+Advisory+Board+on+Indian+Nuclear+Doctrine

[6] Former Pakistani President General Pervez Musharraf quoted as having said this in an interview published in April 2002 in the German magazine, *Der Spiegel*; Peter R. Lavoy, "Pakistan's Nuclear Posture: Security and Survivability," http://www.npolicy.org/article_file/Pakistans_Nuclear_Posture-Security_and_Survivability.pdf

[7] "Pakistan refutes Saudi Funding, Weapons Claims," November 09, 2013, http://www.worldbulletin.net/?aType=haber&ArticleID=122467

strictly under civilian control; and (4) the overall system should be so designed that at least three agencies have to combine their efforts if the bomb has to be prepared for a launch.[8]

Moreover, the quantity of warheads in both countries put together constitutes only a fraction of the global inventory. The magnitude and nature of dangers associated with ready arsenals, akin to that of the Cold War, therefore, cannot be extrapolated or compared to the South Asian context. Nonetheless, the assumption that India and Pakistan will always keep their bombs in the basement cannot be assured. According to Christopher Clary, there were several instances when both countries are alleged to have assembled nuclear devices and moved toward greater peacetime readiness;[9] Pakistan has (in 1999 and 2002) indicated its inclination to use nuclear weapons (without using the term 'nuclear weapon') to deter India from crossing the threshold.[10]

2.2 Protecting Warheads

It is assumed that both India and Pakistan have already taken and are continuously striving for extra measures to achieve the maximum level of safety and security of their nuclear inventory. They have developed their own Permissive Action Link (PAL) mechanisms to block critical arming signals specifically designed to prevent unauthorized use. According to Raj Chengappa, "a series of half a dozen safety locks" ensure that Indian nuclear warheads can explode only when desired.[11] "It could be assumed that these safety locks are based on PAL technologies."[12] With regard to the reliability and safety mechanism of the Pakistan's warheads, the former head of PAEC's Directorate of Technical Development (responsible for the manufacture and testing of nuclear devices), Muhmmad Hafeez Qureshi, claimed that "the [nuclear] device had the entire characteristics and safeguards of a weapon produced by any of the five nuclear weapon states.[13]" According to Samar Mubarakmand, "the [nuclear] device would activate only in the enemy territory when the pilot has entered the code and once he has safely left Pakistani territory. If for any reason there is an accidental drop on Pakistani territory, the device would drop like dead weight."[14] Although, even if it does not lead to a chain reaction or trigger the fissile core, free

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[8] Raj Chengappa, *Weapons of Peace: The Secret Story of India's Quest to be a Nuclear Power* (New Delhi: Harper Collins Publishers India, 2000), p. 391.

[9] Christopher Clary, "Lift the Lid off Nuclear Secrecy," *Business Line (The Hindu)*, July 15, 2013.
Shalini Chawla, "Challenges of Securing Pakistan's Tactical Nuclear Weapons," http://www.aerospaceindia.org/Issue%20Briefs/2013/14%20Feb%202013%20-%20Shalini%20Chawla.pdf

[10] Chengappa, op cit, pp. 383, 429.

[11] Gurmeet Kanwal, "Safety and Security of India's N-Weapons," http://www.idsa-india.org/an-apr-1.01.htm

[12] Ibid.

[13] Hafeez Qureshi quoted in *Long Road to Chagai* (Islamabad: Print Wise Publications, 1999), p. 85.

[14] Feroz Hassan Khan, *Eating Grass: The Making of the Pakistani Bomb* (Palo Alto, CA: Stanford University Press, 2012), p.186.

falling may lead to the detonation of the conventional high explosives[15] and the possible dispersal of radioactive material.

Nonetheless, international security observers and experts believe that increasing numbers of strategic nuclear forces in South Asia makes safety, security, and control issues far more problematic. Specifically, the requirement to keep warheads and delivery systems separate for reasons of security and control could add to design and maintenance problems.[16] According to Verghese Koithara, if India's missiles are to be deployed in a genuinely mobile manner, then the multi-channel system of nuclear weapons control can be very cumbersome. More importantly, as India's current missile force is primarily land mobile and thus requires decentralized operations, it can be prone to logistic and security challenges.[17] Though, according to experts from DRDO, "adequate safety provisions are made through electromechanical devices" like safety arming and detonation mechanisms of guided missiles "to prevent accidental initiation."[18]

In the same manner, if Pakistan relies on silo-based and road mobile survivability methods for its strategic forces, given its comparatively small geographical expanse, safe-keeping of its components necessitates the utmost technical sophistication. It is expected that the Environmental Sensing Devices (ESDs), which monitor the environment to sense whether the weapon should be armed during acceleration in flight or free fall, have been incorporated in both countries. According to sources, these and other relevant best practices are being developed to prevent security breaches while selecting strategic sites, material storage, missile silos, and movement of sensitive material in Pakistan.[19]

2.3 Material Protection

Perceptibly, both countries are aware of the fact that if at any point they are compelled to use nuclear weapons, it would have to be a single-strike (initiating or retaliatory) option as there may not be a second chance. Therefore, they might have to use all the weapons at their disposal at once, in a massive first or second strike, whichever the case may be. This precludes the possibility of a flexible response or a trip-wire, akin to the Cold War models. Thus, in a warlike situation, the assembly of dispersed components would come under extreme stress, which would demand very high managerial and material safety and security competencies.

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[15] Dr. Samar Mubarakmand's Interview with Geo TV, http://www.pakdef.org/forum/topic/8015-dr-samar-mubarakmands-interview-with-geo-tv/, March 05, 2004.
[16] Verghese Koithara, *Making India's Nuclear Forces*, New Delhi: Routledge, 2012, p. 127.
[17] Ibid.
[18] TV Karthikeyan, AK Kapoor, *Guided Missiles*, http://drdo.gov.in/drdo/data/Guided%20Missiles.pdf, p. 16.
[19] Zafar Ali, "Pakistan's Nuclear Assets and Threats of Terrorism: How Grave is the Danger?," http://www.stimson.org/images/uploads/research-pdfs/PakistanNuclearAssets-070607-ZafarAli-FINAL.pdf

India has a comprehensive material protection control and accounting (MPC&A) system, comprising three basic elements: the legislative and regulatory framework, an integrated physical protection program for facilities and materials, and a comprehensive "Nuclear Material Accounting & Control" (NUMAC). There are facility-specific NUMAC arrangements. There is also an Inventory Information and Control and Data Management Section and a Control Laboratory.[20] A Senior Coordination Committee is assigned to review NUMAC reports and initiate actions as needed. The Strategic Armament Safety Authority (SASA) of the Nuclear Command Authority (NCA) is assigned the responsibility to review and update storage and transfer procedures for nuclear armaments, including the submarine-based component.

The Pakistan Nuclear Regulatory Authority (PNRA) initiated the Nuclear Security Action Plan (NSAP) in July 2006, under which it envisioned developing a sustainable system in nuclear security with the establishment of adequate response and recovery capabilities.[21] Pakistan's sensitive material control and accounting system is believed to have been derived from modern training, possibly modelled on the US national laboratory procedures.[22] Since its inception, the Strategic Plans Division (SPD), which is the Secretariat of Pakistan's National Command Authority, has been responsible for conducting audits on all nuclear inventories and implementing regular and surprise inspections at facilities.

Moreover, both countries have adhered to the International Atomic Energy Agency (IAEA) guideline INFCIRC/225 and put in place all domestic arrangements in this regard. Both India and Pakistan have taken measures to implement the obligations set by UN Security Council Resolution 1540,[23] and the Convention on Nuclear Safety (CNS).[24] In view of the scope of existing mechanisms and procedures in place in both countries, one can presume that these would continue to be adequate, given that their nuclear material and weapon inventories are in an expanding mode.

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[20] Statement by K. Raghuraman of India's Department of Atomic Energy. Christopher Eldridge, "Protection, Control, and Accounting of Nuclear Materials International Challenges and National Programs," National Academy of Sciences, 2006, pp. 39-41.

[21] Pakistan Nuclear Regulatory Authority, "Nuclear Security Action Plan (NSAP)," http://www.pnra.org/nsap.asp

[22] Feroz Hassan Khan, "Nuclear Security in Pakistan: Separating Myth from Reality," *Arms Control Today*, July/August 2009.

[23] Jennifer M. Gibson and Sarah Shirazyan, "The UN Security Council Resolution 1540: An Overview of Extraterritorial Controls Over Non-State WMD Proliferation," *NAPSNet Special Reports*, February 14, 2012, http://nautilus.org/napsnet/napsnet-special-reports/the-un-security-council-resolution-1540-an-overview-of-extraterritorial-controls-over-non-state-wmd-proliferation/

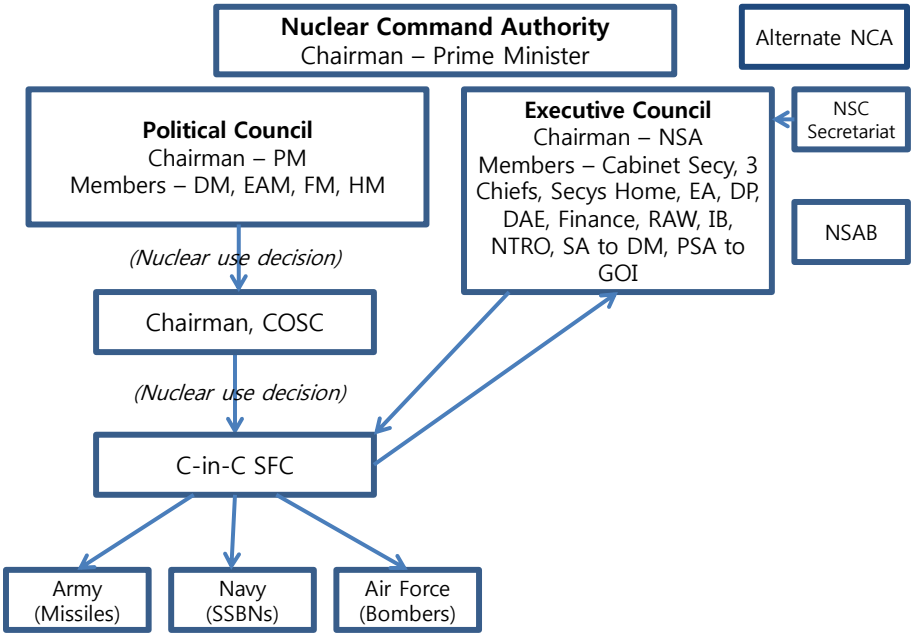
[24] IAEA, "Convention on Nuclear Safety," http://www.iaea.org/Publications/Documents/Conventions/nuclearsafety_status.pdf

2.4 Command and Control

Both India and Pakistan are known to have developed their respective nuclear Command and Control Systems (C&C), strategic force management mechanisms, and deployment structure over the past fifteen years. As a matter of fact, the design of the warheads and missiles, and the wide range of associated equipment and systems, must be capable of safe and reliable operation for effective performance of the C&C. It is expected that both India and Pakistan have adopted best practices in these areas in relation to their specific requirements.

In the case of India, the Prime Minister, as the head of the Cabinet, exercises ultimate control over all nuclear weapons, though the President of India is the Supreme Commander of the Indian Armed Forces. The Prime Minister and the Cabinet Committee on Security (CCS) is designated as the Nuclear Command Authority (NCA) in charge of India's nuclear deterrent.

Figure 1: Structure of Indian Nuclear Command & Control



Source: Manpreet Sethi, *Nuclear Strategy*, New Delhi: KW Publisher, 2010, p. 166.

The NCA is advised by the National Security Council (NSC) and supported by the Strategy Programme Staff (SPS) constituting representatives from the three defence services, science, and technology establishments and other experts from related domains, including the Ministry of External Affairs. The SASA that functions directly under the NCA is responsible for all matters relating to the safety and security of India's nuclear and delivery assets at all locations. In terms of preparedness, efficiency of response systems in possible escalatory scenarios, and surprise

attack scenarios, regular drills are conducted. Specialized units have also been deployed for operation in a nuclearized environment.[25]

In Pakistan's case, Samar Mubarakmand states that Pakistan has "adopted the world's most advanced command and control system."[26] The safety, security, and management of all nuclear facilities, materials, infrastructure, and personnel is the responsibility of Pakistan's NCA through the SPD, which exercises central responsibility for the security and physical protection of all nuclear facilities. It has a Security Division comprised of over 20,000 specially trained military personnel that provide physical protection to nuclear plants, materials, facilities, and sites throughout the length and breadth of the country.

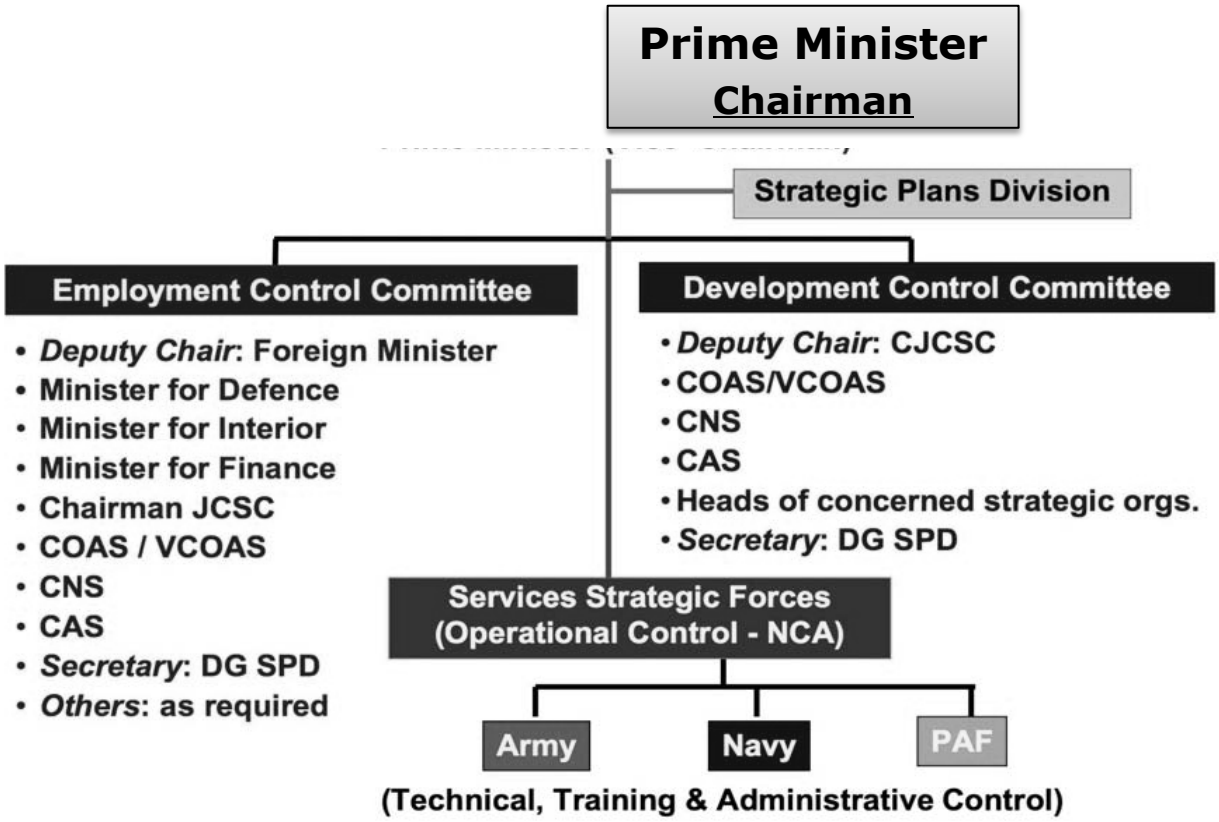


Figure 2: Pakistan's National Command Authority
Source: http://www.npolicy.org/article.php?aid=291&rid=6 [27]

[25] Shyam Saran, "India's Nuclear Weapons not for National Pride," http://ris.org.in/images/RIS_images/pdf/tribune-9may%202013.pdf
[26] Samar Mubarakmand's Interview with Geo TV, http://www.pakdef.org/forum/topic/8015-dr-samar-mubarakmands-interview-with-geo-tv/, March 05, 2004.
[27] The Prime Minister heads the NCA as Chairman instead of the President. There is no Vice Chairman per the NCA Bill 2009 passed by the Pakistani Parliament as NCA Law in 2010.
Pakistan National Assembly NCA Act 2010: http://www.na.gov.pk/uploads/documents/1300934560_193.pdf

According to the former Director-General of SPD, Lt. Gen (retd.) Khalid Ahmed Kidwai, Pakistan's multilayered physical protection system for the nuclear program is based on 5Ds: Deter; Detection; Delay; Defence; and Destruction. Naeem Ahmed Salik, former Director, Arms Control and Disarmament Directorate of SPD, asserts that Pakistan's physical security architecture, based on multilayered perimeter security, is an integral element of all nuclear installations, civilian or military.[28] The SPD's Security Division also has a Quick Reaction Force and a Site Protection Force to ensure physical security of the nuclear sites and facilities.

There is always room for improvement, as a myriad of possibilities, such as design errors and component malfunctions can lead to accidents. Therefore, risk models on nuclear weapon accidents should not be based on zero assumption, since one cannot envision all contingencies and situations in which complex systems can fail, and there can be no "absolute safety." Also, security measures can become obsolete as time passes. Nuclear and missile security involves an intricate inter-relationship between personnel, information management, organizational coordination, safety, and security components. A decision to deploy in a confrontational situation further adds to the complexity of challenges and increases chances of mismanagement in all these respects. Moreover, "the excessive secrecy and compartmentalism attendant on a covert nuclear force means that unsafe procedures could go unnoticed."[29]

2.5 Protection during Movement

As both countries' nuclear weapons are claimed to be in disassembled state and are geographically dispersed, ensuring transportation security is crucial. However, specific information regarding transportation security of nuclear weapon components in both countries is shrouded in secrecy. The information discussed in this section pertains to security arrangements during transportation of radioactive materials and related components in the civilian nuclear sector. Pakistan has formulated specific "Regulations for Safe Transport of Radioactive Material" (PAK/916) that provides guidance for the safe transport of such materials so that the workers, consignors, carriers, consignees, the public, and the environment can be protected from the harmful effects of radiation during transport of radioactive material.[30] The "Regulations on

[28] Kenneth N. Luongo and Naeem Salik, "Building Confidence in Pakistan's Nuclear Security," *Arms Control Today*, December 2007, www.armscontrol.org/act/2007_12/Luongo

[29] Gregory F. Giles, "Safeguarding the Undeclared Nuclear Arsenals," *The Washington Quarterly*, 1993, Spring, http://www.armscontrolwonk.com/file_download/98/Giles%20Safeguarding%20Undeclared%20Nuclear%20Arsenals.pdf, p. 4.

[30] "Transportation of Radioactive Material by Road in Pakistan," PNRA-RG-916.01, April 2007, http://www.pnra.org/guidelines/RG-916%2001.pdf

Radiation Protection" (PAK/904) 2004 has laid down procedures to prevent loss, theft, damage, and any unauthorized transfer or access to the sources.[31]

In the case of India, the Atomic Energy Regulatory Board (AERB) has stipulated a Safety Guide on the security of radioactive materials during transport (AERB/NRF-TS/ SG-10) that prescribes the rules, regulations, and standard procedures to be followed in the packaging, shipment, and protective measures to be arranged for ensuring safety in the movement of radioactive material through the public domain.[32] Different security levels are specified for different materials (Category 1 to 5) depending upon the degree of fissile characteristics and the dangers involved. Moreover, India has adhered to the IAEA INFCIRC/225/Rev.5 that prescribes guidelines for the physical protection of nuclear material and nuclear facilities.[33]

Both India and Pakistan have acceded to the policies set forth by the Convention on Physical Protection of Nuclear Materials (CPPNM, 1980), which bestows legal obligation on States Parties "to protect nuclear facilities and material in peaceful domestic use, storage as well as transport."[34] Although, Pakistan has not yet ratified the amended CPPNM (2005)[35] it is "considering ratification of the 2005 Amendment to the CPPNM and was actively conducting a review to meet its various requirements."[36]

To further enhance their capabilities, Pakistan's and India's participation in multilateral programs to learn best practices on physical protection of material should be encouraged. In light of the aforementioned regulation and steps taken, it is also presumed that civilian and military related nuclear materials in both countries are covered by equally stringent procedures, mechanisms, and regulations for their protection, safety, control, and transportation.

2.6 Personnel Reliability

One of the most challenging problems for the security of nuclear weapons, materials, and information is the people who work in and manage the nuclear weapons complex. Both countries have elaborate personnel reliability programs in place to ensure that a "mad major" scenario does not occur.

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[31] "Regulations on Radiation Protection (PAK/904)," October 05, 2004, http://www.pnra.org/legal_basis/RP%20Regulations%20PAK-904.pdf

[32] AERB, "Security of Radioactive Material during Transport," AERB Safety Guide No. AERB/NRF-TS/SG-10, January 2008, http://www.aerb.gov.in/T/PUBLICATIONS/CODESGUIDES/sg-10.pdf

[33] IAEA, INFCIRC/225/Rev.4, "The Physical Protection of Nuclear Material and Nuclear Facilities", http://www.iaea.org/Publications/Documents/Infcircs/1999/infcirc225r5c.pdf

[34] IAEA, "The Convention on the Physical Protection of Nuclear Material" (INFCIRC/274/Rev.1, 1980, amended in 2005), http://www.iaea.org/Publications/Documents/Infcircs/Others/inf274r1.shtml

[35] IAEA, "Amendment to the Convention on the Physical Protection of Nuclear Material," September 16, 2013, http://www.iaea.org/Publications/Documents/Conventions/cppnm_amend_status.pdf

[36] "US termed Pakistan nuclear security as exemplary: Nawaz," *The News*, March 25, 2014. http://www.thenews.com.pk/article-142278-US-termed-Pakistan-nucler-security-as-exemplary:-Nawaz-.

India has maintained a stringent personnel reliability framework in all its nuclear-related institutions, prescribing a code of ethics and conduct to be followed. Besides the defence establishments' own mechanisms and procedures of scrutiny of their own staff and the Strategic Forces Command's (SFC) own standard operating procedures, the intelligence agencies and police network are part of the mechanism to ensure the integrity of the scientists or civilian staff employed in this sector. The AERB has developed a formal code of professional ethical values for the adherence of employees.[37] Accordingly, officials shall be guided by the principle to (1) maintain a high level of professional competence; (2) maintain a high level of honesty and integrity, and be principled and consistent in application of regulations. A number of procedures and schemes are implemented to constantly evaluate and monitor reliability standards, emotional behavior, belief patterns, engagements, and to maintain the morale of the employees. Only those persons who demonstrate reliability are certified to perform specified duties associated with nuclear weapons. The Department of Atomic Energy (DAE) and DRDO have their own personnel screening program to prevent potentially dangerous individuals from having access to nuclear materials.

The discovery of the A.Q. Khan covert and illicit nuclear technology proliferation network revealed serious weaknesses in Pakistan's nuclear management; however, since 2004, Pakistan has instituted elaborate export controls to prevent the recurrence of unauthorized export of sensitive nuclear materials or technology. Pakistan has also greatly improved its supervisory procedures for military and scientific manpower involved in the country's strategic programmes and is consciously striving to ensure that such an event would never occur, again. A comprehensive scheme of the Personnel Reliability Program (PRP) and the Human Reliability Program (HRP) for military and civilian personnel respectively is now in place. The SPD thoroughly screens, monitors, and grants overall approval of key personnel and also retains information on all retired personnel. Any individual assigned to a strategic project or a sensitive task now undergoes a security clearance by multiple intelligence agencies and the SPD has instituted a "cradle to grave" monitoring of all critical personnel. Reportedly, many lessons have been learned and adapted from the U.S. personnel reliability program.[38]

Unfortunately, personnel are not immune to illness, subordination, or invulnerable to a bad actor's influence, etc. The few reported instances of personnel misconduct in India, and the history of Khan's clandestine proliferation network bring home the fact that eternal vigilance is of the utmost importance for ensuring strict nuclear security and personnel reliability.

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[37] AERB, "Code of Ethics," http://www.aerb.gov.in/t/publications/ethics.pdf

[38] Kenneth N. Luongo and Naeem Salik, "Building Confidence in Pakistan's Nuclear Security," http://www.armscontrol.org/act/2007_12/Luongo

3. ACCIDENT IMPLICATIONS OF NEW NUCLEAR DEVELOPMENTS

Currently, two significant, nuclear weapons-related developments are visible on the horizon in South Asia. Pakistan has reportedly miniaturized nuclear weapons and developed Tactical or battlefield Nuclear Weapons (TNWs). Safeguarding deployed TNWs, which are much smaller in size, is indeed a challenge. India, on the other hand, is preparing its third leg of the nuclear triad – INS Arihant, the first 6,000-ton submarine with a 83MW pressurized light-water reactor onboard, is being readied for extensive sea-trials. First, both these issues involve very complex technology and delicate processes in terms of ensuring their safety and security. Second, the increasing number of warheads, their storage, maintenance, and dispersal involve additional responsibilities and risks.

3.1. Concern for TNWs

Generally speaking, the smaller the nuclear weapon and its means of delivery, the more susceptible it is to loss of central control. The very nature of the TNWs, and the fact that they need to be deployed on the battlefields or stored close to the battlefield and away from the central command and control chain, substantially increases the risks of "accidental, unauthorized or mistaken use."[39] However, Pakistan maintains that it will continue to exercise centralized control over any battlefield nuclear weapons during possible deployment. It is also asserted that these weapons won't need to be deployed prematurely or unnecessarily exposed to security risks or to the enemy, due to the relatively short distances between the storage sites and potential deployment areas (given Pakistan's lack of strategic depth).[40] Any deployment of battlefield nuclear weapons by Pakistan would be done following the decision of the NCA during a crisis when the collapse of the conventional forces would be imminent, and it would be used as a weapon of last resort – the first among several other nuclear weapon systems in the country's arsenal.[41]

3.2. Concern for Sea-based Assets

The maintenance and management of nuclear-propelled and nuclear-armed submarines are significantly more complex than conventional submarines because of the need for reactor maintenance and nuclear warheads onboard. Nuclear-propelled submarines armed with nuclear weapons are designed to stay hidden for long durations, can travel much longer than conventional boats, and their locations are a necessary secret. This may pose serious problems

[39] Samuel R. Berger, Steve Andreasen, "The Final Failure," *Foreign Policy*, September 8, 2011.
[40] Mark Fitzpatrick, "Overcoming Nuclear Dangers," *Adelphi Paper 443*, (London: International Institute for Strategic Studies, March 2014), p.90. https://www.iiss.org/en/publications/adelphi/by%20year/2014-de9e/overcoming-pakistan-nuclear-dangers-7ef0.
[41] Ibid.

for any search-and-rescue team in case of an accident at sea. There are many reported instances of accidents or near misses involving atomic warheads, known as *Broken Arrows* by the erstwhile Soviet Union and the United States, which involved incidents at sea.[42] Still, India is conscious of the nuclear safety requirements related to its Arihant-class nuclear power submarines and has built a Soviet-designed facility called the Special Safety Service at Vishakhapatnam to monitor the health of people working on the submarines and detect any radiation leaks.[43]

3.3. Expanding Cruise Missile Inventory

A cursory look at the missile tests during the last decade would reveal that both countries have increasingly prioritized their cruise missile programs in addition to ballistic missiles. Two of Pakistan's cruise missiles (*Babur* and *Raad*) are known to be nuclear capable, and logically, it would acquire supersonic versions of them soon, while a naval version of the *Babur* is believed to be under development.[44] At the same time, India's cruise missile program is on the path to becoming more robust with the ambition to acquire hypersonic versions of them. One perceived strategic implication of the expanding inventory of (nuclear-capable) cruise missiles is that it will impact strategic stability in the region seriously, but these might be seen as stabilizing by the other party in the face of growing missile defenses. Nonetheless, the deployment of land attack cruise missiles (LACMs) on survivable submarines or mobile platforms, obviously provides an assured means of surviving counterforce attacks; however, being a counterforce weapon platform, cruise missiles can obscure the distinction between tactical and strategic weapons, thereby complicating nuclear signaling by creating a degree of uncertainty in the type and nature of the incoming warhead and whether it is conventional or nuclear. Therefore, cruise missile proliferation in South Asia coupled with the acquisition and induction of possible missile defenses necessitates revisiting the contours of deterrence stability, nuclear accidents, and possible military-CBMs.

3.4. Expanding Fissile Material Production

Fissile Material production in India and Pakistan has witnessed an upward trend since 1998, primarily due to the requirements for operationalization of their respective nuclear deterrents. Both countries are believed to be developing strategic triads for greater survivability and

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[42] Andrew Rosenthal, "Dozens of Atomic Warheads Lost in Sea by Superpowers, Study Says," *New York Times*, June 07, 1989. "MoD Disclose 11 Safety Incidents at Nuclear Submarine Bases," *Sunday Herald*, October 27, 2013.
[43] "The Indian SSN Project: An Open Literature Analysis," http://www.fas.org/nuke/guide/india/sub/ssn/part01.htm Bruno Tertrais, "Pakistan's Nuclear and WMD Programmes: Status, Evolution and Risks," Non-Proliferation Papers No. 19 (EU Non-Proliferation Consortium, July 2012).
[44] Ibid.

effectiveness of their nuclear forces. They have also added nuclear fuel cycle and fissile material production facilities to their existing infrastructure, and this trend is likely to continue for the foreseeable future; however, doing so would generate additional responsibilities for nuclear material safety, accounting, and security, which both countries are expected to be aware of, given that this vertical nuclear expansion is central to their respective force goals.

4. NUCLEAR WEAPONS ACCIDENTS

The intention here is not to draw any parallel of the Cold War experience to the India and Pakistan scenario. Rather, the aim is to highlight the bitter experiences of other nations in the management of nuclear weapons that "involves the unpredictability of circumstances and human behaviour"[45] interacting with complex and sophisticated military technologies. Therefore, it would be useful to study instances involving nuclear accidents or *Broken Arrow* incidents of other countries and draw lessons cooperatively, in the spirit of the 2007 Agreement.

4.1. Global Experience

It is believed that there were at least 230 accidents involving aircraft, missiles, and ships that had some kind of nuclear mission of the United States, the Soviet Union, and the United Kingdom between 1950 and 1980.[46] The US Department of Defense "Narrative Summaries of Accidents Involving U.S. Nuclear Weapons 1950-1980" describes the circumstance surrounding 32 accidents involving nuclear weapons. Only two accidents, those at Palomares and Thule, resulted in a widespread dispersal of nuclear materials.[47] Accidents in the US have been detailed in Eric Schlosser's work, *Command and Control*.[48] One source lists over 25 serious nuclear facility incidents in the erstwhile Soviet Union.

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[45] Ashton B Carter, et al., (eds.), *Managing Nuclear Operations*, The Brookings Institution, Washington, 1987, p. 3.
[46] Shaun Gregory and Alistair Edwards, "The Hidden Cost of Deterrence: Nuclear Weapons Accidents 1950-1980," *Bulletin of Peace Proposals*, Vol. 20, No. 1, 1989. For accidents relating to US nuclear forces see Jaya Tiwari and Cleve J. Gray, "U.S. Nuclear Weapons Accidents," CDI Center for Nuclear Information, http://tybeebombsquad.com/Accidents/accidents.htm
[47] U.S. Department of Defense, "Narrative Summaries of Accidents Involving U.S. Nuclear Weapons 1950-1980," http://nsarchive.files.wordpress.com/2010/04/635.pdf, p. i.
[48] Eric Schlosser, *Command and Control: Nuclear Weapons, the Damascus Accident, and the Illusion of Safety*, New York: The Penguin Press, 2013.

4.2. Local Incidents

Instances of nuclear weapons related accidents or incidents in India or Pakistan, if any, are not known. Both India and Pakistan have had relatively limited experience with nuclear weapon design, testing, and mating with delivery systems. Their armed forces have had even more limited experience with nuclear weapons in the field. However, the no first use policy of India, and "first-use as the last resort" policy of Pakistan reduce the chances of accidental use. Nevertheless, it is not reasonable to assume that they have not confronted difficulties in managing the safety and security of their nuclear inventory.

In India, a number of industrial accidents/incidents have occurred within nuclear facilities – the Narora reactor fire incident in March 1993, the collapse of containment dome in Kaiga reactor during construction in 1994, and the flooding of the Kakrapar reactor site in June 1994. These incidents are of course industrial accidents, and corrective measures have been administered on the basis of the lessons learned. In the case of Pakistan, at least three earthquakes in northern Punjab destroyed thousands of centrifuges in the Kahuta enrichment plant in 1981,[49] and two more in 1983 and 1986.[50] There were unconfirmed reports of earthquake damage in 2005 as well.[51] Other incidents involved leakage of heavy water from KANUPP in 1989,[52] and a reported cylinder explosion incident at the Khushab heavy water plant in 2008.[53] Though, none of the above-mentioned incidents involved any nuclear materials or nuclear weapons.

[49] Feroz Hassan Khan, *Eating Grass: The Making of the Pakistani Bomb*, op. cit., pp. 156-157.
[50] Ibid., p. 160.
[51] Adrian Levy and Scott-Clark, *Deception: Pakistan, the United States and the Secret Trade in Nuclear Weapons* (New York: Walker & Company, 2007) p. 100.
[52] "Spokesman On Leak," Islamabad Domestic Service, May 141989; Nuclear Developments, 1June 1989, p. 21; in NTI Nuclear and Missile Database, June 1, 1989, www.nti.org.
[53] "Two killed in gas leak at Khushab plant," *Dawn*, http://archives.dailytimes.com.pk/national/09-Apr-2008/two-killed-in-gas-leak-at-khushab-plant.

5. ANALYSIS OF THE AGREEMENT

The 2007 India-Pakistan Agreement is certainly a realization by both countries regarding the probability of such an accident taking place, the risks involved in the event of such an accident, and the countries' duties in such a scenario. Through this agreement, both countries have outlined the parameters of "responsibility," concepts, and the redlines to be adhered to in the management of their respective nuclear deterrents.

5.1. Responsibilities and Obligations

The Agreement is farsighted, as it unambiguously bestows responsibilities on both countries "to guard against accidents related to nuclear weapons" *under their jurisdiction or control* (Articles 1 and 2). This also encompasses the future nuclear inventory of both countries. Article 2, however, clarifies that they are obliged to notify each other only of such accidents that may result in international, trans-boundary release or have security implications. In addition, the "information obtained on the accident cannot be disclosed to a third Party without prior consent of the other Party…" (Article 5).

5.2. Scope for Cooperative Measures

Certain provisions in the agreement seem open-ended, leaving ample scope for follow up measures. For example, Article 3(i) prescribes that "each Party shall act in such a manner as to reduce the possibilities of its actions being misinterpreted by the other Party." To eradicate the chances of misinterpretation, both Parties must first devise certain mechanisms and interact at successive intervals to cooperate on less sensitive issues relating to nuclear weapons safety and security. Article 3(ii) enumerates that "in case of likely impact of the accident on the other Party, the first Party shall inform the other Party forthwith with relevant information." This necessitates an institutional mechanism to decide what specific information needs to be obtained. In pursuance of the information obtained, the measures to be undertaken have to be ascertained as well. Lastly, Article 4 says that in addition to using the hotline links between the two Foreign Secretaries and Directors-General Military Operations (DGMOs) for information sharing, "the Parties may also make use of any other communication channels…." It would be prudent, therefore, to identify or put in place alternative information management and communication sharing mechanisms to better facilitate the process.

This study attempts to suggest a framework of cooperative measures for consideration. Since both countries have acknowledged the "nuclear dimension of the security environment" and "their responsibilities," a few follow-up measures within the purview of this agreement would further strengthen the nuclear CBM process.

6. FRAMEWORK FOR COOPERATIVE MEASURES

India and Pakistan seldom subscribe to each other's apprehensions on the safety and security of their respective nuclear arsenals and strategic forces. Rather, they are confident of their respective mechanisms in place and have strived to maintain the safekeeping of their nuclear arsenals. It is presumed that the overriding motivation for signing of such an agreement was, first, to show the world that both countries are responsible nuclear powers, and secondly, to spell out redlines and concepts of accidents relating to nuclear weapons in South Asia.

Theoretically, the sources of an imagined nuclear weapon accident would be the lack of understanding of the exigencies of doctrines on force postures, laxity in rule implementation, and lack of or weak security culture. Therefore, any framework for additional cooperative measures to promote this Agreement should take into account these issue areas. Natural disasters and non-state terrorism events are not in the purview of this study, as the Agreement is focused on avoiding "accidents" – unintentional or inadvertent. It is the sole responsibility of both states to guard against, and put in place, "national measures" to prevent misuse of "nuclear weapons under its control." As the Agreement is silent on the definition of 'nuclear weapons accident', it is suggested that both parties must arrive at a working definition first. The US Department of Defense defines an "accident involving nuclear weapons" as:

> An unexpected event involving nuclear weapons or nuclear weapons components that results in any of the following: accidental or unauthorized launching, firing, or use; nuclear detonation; non-nuclear detonation or burning of a nuclear weapon or radioactive weapon component; radioactive contamination; seizure, theft, or loss of a nuclear weapon or radioactive nuclear weapon component, including jettisoning; public hazard, actual or implied.[54]

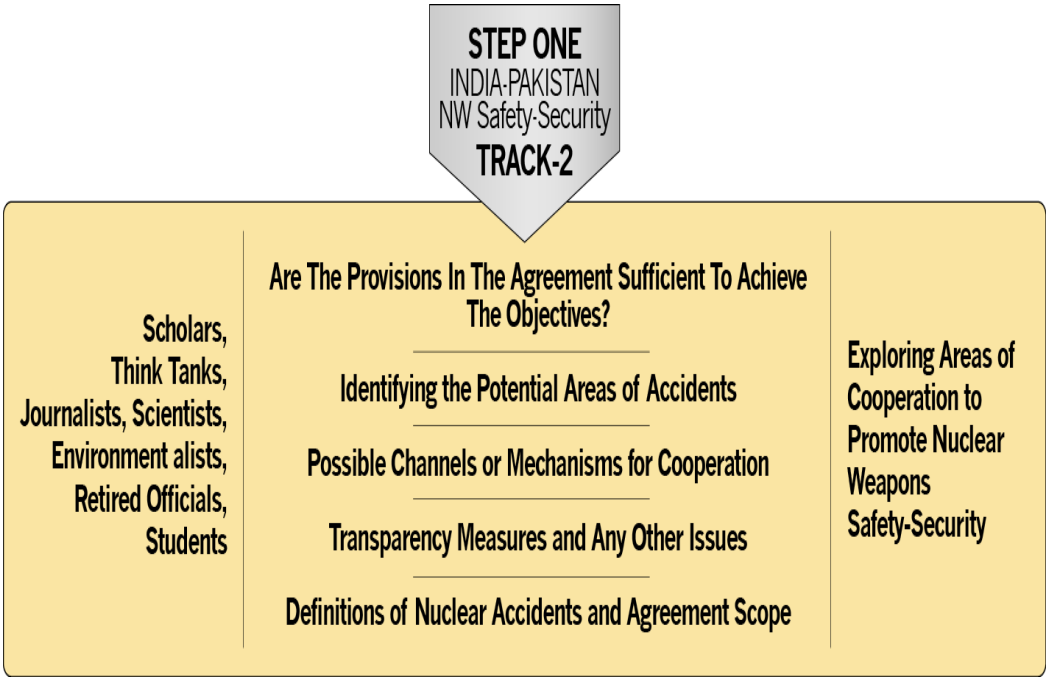
6.1. Stepping Stone

At the outset, a public debate on the imperatives of such an approach needs to be generated in both countries. This first suggests a targeted, Track 2 initiative involving relevant scholars and experts, think tanks, journalists, environmentalists, scientists (if possible), retired officials, and students from both sides to discuss and suggest modalities to move forward. The Ottawa Dialogue has made a number of recommendations on nuclear, missiles, and regional security issues.[55] Nevertheless, intensive debate and deliberations are warranted, particularly on the provisions of this Agreement, regarding potential areas of vulnerability, communication links,

[54] U.S. Department of Defense, n. 44, p. iii.
[55] "Ottawa Dialogue Makes Further Recommendations for India-Pakistan Nuclear Agreements," December 22, 2011, http://ssms.socialsciences.uottawa.ca/vfs/.horde/newsfeed/000301_001324577320_Copenhagen_ENG%20(2).pdf

and transparency measures on nuclear safety and security (Fig.3). Outcome of such initiatives should be conveyed to both the governments for consideration.

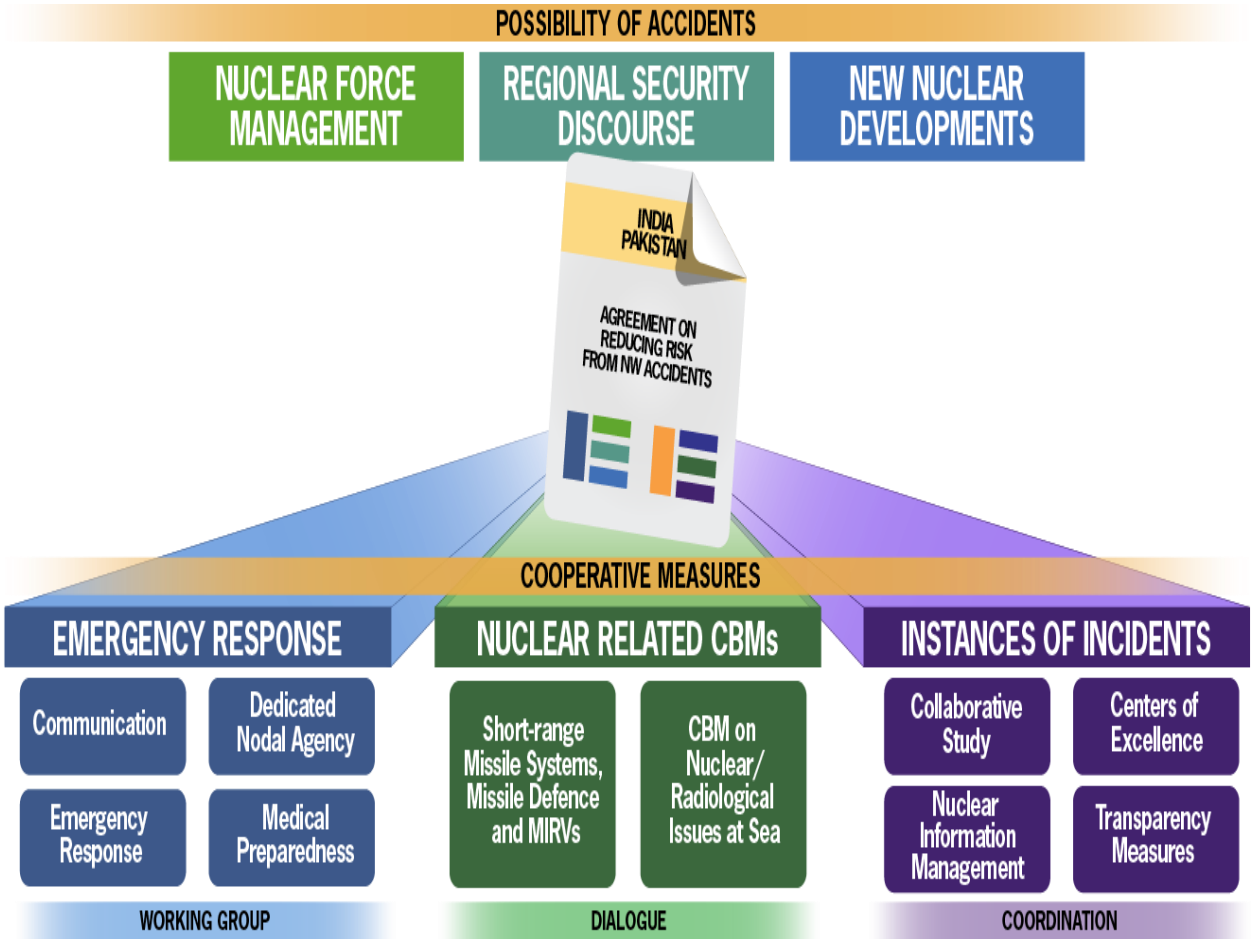
Figure 3: Tasks for Track 2



6.2. A Framework for Possible Cooperation

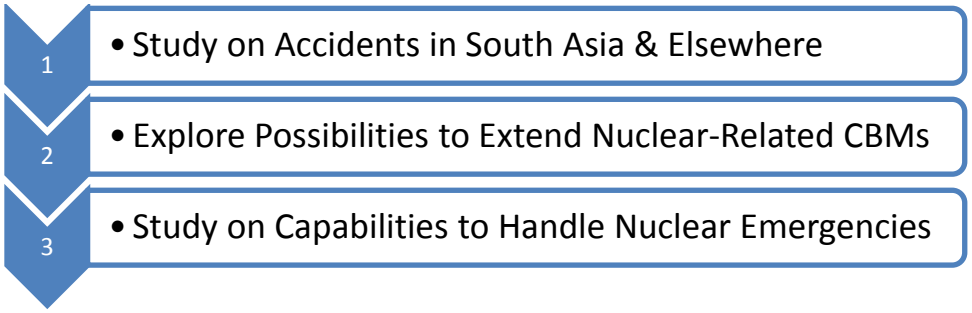
Based on the examination (in the "South Asian Context" section) of the regional security discourse, nuclear force management, and the evolving nuclear weapons policies of the two countries, the subsequent sections attempt to delineate a framework of cooperative measures (Fig. 4). It identifies mainly three broad areas – emergency response, extending nuclear CBMs already at work, and a study of the past nuclear-related accidents elsewhere – to explore possible cooperation by initiating a process of periodic dialogue amongst working groups, coordinating agencies of both countries, and deliberation on different issue areas to promote the ethos stipulated in the Agreement.

Figure 4: The Framework



Issues like nuclear force management and new nuclear weapons related developments are comparatively more sensitive than other areas like emergency response, past events, and nuclear CBMs. Understanding the fact that both countries will be hesitant to discuss sensitive and secretive areas, this study proposes to start with less sensitive areas at the outset.

Figure 5: Areas of Possible Cooperation

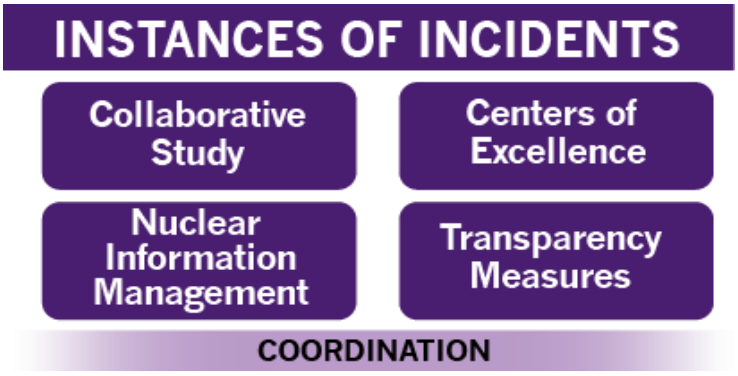


6.2.1. Issue Area One

To begin, we suggest initiating a *collaborative study* on nuclear-weapons related incidents and safety-security aspects, initially focusing on the accidents that have occurred in other countries. The objective is to draw lessons from, and develop common understanding of, the matter.

The glimmer of hope is the fact that even after the nuclear tests in 1998, Indian and Pakistani representatives have worked collaboratively on nuclear safety issues within the Regional Cooperative Agreement for Research, Development and Training in Nuclear Science and Technology in Asia, and the Pacific (RCA) framework of the IAEA.[56] In 1998, within the framework of the RCA, China, India, the Republic of Korea, and Pakistan collaboratively developed the "Regional Asia Reference Book on Good Operational Safety Management" of nuclear power plants.[57] Later on, subject to each other's approval, a collaborative study can be undertaken to analyze vulnerabilities in South Asia.

Figure 6: Tasks in Issue Area One



For this cooperation to commence, each side first needs to nominate respective *Centres of Excellence for possible collaboration* and joint studies. In the case of India, the Bhabha Atomic Research Centre (BARC) of DAE located in Mumbai would be the appropriate agency for such collaboration. In the case of Pakistan, the National Nuclear Security Emergency Coordination Centre (NRECC) at the PNRA in Islamabad "is the National Warning Point (NWP) and operational facility for response to nuclear accidents or radiological emergencies happening domestically or abroad."[58]

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[56] "The Regional Cooperative Agreement," http://www.aea.gov.lk/web/index.php?option=com_content&view=article&id=300&Itemid=257&lang=en

[57] IAEA, *Annual Report 1998*, http://www.iaea.org/worldatom/Documents/Anrep/Anrep98.

[58] NRECC, http://www.pnra.org/nrecc.asp

In India and Pakistan, due to the deep sense of nuclear nationalism, public discussions and debates on anything "nuclear" are highly charged – more so after the Fukushima nuclear disaster in Japan. A number of misperceptions on nuclear energy, nuclear safety, and radiological matters persist in South Asia, which discourages open discussion and debate, though the situation in India is relatively better. One reason is the general lack of public understanding of basic nuclear technology and the distinction between nuclear energy, nuclear weapons, and other peaceful uses of atomic energy. Another is the presence of the anti-nuclear lobby in both countries, and any nuclear-related discussion – even on civil nuclear energy – has the potential of being influenced or affected by such nuclear pessimists. This, in turn, discourages openness and debate on nuclear weapon-related issues; however, in the wake of a crisis, a lack of understanding of issues related to nuclear and radiological safety, and how to cope with emergencies would eventually result in chaos and disarray. As a less sensitive area, both countries might be willing to plan for a collaborative framework and experiment to devise a nuclear information management (NIM) system, shaped according to their respective national characteristics. For this concept to initiate, the governments of India and Pakistan need to work toward creating mutually understood nuclear information management infrastructures. In this area, the collaborating agencies of both countries may study and draw lessons from systems and experiences of other countries, especially on the "social acceptance" of nuclear technology. This endeavour may include public information systems, academia, and social organizations to examine how much or what nuclear information can be shared for public consumption.

As a crucial part of the proposed framework, both countries may take steps to "promote incremental progress in nuclear transparency, [and] nuclear-related information."[59] This study acknowledges the fact that serious concerns of policy-makers exist on both sides who are opposed to greater nuclear transparency due to a sense of mutual mistrust. Therefore, why should India and Pakistan agree to increase nuclear transparency to any extent? The answer is, "for both countries to strike a balance between nuclear ambiguity and nuclear transparency for better crisis management."[60] Here, the suggestion is not out of the box; at the first stage, an expansion of existing Indian and Pakistani multilateral treaty arrangements that require the sharing of nuclear information with international, regional, and bilateral entities can initiate a process of greater nuclear transparency. The table below shows existing information-sharing obligations of India and Pakistan under various multilateral treaty arrangements that could provide a framework to adopt for this Agreement.

[59] Gaurav Rajen and Kent Biringer, "Nuclear-Related Agreements and Cooperation in South Asia," *Disarmament Diplomacy*, Issue No. 55, March 2001, http://www.acronym.org.uk/dd/dd55/55rajen.htm
[60] Ibid.

Table 1: Nuclear-related Agreements Involving India or Pakistan

	India		Pakistan	
Treaty/ Convention/ Agreement	**Date of Signature**	**Date of Accession**	**Date of Signature**	**Date of Accession**
Agreement on the Prohibition of Attack Against Nuclear Installations and Facilities	12/31/1988	1/1/1991	12/31/1988	1/1/1991
The Antarctic Treaty		8/19/1983		
Code of Practice on the International Trans-boundary Movement of Radioactive Waste		9/21/1990		9/21/1990
Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	9/29/1986	2/28/1988		10/12/1989
Convention Concerning the Protection of Workers Against Ionizing Radiation		11/17/1976		
Convention on Early Notification of a Nuclear Accident	9/26/1986	2/28/1988		10/12/1989
Convention on the Liability of Operators of Nuclear Ships	5/25/1962	Not applicable - not in force		
Convention on Nuclear Safety	9/20/1994		9/20/1994	9/30/1997
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter				4/8/1995
Food and Agriculture Organization/ United Nations - nuclear projects		10/1964		10/1964
Lahore Memorandum of Understanding	2/21/1999		2/21/1999	
International Convention for the Safety of Life at Sea		6/16/1976		4/10/1985
Regional Cooperative Agreement for Research, Development and Training in Nuclear Science and Technology in Asia and the Pacific	6/7/1972	6/7/1972	9/6/1974	9/6/1974
Safeguards Agreements with the IAEA		Various times		Various times
Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies	3/3/1967	1/18/1982	9/12/1967	4/8/1968

	India		Pakistan	
Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water	8/8/1963	10/10/1963	7/14/1963	3/3/1988
Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other WMD on the Seabed and the Ocean Floor		7/20/1973		
UN Convention on the Law of the Sea	12/10/1982	7/29/1995	12/10/1982	

Source: Gaurav Rajen and Kent Biringer, "Nuclear-Related Agreements and Cooperation in South Asia," *Disarmament Diplomacy*, Issue No. 55, March 2001.

The aforementioned information exchange in the context of the Agreement could also be facilitated through an equivalent and mutually understood information management infrastructure in each country; all such information can eventually be hosted in dedicated, nodal agencies created on each side. These nodal agencies (part of the structure in Issue Area Two and explained in a subsequent section) may consist of personnel from the scientific community, defence establishments, foreign affairs, civic bodies, disaster management agencies, and other security agencies to spearhead emergency response in times of emergency and in specific locations.

From an Indian perspective, it is important to acknowledge the fact that India adheres to a second-strike nuclear posture that relies on secrecy and has to keep internal safety and security measures away from scrutiny, mainly to ensure survivability of its arsenal; however, "as its nuclear weapon status (though *de facto*) has now achieved greater international acceptance, India may afford to be transparent about the steps it takes to prioritize nuclear weapons safety. India's deterrent [triad] is still in the making, any transparency initiative will have to be limited and certainly on India's terms or comfort level, and confidence in reliability and survivability of its own capability."[61]

Nonetheless, a certain level of ambiguity in South Asian nuclear discourse is viewed as a stabilizing factor, but "unconstrained ambiguity will jeopardize the verifiability and effectiveness of future nuclear-related agreements India and Pakistan may negotiate, as well as those they have already acceded to."[62] Limited transparency is also necessary for management of crises and long-term, regional stability. In reciprocation to India's transparency initiative, Pakistan can also come up with similar initiatives.

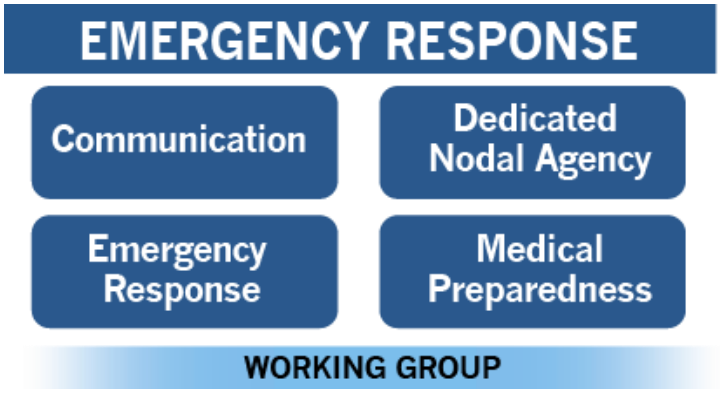
[61] Email interaction by Sitakanta Mishra with Manpreet Sethi, Senior Fellow, Centre for Air Power Studies, New Delhi, on 14 November 2013.
[62] Gaurav Rajen, op cit.

In summary, the three aspects of Issue Area One – collaborative study, nuclear information management, and transparency measures – can be coordinated by the centers of excellence identified in each side to initiate the collaboration.

6.2.2. Issue Area Two

The most important and potential area of cooperation in this framework is the capability of both countries to handle nuclear weapons emergencies, if they ever arise. Both countries are known to have developed their own national infrastructure, mechanisms, and plans of action to contain or deal with a nuclear disaster. Of course, there is always opportunity for adopting global best practices, to which both countries are open.

Figure 7: Tasks in Issue Area Two



In India, the Central Industrial Security Force (CISF), in charge of providing security to nuclear installations, is equipped with the necessary ability to deploy specially trained teams in case of a nuclear emergency. Four companies of the CISF have been stationed with specialized training in four regional locations as First Responders – the Ghaziabad unit (Uttar Pradesh) to cater to Delhi and other northern areas, the Ranchi unit (Bihar) to cater to the eastern areas, the Kota unit (Rajasthan) for the western, and the Chennai unit (Tamil Nadu) for the southern part of the country.[63] A Crisis Management Group (CMG) has been set up under the Crisis Management Plan and the DAE functions as the nodal authority with respect to nuclear/radiological emergencies in the public domain. In addition, the National Disaster Management Authority (NDMA) has drawn up a National Plan, State Plans, and District Plans in coordination with respective authorities.[64]

[63] Sitakanta Mishra, *The Challenge of Nuclear Terror* (New Delhi: K W Publishers, 2008).
[64] National Disaster Management Authority, Government of India, "National Disaster Management Guidelines: Management of Nuclear and Radiological Emergencies," 2009, http://ndma.gov.in/ndma/guidelines/Management+of+Nuclear+&+Radiological+Emergencies.pdf

Located in various parts of India, there are 22 Emergency Response Centers (ERCs), with skilled Emergency Response Teams (ERT) comprising the Aerial Survey Team (AST), Field Monitoring Team (FMT), Source Recovery Team (SRT), Assessment and Advisory Team (AAT), Medical Team (MT), and Bioassay Team (BT). They form an extensive network monitored by BARC (Mumbai) as the nodal agency. In case of any such event, an urgent response would be extended after conducting a Quick Impact Assessment (QIA) through Impact Assessment Software (IAS), specially developed in BARC to predict the impact. As per the arrangement, the ERC nearest to the site of such an incident will be activated by the centralized Emergency Communication Room (ECR – Mumbai) of the DAE CMG, on receipt of confirmation. The CMG coordinates between various state and central agencies to facilitate an effective response to such emergencies. During the past few years, the first-responders – custom officials, police, fire brigade personnel, and paramilitary forces – are being trained to handle radiological emergencies. State of the art monitoring systems and methodology are also developed and kept in readiness in various parts of the country.[65]

Pakistan has established a Nuclear Security Center of Excellence "that conducts specialized courses in nuclear security, physical protection, and personnel reliability." The Center can be used as a regional and international hub for training.[66] In addition, it has also developed a strong radiation emergency response mechanism. Its Nuclear Emergency Management System (NEMS) is designed to cater to nuclear and radiological emergencies. The NEMS also has a Nuclear and Radiological Emergency Support Center (NURESC), which is ready to respond to any emergency at any time.[67] The Radiation Monitoring Portal monitors are also being deployed at important exit and entry points in the country to prevent any illicit nuclear or radioactive material trafficking. Pakistan already has a National Disaster Management Authority (NDMA) that functions in the office of the Prime Minister. Capacity building of the NDMA to handle such potential situations in conjunction with the SPD/PNRA and other specialized departments might be a useful starting point to generate know-how and training on the issue for the country's civil departments.

This gives the impression that both countries have developed and remained in readiness with their respective mechanisms and standard operating procedures to deal with any unforeseen nuclear contingencies, and they are committed to maintaining a safe, secure, and effective deterrent; however, as no such incident has happened yet in either country, they have no practical experience in dealing with such a situation. Only through simulation and training exercises in artificial scenarios, or Design Basis Threat simulation exercises, can the concerned agencies and

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[65] Mishra, 2008, op cit.
[66] Addressing the International Conference on Nuclear Security in Vienna in July 2013, Ambassador Masood Khan.
[67] "Pakistan National Statement at the Nuclear Security Summit," Seoul, 26-27 March 2012, http://pgstest.files.wordpress.com/2013/06/pakistan-national-statement2.pdf

departments prepare themselves to deal with a nuclear disaster. Also, all such preparedness is essentially designed to manage contingencies that may occur within their respective borders. In fact, dealing with a nuclear contingency occurring in the neighboring country presents a different set of scenario requirements and mechanisms. This Agreement, therefore, expressly states in Article 2 that "the Parties shall notify each other immediately in the event of any accident relating to nuclear weapons," and "the first Party shall inform the other Party forthwith relevant information" so "as to reduce possibilities of its actions being misinterpreted by the other party" in Article 3. This raises four sets of issues: (a) notification through which channel? (b) notification to which agency? (c) notification of what specific information? and (d) what type of emergency response – unilateral or cooperative?

This study recommends the establishment of working groups on these issue areas involving experts from both sides to take charge of, or suggest additional measures to be undertaken in regard to consequence responsibilities.

As far as a communication link is concerned, Article 4 of the Agreement mentions, "Parties shall make use of the hotline links between the two Foreign Secretaries and DGMOs or any other appropriate communication link as mutually agreed upon…for transmission of, or request for, urgent information..." It also mentions, "…the Parties may also make use of any other communication channels, including diplomatic channels depending upon the urgency of the situation." Under the Lahore MoU, upgrading and improvement of these channels of communication were agreed upon and has been implemented as well. Agreement to shift the DGMO hotline to the fiber optic link was formalized during the expert-level meeting in New Delhi in August 2005 and has since been implemented.[68] If the two existing communication channels (Foreign Secretaries and DGMOs) are assigned the task of managing communication for and during nuclear weapons-related disasters or accidents, at the very least, a disaster management expert, a nuclear scientist, or an individual with technical expertise must be attached to both these offices to guide what information to seek or what technical detail is required to start its own course of action.

This is specifically to address the issue of deciding what type of technical information is required and at what stage during such a crisis. For that matter, both countries may start to reexamine the IAEA Convention of Early Notification of a Nuclear Accident (1986) on which they have serious reservations.[69] The purpose is to refer to Article 5 of the Convention, where a clear set of

[68] Jawed Naqvi, "Accord on Nuke Hotlines, Missile Tests with India," *Dawn*, August 7, 2005.
[69] IAEA, "Convention of Early Notification of a Nuclear Accident," INFCIRC/335, http://www.iaea.org/Publications/Documents/Infcircs/Others/infcirc335.shtml, November 18, 1986. India, though has ratified on 28 January 1988, considers the Convention "inherent with serious defects in as much as it differentiates between nuclear weapon states and non-nuclear weapon states," and does "not cover all accidents." Pakistan, on the other hand, has acceded to it on September 11, 1989, but "does not consider itself bound by the provisions of submission of disputes to arbitration" or to the International Court of Justice at the request of any party to such dispute. "Declarations/reservations made upon expressing consent to be bound and objections thereto," http://www.iaea.org/Publications/Documents/Conventions/cenna_reserv.pdf, July 28, 2011.

parameters on essential information required have been delineated. For example, each state party shall provide the date, time, exact location, and nature of the nuclear accident; the facility or activity involved; the assumed or established cause, and the foreseeable development of the nuclear accident, etc.

Depending upon the gravity of the situation and information required, the necessity may arise to arrange face-to-face consultations or discussions. This is especially true for obtaining and using the information provided for analyses, which requires a dedicated nodal agency comprising technical as well as disaster management officials and decision-making authorities to officially obtain, consult, analyze, and act upon the information received. This nodal agency can be the link between the country of origin of the accident and the authorities in charge of emergency response on the other side. Therefore, a dedicated communication channel, which this study proposes, may be considered linking the two nodal agencies on each side for information sharing and further, necessary action. A single agency serving as a point of contact for sharing nuclear-related information could make it easier to block all information flows in a situation of worsening relations, and a specialized, information-sharing infrastructure would further facilitate the transfer of more useful and relevant information for cooperative disaster management and emergency response, if required.

The arena of nuclear emergency response provides ample opportunity for cooperation if both countries are desirous. As any trans-boundary release of radiation demands cooperative responses to address the likely impact, it is warranted that both countries identify some areas of cooperation within their comfort level. In accordance with the provisions of the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1986), India and Pakistan are obliged to "cooperate between themselves and with the IAEA to facilitate prompt assistance in the event of a nuclear accident or radiological emergency to minimize its consequences and to protect life, property and the environment from the effects of radioactive releases."[70] Also, under this Convention, they "may agree on bilateral or multilateral arrangements…for preventing or minimizing injury and damage which may result in the event of a nuclear accident or radiological emergency." Therefore, it would be prudent for both countries to identify potential areas of cooperation in advance, perhaps through a working group consisting of experts from both countries.

One potential area of collaborative work would be environmental sampling around the affected area through aerial surveys for deciding further courses of action. For better estimation of the consequences of an accident, joint studies on the atmospheric dispersion modeling, and probabilistic consequence analysis of the plume and wind are essential for any emergency

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[70] IAEA, "Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency," INFCIRC/336, November 18, 1986, http://www.iaea.org/Publications/Documents/Infcircs/Others/infcirc336.shtml

response to begin with. However, it would be unrealistic to suggest both countries to collaborate in this sensitive area at this stage. India has developed a sophisticated Aerial Gamma Spectrometry System (AGSS) for online assessment of radiological impact, which can be mounted on helicopters flying over the affected area. Other technologies, like the Compact Aerial Radiation Monitoring System (CARMS) for remote aerial radiation monitoring, and Environmental Radiation Monitoring Network (IERMON),[71] satellite imagery-mapping of a "contaminated area" can be of great use in such emergencies, depending upon everyone's comfort level and willingness. Subject to mutual approval, both countries can study models of other countries, like the US, France, the UK, or Germany – all more experienced in this area. Moreover, both countries may approach the US through a formal, trilateral understanding among them through IAEA or otherwise to observe nuclear weapons accident and emergency response exercises conducted in the US.

The most crucial area, having wide scope for cooperation between India and Pakistan, could be the fielding of medical response to a nuclear emergency. A situation may occur where both countries have to carry out integrated diagnostic and dosimetric responsibility in the affected area, if the situation involves a trans-boundary release. This necessitates comprehensive medical preparedness, both at incident site and hospitals. In both countries, only a handful of medical centers are equipped with radiation-related hazards treatment.[72]

Therefore, a working group consisting of medical personnel from both countries can plan for developing comprehensive response capabilities and operational readiness of responders (both health and non-health service providers) in a contaminated environment and supported by R&D and technological efforts. As a common ground to begin with, the working group can use the IAEA-WHO Generic Procedures for Medical Response during a Nuclear or Radiological Emergency (2005) as a guide.[73] The plan may include a study of advanced Decontamination Room, Dust-Filtered Nuclear Ward, Radioactive Bio-Waste Disposal Methods, Study of Chromosomal Aberration, Hematology Laboratory with Cell Separator for Granulocyte Concentrate, Bone Marrow Bank, Bone Marrow Transfusion, and Stem Cell Harvesting techniques, etc.[74]

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[71] C.K.G. Nair, et al., "National Network for Early Detection of Nuclear Emergency: Indian Environmental Radiation Monitoring Network (IERMON)," http://nidm.gov.in/idmc2/PDF/Abstracts/Nuclear.pdf

[72] Muhammad Ahmed Siddiqui, et al., "Pakistan: The New Target of Terrorism: Are Karachi's Emergency Medical Response Systems Adequately Prepared?," *Journal of Pakistan Medical Association*, Vol. 59, No. 7, July 2009, pp. 441-45, http://www.jpma.org.pk/PdfDownload/1741.pdf

[73] IAEA-WHO, "Generic Procedures for Medical Response during a Nuclear or Radiological Emergency," April 2005, http://www-pub.iaea.org/MTCD/Publications/PDF/EPR-MEDICAL-2005_web.pdf

[74] Rajesh Arora, et al., "Medical Radiation Countermeasures for Nuclear and Radiological Emergencies: Current Status and Future Perspectives," *Journal of Pharmacy & BioAllied Sciences*, July-September 2010, 2(3), pp. 202–212, http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3148625/#ref1

Besides preparedness, periodic training programmes can be arranged between medical and paramedical officials of both countries. India's BARC has a 292-bed hospital with advanced facilities to experiment and take care of all kinds of radiation emergencies.[75] In Pakistan, the NRECC of the PNRA is equipped with handling such emergencies.[76] It would be prudent for both countries to explore and adopt international best practices in this field. The Radiation Emergency Assistance Center/Training Site (REAC/TS) managed by the US Department of Energy and National Nuclear Security Administration (DOE/NNSA)[77] specializes in medical aspects of managing radiation emergencies can be a model studied by joint delegations from India and Pakistan. It is unreasonable to suggest that they start collaborating in all these areas at once; however, the scope for joint work on all these areas is enormous as well as non-controversial.

6.2.3. Issue Area Three

The less talked about facts, but potentially having serious implications on South Asian nuclear weapons discourse, are the nuclear and radiological issues at sea and the spread of sophisticated cruise missiles, short-range systems, and missile defenses. As a logical corollary of the concern for the safe-keeping of nuclear weapons, management of delivery vehicles and the trend in their spread is equally important. With the gradual evolution of South Asian nuclear arsenals/deterrents naval nuclearization would be more pronounced.

The Agreement in its preamble expresses "the need for adopting measures aimed at promoting a stable environment of peace and security between the two countries." Undoubtedly, the nuclear dimension of the security environment has added utmost responsibility to mend fences on the current bilateral contentious issues. Being cognizant of the new nuclear developments in South Asia, we assume that sea-related nuclear and radiation issues and the lack of prior notification of cruise missile tests are potentially the two most contentious areas that need serious attention. This study, therefore, proposes dialogues for exploring options for bilateral cooperation in these areas.

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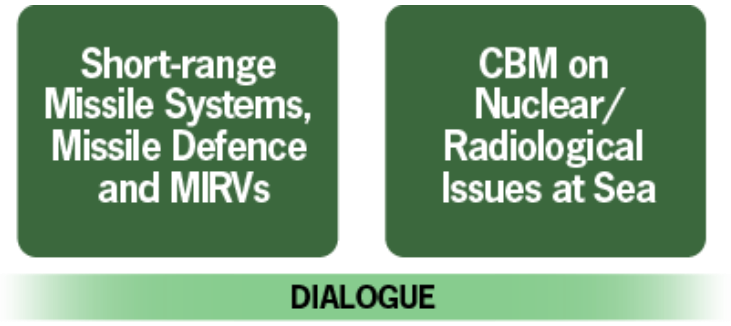
[75] B.J. Shankar, "Radiological Emergency Medical Preparedness in India," 8th Coordination Meeting of World Health Organization Collaborating Centres in Radiation Emergency Medical Preparedness and Assistance Network, REMPAN (WHO, 2002), http://helid.digicollection.org/en/p/printable.html

[76] http://www.pnra.org/nrecc.asp

[77] "Radiation Emergency Assistance Center/Training Site (REAC/TS)," orise.orau.gov/reacts/work-with-us.aspz

Figure 8: Tasks in Issue Area Three



As far as radiological issues at sea are concerned, the South Asian Seas Action Plan[78]– to which India and Pakistan are signatories – encourages and provides a framework for collaboration. The action plan suggests the establishment of a coordinated regional marine pollution monitoring program for collaboration among regional scientists and technicians as well as their institutions. This is based on inter-comparable methods, for the study of the various processes occurring in the coastal areas and open-ocean of the region. As a confidence building measure within the framework of the SAS Action Plan, India and Pakistan may like to take steps in sharing data on environmental and effluent releases from two civilian nuclear power plants located on the shoreline of the Arabian Sea – TAPS and KANUPP – as a starting point.[79]

The BARC in India has initiated two projects in the marine pollution area. One involves the use of radiotracers in the Hoogli estuary near Calcutta. The other BARC marine research project is in cooperation with the MS Swaminathan Research Foundation in India and involves the use of "Nuclear and Biotechnological Tools in Coastal Systems Research." Given this interest in the marine coastal environment, the BARC could be a suitable partner for supporting the South Asian Seas Action Plan.[80] Secondly, the South Asian Seas Action Plan can be linked to the RCA where Indian and Pakistani representatives have already collaborated on nuclear safety issues. India, while readying its third leg of its deterrent, must also highlight the fact that it is a responsible member of the Convention on the Liability of Operators of Nuclear Ships[81] (signed May 25, 1962) and has also acceded to the Treaty on the Prohibition of the Emplacement of

[78] "Action Plan for the Protection and Management of the Marine and Coastal Environment of the South Asian Seas, Region," http://www.sacep.org/pdf/SAS%20Action%20Plan.pdf
[79] Gaurav Rajen, op cit.
[80] Bhabha Atomic Research Centre, *RCA Annual Report, 1998*, http://www.barc.ernet.in/webpages/rca_india/annual_report.html.
[81] "Convention on the Liability of Operators of Nuclear Ships," http://iea.uoregon.edu/pages/view_treaty.php?t=1962-LiabilityOperatorsNuclearShips.EN.txt&par=view_treaty_html

nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and the Ocean Floor and in the Subsoil Thereof (Seabed Treaty)[82] on July 20, 1973.

The second, and an evolving element in South Asian nuclear weapons discourse, is the spread of sophisticated dual-capable cruise and short-range missiles. Ballistic missiles and nuclear weapons do indeed remain a great concern, but they are not the only issue that South Asia is experiencing. Given the specificities of South Asian security architecture, the presence of cruise missiles, along with ballistic missiles, emerging triads, and missile defences makes the environment more complex. Having the ability to carry nuclear, chemical, and biological payloads, cruise missiles (with prior-notification of their flight tests) should be treated the same way ballistic missiles are treated in South Asian regional security architecture. To date, these delivery systems are not included in any CBMs between India and Pakistan, even though Pakistan made a proposal in this regard a few years ago.

Moreover, the changing calculus of nuclear deterrence caused by the improving accuracy and diversification of missile delivery systems in South Asia, and the increasingly blurred line between nuclear and conventional forces has made the regional security situation precarious. Therefore, a critical assessment of nuclear stability in the context of short-range, nuclear-capable systems, cruise missiles, sea-based nuclear forces, MIRVs, and missile defenses is particularly noteworthy. It is to examine if there are any tactical, strategic, or logical reasons as to why India and Pakistan cannot come together to agree upon a CBM addressing these threats. Of course, China is a major factor in India's nuclear and military strategy. Therefore, any dialogue with Pakistan in these respects has to accommodate India's concerns with China.

[82] "Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-bed and the Ocean Floor and in the Subsoil Thereof (Seabed Treaty)," http://www.un-documents.net/seabed.htm

7. SUMMARY OF RECOMMENDATIONS

Declaratory guidelines alone do not suffice to prevent, respond, and mitigate the risks. Implementation of the agreed upon rules, in addition to putting in place necessary infrastructure beforehand, is essential as a disaster does not occur with prior notice. Therefore, both countries must realize the drawbacks of not taking the initiative to the next level. This study has suggested a few steps in the form of an overarching framework which are summarized below.

1. Establish a targeted Track 2 initiative involving scholars, experts, think tanks, journalists, environmentalists, scientists, government officials (serving, if possible, and retired) in their private capacity, and students from both sides to discuss the imperatives of carrying forward the Agreement and suggesting modalities to move forward.

2. Initiate a collaborative study on nuclear weapons-related incidents and safety-security aspects, initially focusing on the accidents that happened in other countries to draw lessons from, and develop a common understanding of the matter.

3. Nominate respective centers of excellence for possible collaboration and joint studies. India's Bhabha Atomic Research Centre (BARC) of the DAE and Pakistan's National Nuclear Security Emergency Coordination Centre (NRECC) of the PNRA would be the ideal candidates.

4. Create a collaborative framework for a nuclear information management (NIM) system, shaped according to their respective national characteristics and sensitivities to address misperceptions and misunderstandings while promoting openness on nuclear issues.

5. Set up of working groups to examine and discuss issues like specialized communication links, types of technical information required, schedules of interaction, and a composition of nodal agencies to act upon the information received.

6. Conduct joint studies on the atmospheric dispersion modeling and probabilistic consequence analysis of the plume and wind pattern for effective management of any emergency response. In this regard, study of models of countries like the US, France, the UK, or Germany is advised. Both India and Pakistan may approach the US through formal, trilateral understanding or through IAEA, to be observers in the nuclear weapons accident emergency response exercises.

7. Strengthen medical response capabilities of both countries through a collaborative approach and adoption of global best practices. Periodic training programs can be arranged between medical and paramedical officials of both countries– bilaterally or in collaboration with advanced countries.

8. Initiate a dialogue on sea-related radiation issues and possibly sharing of data on environmental release and effluent from coastal nuclear reactors. Also to initiate a

dialogue to explore options for bilateral cooperation in the areas of cruise and short-range missile as well as missile defences, subject to each other's comfort level.

9. Undertake follow-on joint studies on all of these areas to work out in greater details.

8. CONCLUSION

Constrained by secrecy and unavailability of information, an attempt is made to analyze the South Asian nuclear weapons discourse and their safety-security management. A number of CBM proposals are also borrowed from various writings and assimilated into this framework. Some of the proposals may not sound feasible and acceptable to both countries for various reasons; however, the intention is to identify potential areas for cooperation to promote the Agreement.

This study acknowledges that more comprehensive joint studies need to be performed on all of these issue areas before any actual development can take place. It is therefore recommended that follow-on studies be initiated to work out in greater details. In the meantime, bringing all these issues to the both governments' notice and targeting public debate on all these issues needs to be initiated in both countries by engaging the media, scholars, and academia. This report, as a precursor, aims to generate opinions and sustained debate in this direction.

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APPENDIX 1: Agreement Text

Indo-Pak Agreement on Reducing Risk from Accidents Relating to Nuclear Weapons

The Government of Islamic Republic of Pakistan and the Government of Republic of India, hereinafter referred to as the Parties:

Recalling the Memorandum of Understanding signed at Lahore on 21 February 1999 between the two countries;
Recognizing that both Parties have national measures including Command and Control structures to guard against accidents related to nuclear weapons;
Recognizing that the nuclear dimension of the security environment of the two countries adds to their responsibility for avoidance of conflict between the two countries;
Committed to the objective of global and non-discriminatory nuclear disarmament;
Conscious of the need for adopting measures aimed at promoting a stable environment of peace and security between the two countries; Have agreed as follows:

Article 1
Each Party shall maintain and improve, as it deems necessary, existing national measures including organizational and technical arrangements, to guard against accidents related to nuclear weapons under its control.

Article 2
The Parties shall notify each other immediately in the event of any accident relating to nuclear weapons, under their respective jurisdiction or control, which could create the risk of a radioactive fallout, with adverse consequences for both sides, or create the risk of an outbreak of a nuclear war between the two countries. In the event of such an accident the Party within whose jurisdiction or control the accident has taken place will immediately take necessary measures to minimize the radiological consequences of such an accident.

The obligation of a Party to notify shall be in respect of only such accidents which may result in an international transboundary release that could be of radiological safety significance or have security implication for the other Party.

Article 3
In the event of occurrence of an accident of the type referred to in Article-2 of this Agreement:
(i) Each Party shall act in such a manner as to reduce the possibilities of its actions being misinterpreted by the other Party;
(ii) In case of likely impact of the accident on the other party, the first Party shall inform the other Party forthwith with relevant information.

Article 4
The Parties shall make use of the hotline links between the two Foreign Secretaries and DGMOs or any other appropriate communication link as mutually agreed upon between their Governments for transmission of, or request for, urgent information in situations relating to the implementation of this Agreement. The Parties may also make use of any other communication channels, including diplomatic channels depending upon the urgency of the situation.

Article 5
Information obtained by a Party pursuant to this Agreement shall not be disclosed to a third Party without the prior consent of the other Party except where it concerns environment, public health or safety.

Article 6
This Agreement shall not affect the rights and obligations of the Parties under existing international agreements to which they are a Party.

Article 7
The Parties may hold consultations, as mutually agreed upon, to review the implementation of the provisions of this Agreement as well as to consider possible amendments aimed at furthering the objectives of this Agreement. Amendments shall enter into force in accordance with procedures that shall be agreed upon.

Article 8
This Agreement shall remain in force for a period of five years. Upon agreement by the Parties, the Agreement may be extended for successive periods of five years at a time. A Party may withdraw from this Agreement by giving six months written notice to the other indicating its intention to terminate the Agreement.

In witness whereof the undersigned being duly authorized thereto by their respective Governments, have signed this Agreement.

Done at New Delhi on …….. in two originals, in English language, each text being equally authentic.

K.C. Singh
Additional Foreign Secretary
For Government of the
Republic of India

Tariq Osman Hyder
Additional Foreign Secretary
For Government of the
Islamic Republic of Pakistan

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