

Chapter 2

The Development of Institutions and Liability Laws Relating to Nuclear Energy

Abstract Nuclear energy development and the laws relating to liability and compensation have had an eventful history, which continues even today. Historically, nuclear energy development was initiated as a military programme, and once the war ended, efforts were made to use this energy source for civilian applications. Today, world over, institutions have been established to control and propagate the use of civilian nuclear energy in line with internationally accepted rules. Over the years, however, the memory of atomic bombings in Japan, accident at Three Mile Island, Chernobyl and recently as Fukushima has left the public with a deep suspicion of the civilian use of nuclear energy. Laws relating to liability and compensation in case of accident became the foundation to take the program forward. In order to create a universal liability regime, regional Paris Convention and international Vienna Convention formed the template. Many countries followed these conventions based on geographies with varying degrees of adherence, while several countries remained outside the regime. It appears that even after many decades of the Chernobyl transboundary nuclear accident and the recent Fukushima accident, a universal regime is far from being realised.

Keywords International atomic energy agency • Nuclear energy and technology transfer • Bilateral agreement on nuclear energy • Nuclear risk studies • Military to civilian nuclear program • Development of nuclear liability regime • OECD and United States nuclear liability law

2.1 Introduction

The development of nuclear energy for peaceful purposes has its history in military applications. In the aftermath of the horrific bombings of cities in Japan in 1945, the World community, primarily led by the United States (US) and the

Soviet Union (USSR), insisted on regulating nuclear technology, convinced that such regulations should not hamper the progress in peaceful applications. Countries saw the enormous potential of nuclear technology in its civilian use, particularly in nuclear power programs.

With the end of the war, efforts were redirected to produce civilian applications for nuclear technology (Green 1973). Governments actively pursued domestic nuclear energy programs and also entered into bilateral agreements for transfer of technology. Initially however, such transfer of technology was limited to war-time allies. Many countries outside the military alliance sought technology for their power programs in the hope that this would give them unlimited source of power and would enable them to economically progress faster (Fischer 1997). This global interest called for the creation of an international institution at the United Nations (UN), tasked with regulating the security and safety of nuclear technology. In subsequent years, international community established the UN Atomic Energy Commission (UNAEC) in 1946 and later in 1957 International Atomic Energy Agency (IAEA) came into existence.

Pursuing civilian programs also meant setting up of adequate mechanisms for tackling the consequences of an accident. The impact could lie within the country or be transboundary in nature. The problems of civil liability for nuclear damage became one of the most contested issues. Knowing well that nuclear activities are more hazardous than conventional industrial activities, the need for a specific legal regime for nuclear damage was felt (Schwartz 2006). It was argued that this would ensure that countries could provide prompt and adequate compensation for nuclear damage without exposing the infant nuclear industry to excessive burdens (IAEA 1997).

In 1986, the Chernobyl accident in former USSR revealed the extent of damage that can be caused by a nuclear accident. Radiation transgressed national boundaries and caused harm on an international scale (IAEA 2006). Much before Chernobyl, other nuclear accidents, 1957 Windscale in the United Kingdom (UK) and 1974 Three Mile Island in the United States had also occurred. But the damage from both Windscale and Three Mile Island was limited to reactor surroundings and there were no transnational implications. The Chernobyl accident shook the international community; subsequently major reforms were undertaken to strengthen the international nuclear liability regime. Unfortunately, it took another accident; the 2011 Fukushima nuclear accident in Japan, to reinforce the importance of a universal regime which is in harmony within the wider regions of the world.

This chapter briefly describes the historical facts relating to the development of nuclear technology. This is followed by a discussion on the civilian applications and consequent development of liability regimes. The special legal regime sought and enacted; and post-Chernobyl modernization attempts are dealt in detail. The chapter concludes with an analysis of these conventions in order to grasp the difficulty in achieving a global nuclear liability law.

2.2 Institutional Control of Nuclear Energy: Creation of the UN Atomic Energy Commission

In July 1945, the US tested its first atomic bomb in Los Alamos, New Mexico. The test came nearly 3 years after Enrico Fermi's effort of achieving controlled nuclear chain reaction (US DOE 2006). Soon after, in August, the US atomic bombing of Hiroshima (6 August 1945) and Nagasaki (9 August 1945) in Japan showed the destructive power of nuclear energy, and the consequences of human exposure to nuclear radiation. It may be remembered that the action of bombing Japan took place within weeks of signing the Charter of the UN on 26 June 1945 in San Francisco (UN Charter 1945). With the war ending, and knowing well that the US may no more hold monopoly in nuclear science, efforts were directed towards controlling the spread of nuclear weapons (Green 1973). At the same time, attention was also focused on the peaceful application of nuclear energy. The newly formed United Nations was drawn into this effort.

UN became the focal point for nuclear issues and concerns. It was believed, as the subject is contentious, that the involvement of all the five permanent members of the Security Council and others at a multi-lateral institutional level was necessary (Fischer 1997). In 1945, there had been extensive consultations, in particular, between the US, the UK, Canada and later with the USSR on "the need in an effort to reach agreement on the conditions under which international co-operation might replace rivalry in the field of atomic power" (Bathurst 1947). In November 1945 at a multilateral summit in Washington; US, UK and Canada issued a declaration that, "in order to attain the most effective means of eliminating entirely the use of atomic energy for destructive purposes and promoting its widest use for industrial-and humanitarian purposes, a commission should be set up at the earliest practicable date, under the UN, to prepare recommendations for submission to that Organization" (Bathurst 1947).

On 27 December 1945, at a meeting of Council of Foreign Ministers held in Moscow, the creation of the United Nations Atomic Energy Commission (UNAEC) was proposed by the US and UK, and agreed to by USSR with veto conditions. On 24 January 1946, in its first Session, the UN General Assembly created the UNAEC (UN Resolution 1946). The Commission was entrusted to proceed "with the utmost despatch" and towards an effort "to consider problems arising from the discovery of atomic energy and related matters" (Fischer 1997). The terms of reference were:

- The exchange of basic scientific information for peaceful use between all nations;
- The control of atomic energy to the extent necessary to ensure its use only for peaceful purposes;
- The elimination of national armaments adaptable for mass destruction, atomic or other;
- Effective safeguards by inspection or other means to protect against the hazards of violation or evasion.

However, though well intended in its efforts in establishing an international oversight on use of atomic energy, the working of the UNAEC had been contentious. The US presented the Baruch Plan in March 1946 and the USSR presented the Gromyko Plan in June 1946; both the proposals had different visions on the structure and mission of the UNAEC. It is reported that not a single unanimous decision by the Veto powers, particularly the US and the USSR could be achieved (Fischer 1997). While reviewing the ongoing work at the UNAEC, Benoit-Smullyan (1946) summarised that the heart of failure of negotiations on atomic bomb was the ‘distrust’ between the US and the USSR. The work of UNAEC suffered greatly; the Commission discontinued its working even without being discharged by the Security Council (Shils 1948). In September 1949, the USSR conducted its first nuclear weapons test followed by the UK in 1952 (Fischer 1997). The Soviet nuclear test effectively ended the UNAEC’s role, and in 1952 the UN General Assembly formally dissolved the UNAEC. A view may be taken that the entire negotiating exercise was undertaken superficially with no intent to broke a conclusive deal, but only to show deliberation as a cover for building their nuclear capabilities. The lack of any international institutional space for deliberation after the dissolution of the UNAEC led each country to pursue its own strategy on nuclear energy.

In the meanwhile, an important step towards peaceful uses of nuclear energy—the production of electricity from atomic energy became successful. In 1951, electricity generation was successful (100 kilowatts (KW) of electricity) from an Experimental Breeder Reactor (EBR-I) at the National Reactor Testing Station in Idaho, the US (Michal 2001). Even before this success, after the Second World War with the intent to institutionalise the nuclear energy program, the US government enacted the Atomic Energy Act on 1 August, 1946 (US AE Act 1946).

One of the major aims of the law was to harness the use of atomic energy for peaceful purposes. The US AE Act created the United States Atomic Energy Commission (USAEC) as a civilian controlled authority. Consequent to the establishment of the USAEC, the complete Manhattan Project office and its related facilities and files were transferred to the USAEC (Buck 1983). Acknowledging the importance of civilian applications, the US Congress while enacting the US AE Act stated that “atomic energy should be employed not only in the Nation’s defense, but also to promote world peace, improve public welfare, and strengthen free competition in private enterprise” (Buck 1983). However, the US AE Act retained complete government control, albeit with exceptions, of the nuclear materials—its production, research and use.

Meanwhile in USSR, the 1940s and 1950s witnessed considerable effort in developing nuclear technology (both for military and civilian purposes) with the aim to reach the same capability as the US (Nordykea 1998). The Institute of Physics and Power Engineering was set up in May 1946 at the then-closed city of Obninsk, 100 km southwest of Moscow, to develop nuclear power technology. Obninsk became one of the nerve centres of the Soviet nuclear energy program and became famous on 27 June 1954 with the world’s first nuclear power station at Obninsk with a capacity of 5 MW, being connected to the Moscow grid

(Petros'yants 1984). Morokhov concludes that invaluable lessons had been drawn from the Obninsk reactor (IAEA 1968). According to him, the learnings were, “(a) Transformation of nuclear energy to electricity was proved to be practical, (b) Atomic power was sufficiently reliable and flexible in operation and fulfilled the requirements for utilization in an electrical network and (c) It was completely safe both for personnel in the plant as well as the surrounding population” (IAEA 1968).

Remarkably, in the Asian context, India was leading the efforts on nuclear energy. The history of India's nuclear quest is fascinating. As early as 1944, Homi Bhabha the founder of the Indian nuclear program proposed creation of Tata Institute of Fundamental Research (TIFR) (Chidambaram 2006). With the establishment of TIFR in the year 1945, India launched into research in nuclear technology and science. On 15 April 1948, the government enacted the Atomic Energy Act and established the Atomic Energy Commission of India. Chengappa (2000) says that Prime Minister Jawaharlal Nehru, stating his vision on the nuclear energy program, observed, “We must develop this atomic energy quite apart from war—indeed I think we must develop it for the purpose of using it for peaceful purposes...of course, if we are compelled as a nation to use it for other purposes, possibly no pious sentiments of any of us will stop the nation from using it that way”. India immediately launched its nuclear energy program on a full scale.

In 1955, India began construction of a 1 MW research reactor with British assistance. In 1957, the first nuclear reactor in Asia—Apsara was dedicated to the nation (Chidambaram 2006). Sethna (1979) states that British assistance was limited to supply of fuel elements. The reactor and all the equipments were designed and built by Indians. Within a year, i.e. 1955 India was negotiating with Canada for 40 MW reactors. Under the “Atoms for Peace” program, the US supplied heavy water and the reactor was named the ‘Canada-India Reactor, the US’ otherwise called as CIRUS (Hunt 1977). CIRUS became operational in 1960. Pakistan, the only other country in South Asia also reached a bilateral agreement with Canada, which is discussed below.

As several countries were acquiring nuclear capability, Epstein (1977) observes “the incentives and disincentives for countries in going nuclear vary between a combination of military, political, and economic concerns and motivations at particular period in time”. The World community was concerned about the consequences of the proliferation of the technology. The technology has dual applications—military and peaceful. On 8 December 1953, “Atoms for Peace” speech by the US President Eisenhower before the UN General Assembly called for the governments, principally involved in making joint contributions, to set up an IAEA under the UN (IAEA Transcript 1953). Eisenhower spoke on the peaceful use of the proposed atomic energy agency:

The more important responsibility of this Atomic Energy Agency would be to devise methods whereby this fissionable material would be allocated to serve the peaceful pursuits of mankind. Experts would be mobilized to apply atomic energy to the needs of agriculture, medicine and other peaceful activities. A special purpose would be to provide abundant electrical energy in the power-starved areas of the world.

The US by walking the talk at the UN, in 1954, provided a legal basis for 'Atoms for Peace' by amending its Atomic Energy Act, 1946. This led to a series of international nuclear cooperation, concluding as bilateral agreements with a number of States (Fischer 1997). The amended Atomic Energy Act, 1954 (US AE Act 1954) drastically altered the policy, thereby facilitating participation of private enterprises in the development of atomic energy (Sect. 3, Atomic Energy Act 1954).

2.2.1 Military to Civilian Programs: Creation of International Atomic Energy Agency

Atoms for Peace program gave a foundation to collaborate, and thereby transfer the technology for peaceful applications. In parallel, efforts to establish IAEA envisaged in the 'Atoms for Peace' program also gathered pace. The UN General Assembly in its plenary session, in December 1954, unanimously adopted a resolution for the establishment of the IAEA, and for the convening of an international technical conference of governments under the auspices of the UN (IAEA 1964).

The *International Conference on the Peaceful Uses of Atomic Energy* was convened under the auspices of the UN in Geneva, in August 1955. The event was a landmark inter-governmental conference, held to illuminate to the world the progress in nuclear science and technology, and it also demonstrated that the generation of electricity was possible (Krige 2006). The President of the Conference, Homi Bhabha, in the context of future scientific and technological progress envisioned that, "during the next two decades scientists would have found a way of liberating [thermonuclear] fusion energy in a controlled manner... When that happens the energy problems of the world will truly have been solved forever..." (Fischer 1997).

For the international institutional initiative, the success of the international conference took the negotiations in establishing IAEA to a level of urgency. From 1955 to 1957, after a series of negotiations, 12 governmental representatives from Australia, Belgium, Brazil, Canada, Czechoslovakia France, India, Portugal, South Africa, the UK, the US and the USSR concluded the drafting of the IAEA Statute (Fischer 1997). India has been a member of the Board of Governors of the IAEA since its inception. Chidambaram (2006) says that the Indian contribution during the negotiations was in the structuring of the IAEA Governing Board. He explains "the Indian delegation came up with a complex but ingenious formula for determining the composition of the IAEA Board of Governors". The Statute of the IAEA was approved on 23 October 1956 by the Conference on the Statute of the IAEA, which was held at the Headquarters of the UN. It came into force on 29 July 1957. The establishment of IAEA was with a twofold purpose: to promote

the peaceful uses of atomic energy, and to ensure, so far as it is able, that such uses do not further any military purpose (Willrich 1965). The main functions that the IAEA was to perform are (Article III, IAEA Statute):

1. Take any action needed to promote research on, development of, and practical applications of nuclear energy for peaceful purposes (Article III.A.1);
2. Provide materials, services, equipment and facilities for such research and development, and for practical applications of atomic energy “with due consideration for the needs of the under-developed areas of the world” (Article III.A.2);
3. Foster the exchange of scientific and technical information (Article III.A.3);
4. Encourage the exchange of training of scientists and experts in the field of peaceful uses of atomic energy (Article III.A.4);
5. Establish and apply safeguards to ensure that any nuclear assistance or supplies with which the IAEA was associated should not be used to further any military purposes—and apply such safeguards, if so requested, to any bilateral or multilateral arrangement (Article III.A.5);
6. Establish or adopt nuclear safety standards (Article III.A.6);
7. Acquire or establish any facilities, plant, and equipment useful in carrying out its authorised functions (Article III.A.7).

Bechhoefer and Stein (1957) summarises the core functions of the IAEA into two: “positive function and negative function”. With the positive function being to “seeks to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world” and the negative function “insuring, so far as it is able, that assistance provided by it or at its request or under its supervision or control, is not used in such a way as to further any military purpose.” In order to carry forward the vision, i.e. expanding peaceful applications of nuclear programs around the world and securing its safety, the immediate tasks of IAEA were to frame rules of safeguards.

Importantly for the purpose of this study, countries, having known the destructive power of nuclear energy from the nuclear bombings in Japan, were becoming concerned about the liability and the accepted definitions of liability arising from an accident in a civilian nuclear reactor. They argued that without a clear understanding of the State responsibility on nuclear liability, growth of the atomic energy industry remains in doubt.

2.3 Nuclear Energy Cooperation: Questions of Liability

In order to achieve the vision envisaged in the ‘Atoms for Peace’ program, i.e. advancing international cooperation; bilateral agreements were negotiated by technology supplier countries with friendly countries (Mallison 1957). There were numerous complex problems that arose while negotiating these agreements. One such complex issue is the State responsibility and its liability.

Any nuclear operation involves use of radioactive materials. Radioactive materials are hazardous in nature and require careful management. The most significant radioactive hazards come from a catastrophic reactor accident. Even though Edwards (1957) considers such a possibility extremely rare, but “given the worst possible combinations of circumstances that might conceivably occur—combinations of mechanical and human failure and error and weather conditions—there exists the possibility of a catastrophic incident causing personal injury and property damage of unprecedented magnitude”. The nuclear bombings in Japan set the context of what constitutes risk in the event of a nuclear disaster.

2.3.1 *Technical Studies on Hypothetical Nuclear Accidents*

In order to develop nuclear energy on a commercial scale, by 1950s it became necessary to establish the scale of a probable accident, and to determine the amount of liability insurance that would be required to cover the cost of an accident. In March 1957, as a first attempt to estimate the possible consequences of an accident—the US Atomic Energy Commission (USAEC) published its risk assessment study titled *Theoretical Possibilities and Consequences of Major Accidents in Large Nuclear Power Plants: A Study of Possible Consequences of Certain Assumed Accidents, Theoretically Possible but Highly Improbable, were to Occur in Large Nuclear Power Plants*—commonly called Brookhaven Report or WASH-740 (USAEC 1957).

The Brookhaven study hypothetically analysed the extent of damages from a 500 MW reactor located about 50 km away from a city of 1,000,000 population. The results showed that the accident could cause deaths and injuries upto 3400 and 43,000 people, and also \$7 billion as property damages. The predicted results varied widely, depending upon which set of assumptions was used (Otway 1974). At the same time, the report made it clear, that such a probability of an accident is extremely rare (USAEC WASH-740 1957). Almost in parallel to WASH 740, another study *Report on the possible effects on the surrounding population of an assumed release of fission products into the atmosphere from a 300 MW Enrico Fermi plant located at Lagoona beach, Michigan* were undertaken (USAEC APDA-120 1957). According to this report “in case of Enrico Fermi plant experiences a core meltdown and releases 50 % of its fission products, with weather conditions carrying radioactivity to the most heavily populated areas of Detroit, there will be an estimated 133,000 deaths, 181,000 immediate injuries and 245,000 long-term injuries” (USAEC APDA-120 1957 in Fuller 1975).

In 1965, an updated Brookhaven report that took into account the increased size of later-model reactors estimated dramatically higher numbers of 45,000 deaths and 100,000 injuries, and \$17–\$280 billion in property damage and long-term contamination of an area to the size of Pennsylvania (Anderson 1978). Anderson (1978) states that the updates were kept confidential and it was only after a threat through a Freedom of Information suit that the working documents of the 1965 the updates of WASH-740 were released. This report triggered considerable public concern about

the safety of nuclear energy. It was said, *though the report was intended to calm fears by showing the rarity of such accidents, in reality, it created more alarm and distrust toward nuclear energy* (Nadar and Abbots 1979).

In 1974, the US Nuclear Regulatory Commission (USNRC) replaced the 1957 Brookhaven Report with a more rigorous study called “Reactor Safety Study” (Known as the Rasmussen Report or WASH 1400) (USNRC 1975). However, the Rasmussen Report has been controversial due to its reliability (US Congress 1984). In 1990, the USNRC published, “Severe Accident Risks: An Assessment for Five US Nuclear Power Plants”—NUREG-1150 (USNRC 1990). NUREG 1150 replaced all the earlier WASH 1957 and WASH 1975 reports (USNRC 1990).

These reports triggered a panic reaction from both the public as well the private industries. Knowing well the probable consequences would be far reaching on human health, environment and economic as witnessed in the Atomic Bombings in Japan, nuclear technology countries ring-fenced themselves while entering into a range of agreements for technology transfer. The concerns arose from both the liability arising from the technology supplied and also from transboundary consequences in the aftermath of a nuclear accident. Importantly, countries began to worry about State liability and its extent in the event of a possible atomic reactor accident abroad.

2.3.2 Continuing International Cooperation

However, internationally, the worry of State liability *per se* did not deter Canada, the US, the UK and the USSR from entering into bilateral agreements with a host of countries that sought nuclear energy for peaceful applications, particularly for electricity. Willrich (1965) states that in the initial years of the IAEA, since the US was unsuccessful in negotiating an international approach to technology transfer, it decided to proceed on a bilateral basis. The USSR also similarly entered into agreements with many countries. As of today, the US has 26 agreements in force for peaceful nuclear cooperation (EURATOM is being considered as a single agreement, consisting of 27 European countries) (US Government Accountability Office 2010). The USSR also had bilateral agreements with countries including Bangladesh, China, Egypt, Poland, Romania, India, Germany, Czech Republic, South Africa and others (Ginsburgs 1960). Canada, the UK and others also followed similar approach. It was under these bilateral agreements, especially in the initial years, that many nuclear ‘have-nots’ including countries in South Asia initiated their nuclear research program.

In the case of South Asian countries, India, Pakistan and Bangladesh benefited from these bilateral collaborations. Under the aegis of the ‘Colombo Plan’; Canada provided research reactor technology and the US became the heavy water supplier for India (Canada–India CIRUS agreement 1956). The Colombo Plan was conceived as a technical assistance program for South Asian countries, with Canada supplying technical and scientific assistance and training the Indian staff

(Hunt 1977). Atomic Energy of Canada Ltd. (AECL), according to Hunt described the project as ‘perhaps the largest single contribution any country has yet made’ in the international atomic energy field. In 1959, Canada also entered into agreement with Pakistan for peaceful application of nuclear energy. In the following years, both India and Pakistan took lead, and entered into several bilateral agreements with the US, the UK, France and the USSR, and also enhanced their relationship with Canada. This international cooperation came to an end, for both India and Pakistan, after India tested its nuclear device in 1974.

Recently, Bangladesh and Sri Lanka have been engaged with IAEA and technology providers to initiate nuclear energy programs through bilateral agreements (See Chap. 4).

The development of the nuclear industry and its consolidation started during the pre-world war phase and was primarily intended for military purposes. The technology was such, that many allied countries collaborated with each other on science, technology, fuel, etc., for making the atomic bomb—the *Manhattan Project*. Similarly the USSR, through a network of communist states developed its competence. These relationships reflected the military alliances from the Second World War. The peaceful application, the energy programme was conceived from the military projects. As the civilian projects involved technology, equipments, fuels, expertise from various countries; industry structures became complex. This complexity became a factor in determining the consequences, to whom and to what extent one country is responsible on account of a nuclear accident in another country. Since a bilateral agreement is between two States; the nuclear technology supplier State was reluctant to singularly take on all the burden of the ‘State responsibility and liability’.

2.3.3 *Bilateral Liability Provisions and Transboundary Liability Concerns*

It is clear that the importance of liability concerns was mainly dictated by one of the beneficiaries of the US bilateral agreements—the private industry. The US, through these bilateral agreements, enabled the private industry in the US to undertake an extensive commercial program abroad. Much before the establishment of the IAEA there were concerns on the operational realities of a nuclear power plant. Green (1973) observes that in the US, “the initial rush of enterprises (private) to get into nuclear energy where thwarted by hard economic and operational realities, i.e. profitability and liability”. With the amendment of the US AE Act 1954, the industry was thrown open for private sector. The infant private sector was apprehensive of the insurability of nuclear business from unknown consequences, which may give rise to large liability claims (Meehan 2012). An interesting study by the Harvard Law School and Atomic Industrial Forum—*A Forum Report: International Problems of Financial Protection Against Nuclear Risks* in 1959 brought out the possible liability on American nuclear exporters with other contracting States (Cavers 1964).

In order to avoid being subjected to liability claims, Hardy (1961) in his comments on the US treaty with Germany and Euratom, states that “a number of the treaties that provide enriched fuels and power reactors also contain ‘hold harmless’ clauses for exonerating the US Government from possible liability”. This was a conscious decision taken by the nuclear technology providers, for exempting themselves from possible host-country domestic law or litigation, in respect of liability and compensation. The UK, Canada and others also entered into bilateral agreements, but were fewer compared to the US and the USSR. It is unclear from the literature review whether such exclusionary clauses were also utilised by the USSR in bilateral agreements. A detailed study of the USSR bilateral agreements by Ginsburgs (1960) does not bring out any of the US-type hold harmless clauses, but suggests that USSR was more liberal in terms of providing technology.

The issue of transboundary liability and state responsibility became important once many countries in Europe initiated their own nuclear power programs. Europe, unlike the US or Canada, is a closely knit constellation of States bordering one another. An accident in one country is bound to have its consequential effect in other countries. Realising the problem of transboundary nuclear damage, Organization for European Economic Cooperation (OEEC)—an organisation established in 1948 for post-war reconstruction efforts; as early as in 1957, established a Working Group on Harmonization of Legislation to examine third-party liability for damage caused by the peaceful use of nuclear energy (Marcus 2008). International cooperation and standard settings became imperative due to the nature of the nuclear energy industry. Freeman (1960) rightly puts it “The concern is universal not merely because atomic energy will permeate-if it has not already done so-every facet of human endeavor, but also because the nuclear genie presents problems and risks which cannot and will not be solved satisfactorily on a purely national or local level. Both because of these risks and the resources required, the need for co-operative action, whether on a regional or a worldwide basis, is probably more insistent here than in other sectors of commerce and industry”. Transboundary liability is one of the most contested issues and also one where there has been major international cooperation.

2.4 Specific Legislative Response on Nuclear Liability

From the early days of development of nuclear energy, it was recognised that sufficient protection must be accorded to the public against the probable risks arising from nuclear energy production. Equally significant is the risk borne by the nuclear industry—unresolved insurance and possible massive litigation for claims on account of an accident.

In many jurisdictions, tort rules govern liabilities arising from hazardous activity. These tort rules require proof of fault and causation. Additionally, any entity or person and any number of them can be held liable under the traditional tort law. Moreover, tort law is enforced by the courts, thus making the compensation

unpredictable and unlimited. Radetzki (1999) argues, “traditional tort liability compensation pre-supposes not only that a certain act caused harm, but also that the harm is due to fault”. These rules can be applied to nuclear liability as well. However, as discussed above, the nuclear technology development had been unique, and represents the efforts of a large number of entities and countries. Here pinning fault to any single person is almost impossible (IAEA 1997). As an example of the multinational nature of nuclear industry Raju and Ramana (2010) examined the status of Westinghouse as “Westinghouse was purchased by British Nuclear Fuels in 1998, which then sold it to Japan’s Toshiba in 2006. In 2007, Toshiba sold 10 % of the company to Kazatomprom, the national uranium company for the Republic of Kazakhstan. Besides these, the Shaw group, based in Louisiana, US, owns 20 % of the company and the Japanese IHI Corporation a 3 % share”. Owing to such an industry structure, in the nuclear accident scenario, the victims would find it difficult to establish fault of an entity, which could then be held liable. In case fault is established, the victims may have to ensure jurisdictional competence of the national courts (Schwartz 2006). It was thought desirable that a special regime was necessary—large and prompt compensation for the victims without any technicalities of tort, and full protection for industry through liability backed by insurance and governments. This initiative led to the development of the unique principles of nuclear liability law. Channelling the liability exclusively to the operator; absolute liability of the operator; exclusive jurisdiction to one national court of the Installation State; financial certainty of the liability, and liability limited in time and amount. Through this way, uniformity and harmonisation was sought and imposed.

Nuclear liability regime embarked upon a fundamentally different route on questions of the State liability for acts not prohibited by international law. On the question of international tort law for transboundary environmental damage, Sachs (2008) says, despite many decades of attempts, the international community could not facilitate tort remedies for victims of transboundary environmental damage. She concludes, though many civil liability treaties were concluded, only a few have entered into force, others continue to be “un-adopted orphans in international environmental law”. The work by International Law Commission on ‘International liability for injurious consequences arising out of acts not prohibited by international law’ reveals the difficulty faced in attempting to codify laws on State liability (Brownlie 2008). Boyle (2005), in the context of sectoral agreements, states that nuclear energy liability conventions represent an alternative approach to transboundary liability. Countries enacted national legislation based on these unique principles, but with varying degrees based on national interests.

2.4.1 The United States Domestic Law

The 1957 Brookhaven report and the Enrico plant report—USAEC APDA-120 led to a popular belief that the development of nuclear power programs would

be financially unviable. The Brookhaven report projected a worst case scenario, which assumed that 100 % of the core went airborne and drifted over Manhattan (Loewen 2011). In order to convince both the public and the industry, in 1957, the US Government through the enactment of the *Price-Anderson Nuclear Industries Indemnity Act 1957* (Price-Anderson Act) provided a legislative backing to nuclear industry to go ahead with the plans of power development. The Price-Anderson Act capped the cost of damages of a nuclear accident.

In drafting the indemnity plan, the US Congress through the original Price Anderson Act, 1974 established a two-tier insurance system. The primary layer required the operator to obtain insurance coverage of \$60 million, with the secondary layer was provided by the government—amounting to \$500 million. It has been argued that the US nuclear industry greatly benefited from having such a large provision of public fund for compensation (Faure and Vanden Borre 2008). Meehan (2012) quoting from hearings before the Senate Committee on Energy and Natural Resources, [107th Cong. 53, 54 (2001)] summarises, “the Act is essentially an insurance program that encourages private development of nuclear power, establishes a legal framework for handling potential liability claims, and provides a ready source of funds to compensate injured victims of nuclear accidents”. This initial scheme witnessed two amendments in 1982 and 2005. With these amendments, a new scheme, i.e. retroactive premiums (explained below) completely replaced government indemnification with much higher compensation amount. From the two-tier scheme now a three-tier model is in place, the addition being industry-wide pool mechanisms requiring nuclear reactors to collectively contribute to a separate insurance pool.

Thus, under the current system, as the first tier, nuclear power plant owners pay premium for obtaining \$375 million as insurance amount annually to private insurers, for each reactor unit. This is supplemented by a second tier retroactive premiums scheme. The second tier envisages, that if the primary layer is exhausted in the event a nuclear accident, “each licensee is required to provide a share up to \$111.9 million” per reactor to cover costs in retrospective annual premiums (US NRC Fact sheet 2012). With 104 reactors currently licensed to operate, it is calculated that the second tier funds now contains about \$11.6 billion (US NRC Fact sheet US 2012). When the second layer of compensation is also inadequate, the third tier kicks in—additional relief as determined by the US Congress. Such an elaborate public and private scheme is the uniqueness of US liability system. However, the Act has also been criticised by many. Green (1973) puts it very effectively that,

The Price-Anderson is a technical measure necessary for adequate protection of the public interest with respect to a technology that exists and will inevitably grow substantially. The fact that the technology exists and grows only because of Price Anderson has been artfully concealed from public view so that consideration of the indemnity legislation would not trigger public debate as to whether nuclear power was needed and whether its risks were acceptable

Nevertheless, the uniqueness of Price Anderson Act lies in two of its mechanisms. The first being the concept of economic channelling and other is the industry insurance pool. US from the very beginning has followed a path of economic

channelling of the liability, meaning, “that any entity may be held legally liable, but the economic consequences of that liability are channelled to the liable nuclear operator. Thus, any person who is held legally liable will be indemnified in respect of that liability” (Schwartz 2006). In essence, the US government has provided economic protection to all the supply contractors of NPPs, by fully exempting them from compensation pay-outs in cases of accident. The American Nuclear Society (2005) considers this a positive development which “by providing omnibus coverage, those who may be harmed are assured of the availability of funds to pay their claims, and firms that contribute in some manner to the design, construction, operation or maintenance of covered licensees are all protected”.

The second important aspect of the Act is the industry insurance pool. Interestingly and unseen on other jurisdictions is the retroactive premiums scheme. Using this mechanism, the US government has effectively curtailed its financial obligation for paying compensation. The nuclear industry itself has been made responsible for arranging a large sum for making the payment at any given time. At hand for disposal is almost a \$12 billion contributed by combined reactors owners operating within US. Thus, through this mechanism there now exists a substantial insurance amount funded by both the insurance and nuclear power industry. This could be a model for others countries. However, in the South Asian context, such a model may not have much relevance as all the NPPs are owned, operated and managed by government or government companies only.

In the initial years, the Price Anderson law had to go through several constitutional, legal and procedural challenges. The constitutional validity of the Act was challenged twice in, *Conservation Society of Southern Vermont v. Atomic Energy Commission* (No. 19-72 D.D.C. Apr. 16, 1975) and *Carolina Environmental Study Group v. Atomic Energy Commission* [438 U.S. 59. 1978]. In both these cases, the court upheld its constitutionality. However, the judgment had been contentious as well. Galiette (1978) was critical of the judgments; summaries his concerns as, “Nuclear power is representative of a new and qualitatively unique class of phenomena-radical technical innovation showing great promise but posing risks which may not be susceptible of reasonable assessment at the time of initial mass application.” The law was first applied subsequent to the Three Mile Island accident in 1974 where compensation was paid.

Almost in parallel and taking cue from the enactment of the Price Anderson Act, several countries sought to legislate, domestically, on the twin issues of nuclear energy, i.e. development of the power program and addressing the liability concerns from a nuclear accident. In Europe this effort was led by OECD.

2.4.2 Organisation for European Economic Co-operation (OEEC)—Regional Efforts

In the aftermath of the Second World War, the Organisation for European Economic Co-operation (OEEC) was reconstituted in 1961 as the Organisation for Economic

Co-operation and Development (OECD). A grouping of the western European countries and the European Atomic Energy Community (Euratom), a grouping of six European Economic Council members, thought energy from nuclear sources could be a possible way to meet massive energy requirements in its re-construction efforts. The European Nuclear Energy Agency (ENEA) was established by a decision of the Council on 17 December 1957, and came into force on 1 February 1958. The ENEA was designed to meet three primary objectives, they are: (1) the establishment of joint research projects; (2) the solution of specific legal problems related to nuclear energy through the harmonisation of national laws or the adoption of regional conventions and (3) the provision of a forum in which the national nuclear energy programs of its member countries could be discussed and coordinated. With the membership of Japan, ENEA's name was changed in 1972 to the Nuclear Energy Agency (NEA), to reflect its growing membership beyond Europe's boundaries.

One amongst the first tasks under the OEEC was addressing a harmonised third-party liability for nuclear activities (Marcus 2008). Interestingly, even before the establishment of the specialised ENEA, the OEEC anticipated the issue of civil liability from nuclear energy accident and established committees in 1957 for nuclear liability and radiation protection (OECD-NEA 2008). The liability committee in the subsequent years evolved into the Group of Governmental Experts on Third Party Liability in the Field of Nuclear Energy¹. This group became instrumental in drafting the *Paris Convention on Third Party Liability in the Field of Nuclear Energy* (Paris Convention) which was adopted by the OEEC Council on July 29, 1960, and it covers most of the West-European countries (OECD-NEA 2008). The Paris Convention entered into force on 1 April 1968 with 16 Contracting Parties. The Paris Convention thus became the first international instrument that established the rules of distribution of responsibility between countries, and ensuring compensation for damage caused by nuclear activities.

After the 1960 Paris Convention was adopted, it was recognised that the compensation amount that was provided for was too low. It is argued, “while governments at the time may not have envisaged a ‘Chernobyl type’ accident, they were very much aware that in the case of a nuclear catastrophe involving a large-scale emission of ionising radiation, hundreds or even thousands of people could suffer radiation-related illness, incur damage to their property and suffer various other forms of economic loss” (Schwartz 2006). In order to increase the financial coverage of the Paris Convention, the OECD countries created an additional finance mechanism to ensure that adequate compensation would be available to the victims of a nuclear accident. *The Convention Supplementary to the Paris Convention of 29 July 1960* (Brussels Convention) adopted in 1963 made the provision for additional or supplementary compensation for nuclear damage made up of ‘public funds’ in addition to the Paris Convention.

¹ A third party is anyone other than the nuclear operator itself and other than a supplier of goods, services or technology for use in connection with a nuclear installation. A third party may be inside or outside the nuclear installation and as such the term includes employees of the operator of the nuclear installation at which an accident occurs (Schwartz 2006).

In the following years, both the Paris Convention and the Brussels Conventions have been further strengthened thrice: by Additional Protocols adopted in 1964, 1982 and 2004. Contracting Parties to both the Paris and the Brussels Conventions have enacted respective domestic legislations which implemented the provisions of the 1960 Paris and the 1963 Brussels Convention.

2.4.3 IAEA Sponsored International Framework

With the adoption of the Paris Convention, internationally, a need was felt for a global liability regime with the aim of harmonising national legislations pertaining to third-party liability for nuclear damage. This was particularly important for two reasons. Firstly, countries were entering into bilateral agreements in faraway places without clear understanding of the rules; secondly, applicability of the Paris Convention was limited to West-European countries.

The international regime was multifaceted in respect to jurisdiction and choice of laws that an accident in one State, may result in claims and suits in many other States, which may end up without providing for compensation (IAEA 1960). The IAEA was convinced on a Convention that “can serve as a basis for harmonized and largely uniform rules regarding civil liability for nuclear hazards. Such a convention should bind not only the States in which nuclear energy is now utilized but also others in which damage may be suffered or where nuclear industry is expected to develop in the future” (IAEA 1960).

In April–May 1963, an international conference approved the *Vienna Convention on Civil Liability for Nuclear Damage*, (Vienna Convention), which was opened for signature on 21 May 1963, and came into force on 12 November 1977. It took 15 years for the Vienna Convention to come into force even though only five states were required to ratify it. The delay has been mainly due to the perceived commonality with the Paris Convention. Major nuclear States had already been committed to the process of the Paris Convention. A detailed analysis of the Vienna Convention is made in the later part of this chapter.

With the adoption of the Vienna Convention, two parallel conventions existed, neither applied to nuclear damage suffered in the territory of a party to the other. Only in the aftermath of the Chernobyl nuclear disaster in 1986, did the world community take concrete steps to reconcile the differences between the Paris and Vienna Conventions and also to strengthen the foundation of nuclear liability principles.

2.5 The Chernobyl Nuclear Disaster and State Liability

A catastrophic consequence from a nuclear power accident came true on 26 April 1986 at Chernobyl, in the former USSR. The radiation exposure caused serious social and economic disruption, covering large populations in Belarus, Russia

and Ukraine (UNSEAR 2008). The world did not know for many months the exact chain of events leading to this disaster (Malone 1987). Literatures point out that the radioactive plume covered much of Europe; even reaching the United Kingdom in the first few days of May 1986 (Woodliffe 1990).

At the time of the Chernobyl incident, two international civil nuclear liability conventions were in force—the 1960 Paris Convention and the 1963 Vienna Convention. The USSR was not a party to either of these Conventions. Unfortunately, the USSR did not notify its neighbours on the occurrence of the accident as well. Chernobyl was classified as Level 7¹² event on the International Nuclear Event Scale by the IAEA—the highest possible classification. The accident fully brought home the picture of the transnational consequences of a nuclear accident—that the geographical scope is not necessarily confined to national boundaries.

Subsequent to the accident, the countries sought in various ways to hold the USSR liable for compensation. At the time of Chernobyl there was no international treaty relating to State liability. However, customary principles of State Responsibility had evolved that could make nations accountable for their actions and two early cases represented this are the *Trail Smelter Arbitration* (1939)³ and *Corfu Chanel Case* (1949).⁴

Wood (2004) states that the Trail Smelter Arbitration is “remembered as the earliest articulation of two core principles of international environmental law: that states have a duty to prevent transboundary environmental harm, and that they have an obligation to pay compensation for the harm they cause”. The Arbitration awarded monetary damages to US for the actions of Canada. In the *Corfu Channel* case, the International Court of Justice (ICJ) found that Albania had an obligation to notify the approaching ships of the dangerous condition on account of mine fields in the area. The court held the Albanian government responsible under international law for the explosions, and for the resulting loss of life and damages (ICJ

² International Nuclear Event Scale (INES) is a tool informing the magnitude of a disaster. The accidents are classified from level ‘0’–‘7’. Level ‘0’ has no safety significance. Level ‘7’ is classified as a major accident. Chernobyl and Fukushima accidents are of level 7. Other levels of classification are, ‘1’-anomaly; ‘2’-incident; ‘3’-serious incident; ‘4’-accident with local consequences; ‘5’-accident with wider consequences; ‘6’-serious accident. Basically, levels 1–3 are incidents and levels 4–7 are accidents (IAEA 2012).

³ The US alleged that the fumes from the operation of Canadian Smelter Company caused pollution (nuisance) to Washington State. The tribunal that was set up to try the case concluded that Canada was responsible for transboundary pollution and owed damages to US.

⁴ Two British destroyers struck mines in Corfu Strait in Albanian waters and suffered damage, including serious loss of life. UK filed an application against Albania in ICJ seeking the Albanian Government to take responsibility and also pay compensation. Albania contented that the UK had violated Albanian territorial waters. ICJ found that Albania was responsible for the explosions and for the resulting damage and loss of human life suffered by the United Kingdom. The Court also found merits with Albania that minesweeping by UK had violated its sovereignty. ICJ ordered Albania to pay the United Kingdom.

1949). Further, in respect to damages to the environment, in 1972 the UN through General Assembly Resolution 2996, in its plenary meeting on 15 December 1972 re-emphasised the importance of Principle 21 ground rules which govern the responsibility of the States to the international arena in preserving and protecting the environment (UN 1972).

Taken altogether, there was a case for the neighbouring States to seek legal remedies from the USSR. However, the USSR had not consented to the jurisdiction of the ICJ at that time and moreover, the decisions of the ICJ are enforced by the Security Council where the USSR has a veto power (Malone 1987). Further, the USSR was not a party to any of the liability conventions. On account of all these factors, none of the affected States brought an action based on public international law for recovery (Malone 1987; Heiss 1993). One may remember that even for the famed Trail Smelter Arbitration award, on account of various factors, it took 13 years before the victims were paid compensatory damages for the injuries suffered (Kaplan 1988).

The legal consequences of the Chernobyl accident were immense. Here was a case, wherein a nuclear accident had adversely affected a large number of people in a geographic area that transcend boundaries, without any legal remedy available. It became apparent that any chance of establishing a worldwide applicable liability law would require the cooperation of all States. Cooperation would require ratification of international treaties and harmonisation of laws with international principles. In the face of Chernobyl; the Paris and Vienna Conventions were seen as ineffective systems requiring considerable reforms for worldwide acceptability.

Nuclear reactor technology safety features and liability and compensation were subject to intense international scrutiny. ElBaradei (2007) stated, “Chernobyl, imprinted on public consciousness as proof that nuclear safety was an oxymoron”. In order to overcome legal lacunas, significant changes were mooted to both the 1963 Vienna Convention and the 1960 Paris Regional Convention liability regimes. Moreover, to address the overlap due to the existence of two parallel conventions, a new Protocol 1988 *Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention* (Joint Protocol) was established to work as a link between these two conventions. Also, a new international liability regime, *Convention on Supplementary Compensation for Nuclear Damage* (Compensation Convention or CSC) was also adopted. In this reforms initiative, while strengthening the regime, the major focus was to ensure universal adherence to liability law.

Amongst others, the lesson learned from Chernobyl was that if information on the accident was provided on time and also assistance was given early, lives and livelihood could be saved. Under the aegis of the IAEA, two conventions were drawn up and quickly adopted in 1986,—the *Convention on Early Notification of a Nuclear Accident* (Early Notification Convention) and the *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency* (Assistance Convention).

2.6 Chernobyl Effect: Reforms in International Nuclear Liability Law

2.6.1 Emergency Conventions

The two international conventions drawn up with remarkable speed under the auspices of the IAEA are: (1) the Notification Convention and (2) the Assistance Convention. Both these Conventions together referred to as 'Emergency Conventions' were adopted on the same day, 26 September 1986.

The Early Notification Convention requires the States to notify nuclear accidents which have the potential for international transboundary release that could be of radiological safety significance for another State. Reporting of a nuclear accident is mandatory, involving facilities and activities listed in Article 1. The Assistance Convention on the other hand, sets out an international framework for co-operation among the State Parties and with the IAEA, to facilitate prompt assistance and support in the event of nuclear accidents or radiological emergencies. It requires the States to notify the IAEA of their available experts, equipments, and other materials for providing assistance. In case of a request, each State Party decides whether it can render the requested assistance as well as its scope and terms. Assistance may be offered without cost, taking into account *inter alia* the needs of developing countries and the particular needs of countries without nuclear facilities. The IAEA serves as the focal point for such cooperation by channelling information, supporting efforts and providing its available services. Liability and compensation are not within the purview of the Emergency Conventions.

2.6.2 Joint Protocol Linking the Paris and the Vienna Liability Conventions

One of the major complexities in the international liability regime in the pre-Chernobyl era was the relation between the Paris Convention and the Vienna Conventions; countries had a choice of treaty adherence. Both these treaties did not recognise each other's jurisdiction, which raised many questions. The IAEA in the explanatory text, states that two areas were crucial for the effectiveness of international nuclear liability regime. First, "importance of having a universally acceptable regime; and second, the adequacy of the regime to cope with the transboundary consequences of a major nuclear accident" (IAEA 2004). On account of this, linking these two conventions became necessary.

This motivated both the Paris and the Vienna Convention States to establish a formal relationship between the two instruments. Expert groups established by the IAEA in cooperation with the OECD Nuclear Energy Agency (OECD NEA), adopted the Joint Protocol with the intent to link the two conventions. The Joint Protocol entered into force on 27 April 1992.

Schwartz (2006) summarises the primary aim of the Joint Protocol, as being to “remove conflicts resulting from the simultaneous application of both Conventions while promoting broader adherence to the basic principles underlying those Conventions”. As of date, 27 States are parties to the convention.

Interestingly, the purpose of the Joint Protocol has not been fully met, since many of the States having nuclear power programs continue to adhere only to either of the Conventions. It is noteworthy, that even today Russia and many other countries in Europe including the UK and France—offending and the victim States of the Chernobyl accident, have not signed the Joint Protocol. This means that even under present circumstances, countries could refuse State liability and payment of compensation on account of being non-party to the Joint Protocol. Moreover, soon after the adoption of the Joint Protocol, it was realised that this protocol is not adequate to cover compensation from accidents such as Chernobyl. Joint Protocol only provided “a solution regarding the relationship between the victims in Vienna and Paris States” (Pelzer 2010). Significant increase in the amount of compensation and also issues of States that are not party to any of the conventions, remain as issues not addressed by the Joint Protocol. In order to make the regime more broad based, comprehensive reforms are necessary in the international nuclear liability system.

2.6.3 Amendments to the Vienna and the Paris Conventions, and the CSC

The 1986 Chernobyl accident prompted widespread awareness of the need for improved protection of the public from the consequences of nuclear accidents (Boulanenkov and Brands 1988). It demonstrated that both the Paris and the Vienna Conventions’ provisions were inadequate in many ways. There was a need to increase the amounts of liability, broaden the types of damage, definition of damage, jurisdiction, equal protection of victims in any country etc.; all requiring substantial changes in the existing regimes. In short, the current legal regime requires modernization (Lamm 1998). The rallying point was that, a nuclear accident having transboundary impact would require equal protection of victims wherever they are—contracting and non-contracting parties. Moreover, the existence of multiple regimes undervalues the importance of the regimes themselves. Significant changes were proposed for both the Paris and the Vienna Conventions.

Internationally, the IAEA “followed a two-track approach: to improve the existing civil liability regime, including revision of the Vienna Convention for which the IAEA is depositary; and, to develop a comprehensive international liability regime” (IAEA Explanatory Text 1997). After many years of negotiations, under the aegis of the IAEA, in 1997 delegates from over 80 States adopted a *Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage* (1997 Protocol) and also Convention on Supplementary Compensation, known as CSC. Regionally, the Paris Convention countries took close to 10 years to reflect

the much required changes. On 12 February 2004, *the Protocol to Amend the Paris Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960* (2004 Protocol) was adopted. On account of the changes in the Paris Convention, the Brussels Convention was also amended through, *the Protocol to Amend the Brussels Convention Supplementary to the Paris Convention of 29 July 1960* (2004 Brussels Protocol). To an extent, the revisions in the Paris and the Brussels Conventions are aligned, and made them compatible with the 1997 Vienna Protocol and CSC (Schwartz 2010).

In respect to extent of liability amount, both the protocols have significantly increased liability amounts. The 1997 Vienna Protocol increased operator's liability to not less than 300 million Special Drawing Rights (SDRs), which is approximately 400 million US dollars (Article V). In the case of CSC as well, States can provide for the maximum or a 'greater amount' [Article 3(a)(1)]. This flexibility was provided to accommodate many States that did not wish to have a limited liability regime. In case unlimited liability is included, the financial security requirements will be capped at 300 million SDR for the operator (Article VII 1997 Protocol and Article III CSC). CSC provides a second tier compensation from the pooled funds of the contracting parties (Article III(1)(b)). In the case of the 2004 Paris Protocol, the amount of a nuclear operator's liability has been significantly increased to an amount not less than Euro 700 million (US\$ 935.45 million) (Article VII). Supplementing this, the revised 2004 Brussels Protocol in the second tier raised to Euro 500 million by the installation State and the third tier from the funds pooled by the contracting States increased to Euro 500 million—combined total of Euro 1.5 billion (Article 3). Interestingly to accommodate unlimited liability States like Germany, Austria and Switzerland; the 2004 Protocol recognises that a State with an unlimited liability regime may equally participate in the scheme established by the Convention.

Thus, under the revised protocols, major increase in amounts as well as attempts for harmonious existence of both limited liability and unlimited liability regime were made. However, the increased minimum amount and the classification of limited and unlimited liabilities in the same Conventions have now contributed to the new fear of disparity in liability amount (Schwartz 2010). The States having unlimited liability regime on the other hand continue to argue that the provision for limited liability must end, since limited liability is seen as a subsidy given to nuclear industry (Currie 2008). Researchers have argued that there exist good reasons for providing such subsidy during the initial phase of a nuclear power program, but not when the industry has matured. Thus, countries are in a way demanding reforms in the founding principles as well.

One of the major successes of the 1997 Protocol was its geographical coverage. Nuclear damage 'wherever' they occur will be within the scope of the Protocol [Article 1(A)(1)]. The Installation State can exclude the applicability of the Protocol to a non-contracting State with nuclear installation that does not provide reciprocal benefits [Article 1(A)(2 & 3)]. The 2004 Paris Protocol also witnessed an expanded scope of geographical coverage. Largely similar to the 1997 Protocol, but the difference here is in its applicability based on Convention State

and reciprocity based on the Paris Convention Principles [Article 2(a)]. The 2004 protocol text states that the applicability in a non-Convention State is limited if such a State, (a) is a party to the Vienna Convention and the 1988 Joint Protocol, or (b) it has no nuclear installations or (c) its nuclear liability legislation affords equivalent reciprocal benefits and is based on principles identical to those contained in the Paris Convention.

This provision of the ‘exclusion’ of States, whatever may be the classification in both the revised regimes can be counted as one of the reasons that the 1997 Protocol has still not seen major adherence. It is interesting to note that during the negotiations for the 1997 protocol, many States argued for a blanket geographical scope (IAEA 1997). The compromise language was the scope ‘wherever’ subjected to domestic application of law. In respect of the 2004 Protocol, considering Europe, the major coverage of the 2004 Protocol are the States that do not come under the expanded geographical scope, i.e. party to the Vienna Convention and the Joint Protocol.

The 1997 Vienna Protocol [Article I(1)(f)], Compensation Convention (Article I(f)) and the 2004 Paris Protocol (Article 1(a)(vii)) have broadly provided for alike definition of nuclear damage. The 2004 Paris Protocol does not have the definition provided under (viii). Though, in the aftermath of the Chernobyl accident, adopting such an expanded definition was seen as a requirement, but the negotiations had to endure serious disagreements by the States which wanted the definition to be aligned with their respective national laws (Soljan 2000 quoting Reyners 1998). Consensus prevailed on the need for a comprehensive definition, and the protocol now defines nuclear damage as:

(k) “Nuclear Damage” means:

- (i) loss of life or personal injury;
- (ii) loss of or damage to property;

and each of the following to the extent determined by the law of the competent court:

- (iii) economic loss arising from loss or damage referred to in para (i) or (ii), insofar as not included in those sub-paragraphs, if incurred by a person entitled to claim in respect of such loss or damage;
- (iv) the costs of measures of reinstatement of impaired environment, unless such impairment is insignificant, if such measures are actually taken or to be taken, and insofar as not included in para (ii);
- (v) loss of income deriving from an economic interest in any use or enjoyment of the environment, incurred as a result of a significant impairment of that environment, and insofar as not included in para (ii);
- (vi) the costs of preventive measures, and further loss or damage caused by such measures;
- (vii) any other economic loss, other than any caused by the impairment of the environment, if permitted by the general law on civil liability of the competent court.

Lamm (2006) in the context of the 1997 Protocol views “redefinition by the 1997 Protocol is clearly reflective of an intention to ensure as possible full compensation to victims of nuclear damage”. Though well intended, such an expanded definition both in the 1997 Protocol and the Compensation Convention became problematic due to the wording, “the extent determined by the law of the competent court”. In effect, allowing all types of damages to be included in the definition. Soljan (2000) states that “The formulation of this definition is not entirely clear. The reference to the ‘extent determined by the competent court’ does not lead to the conclusion that the law of the competent court is applicable to the question of the admissibility of the claim for compensation for economic loss, environmental damage or damage to the property”. This can be viewed as expecting too much from the national courts of the Installation State, to interpret what constitutes these damages and how will the compensation be distributed. Further, national standards relating to environmental pollution and their interpretation by the national courts are never uniform. For example, today, India can boast of multiple legislations covering environmental issues, but none deals with civil liability and compensation. Courts have been interpreting the liability through very liberal tort principles. Owing to such a situation, the application of this protocol definition in the South Asian context, as well as other regions of the world will be complex. The result would lead to unpredictable transboundary claims.

The 2004 Paris Protocol does not include ‘economic loss’ or ‘the extent determined by the law of the competent court’ in its definition. The exclusion of economic loss, as argued by Schwartz (2010), has resulted in incompatibility and non-applicability in relation to the 1988 Joint Protocol and the Compensation Convention—in effect does not obligate the Paris Convention States to compensate even when the victims belong to a Paris Convention State.

Another interesting inclusion in the 1997 Protocol is the ‘priority principle’. The principle has not received adequate critical attention from researchers. Article 10 of the Protocol states, “where in respect of claims brought against the operator the damage to be compensated under this Convention exceeds, or is likely to exceed, the maximum amount made available pursuant to paragraph 1 of Article V, priority in the distribution of the compensation shall be given to claims in respect of loss of life or personal injury”. The Compensation Convention on the other hand in Article III(2) specifies non-discrimination. It provides that “compensation shall be distributed equitably without discrimination on the basis of nationality, domicile or residence”. This is qualified by the provision that the law of the installation State may exclude non-contracting States [Article III(2)(a)]. In effect, since the CSC may not be the preferred law in South Asia, applicability of this non-discrimination principle is also in doubt.

The 2004 Protocol on the other hand does not refer to priority principle. But a review of the domestic laws of the Paris Convention States provides fine details of application of the priority principle. Spain, France, Poland, Norway, Netherlands, Slovenia, Bulgaria provide for the same, while the UK, Czech Republic, Denmark, Norway, Hungary, Italy do not contain any priority principles (OECD-NEA 2009).

In the case of Germany, the law provides an ordinance that establishes criteria for the distribution of compensation (OECD-NEA 2009).

The priority principle basically entails that in cases where the total amount of compensation payable is more than the amount available under the convention; priority will be given to claims relating to loss of life and personal injury. An argument can be raised that, this favours the Installation State. The reason being that in case of an accident, the major impact will be borne by the area immediate to the NPP, i.e. within the Installation State itself. In case of existence of a trans-boundary impact, the consequences will be largely on land, water etc.—essentially economic loss. In case of loss of life and personal injury, the most-affected State will receive a priority in obtaining compensation, while others may have to wait or may not get it at all. The additional question is how the courts of the Installation State will decide the quantum of compensation on the priority. Warren (2000) observes, “the question of how the compensation fund is to be administered in an equitable and prioritised manner and by whom and at what cost of settlement is one which I consider to be one of the most glaring oversights in the international conventions on nuclear liability”. Though the inclusion of the priority principle provision is seen as a major reform in identifying the priority areas for compensation, it ended up as a discriminatory disbursement regime of compensation between the States.

The 1997 and 2004 protocols may have strengthened both the Vienna and the Paris Conventions to an extent, but also in equal measure created problems in fulfilling the harmonisation objectives. For example, a State can become party to the 1997 Protocol without ratifying the 1963 Vienna Convention. Such a Contracting Party will be bound by the provisions of the 1963 Convention, in relation to other State Parties to the Protocol. Currie (2008) views the situation as, “in other words, Parties which join the Protocol but not the Convention are bound by the lower limits in the Vienna Convention unless they state otherwise at the outset, but Parties which join the Convention but not the Protocol are not bound by the higher limits of the Protocol in any event”.

On the question of compatibility, Adisianya (2011) says, these new conventions (referring to both the 1997 Protocol and the 2004 Paris Convention Protocol) “have, in effect, created and broadened the problems which the Joint Protocol intended to solve the situation of no complete link amongst the conventions is more complex and complicated”. A country now can join the 1997 Protocol without being a party to the 1963 Convention, thereby creating confusion within the Joint Protocol signatories. In respect to adherence, sadly only 12 countries are currently party to the 1997 Protocol: Argentina, Belarus, Bosnia and Herzegovina, Jordan, Latvia, Morocco, Romania, United Arab Emirates, Saudi Arabia, Poland, Montenegro and Kazakhstan. None of these countries have significant nuclear power programs. Russia which had signed the treaty in 1996 ratified it only in 2005. Ukraine, the country most affected by the Chernobyl accident has still not ratified the Protocol. In the case of the 2004 Paris Protocol (not in force), the

situation is grimmer. Except Norway and Switzerland, none of the other Paris Convention states have ratified the 2004 Protocol.

2.7 Continuing Efforts in Liability Regime Reforms

In view of the non-adherence by the States, especially in the European Union (EU), the official position calls for greater harmonisation through involvement of the EU. The communication from the European Commission (EC) to the Council and the European Parliament—Nuclear Illustrative Programme (NIP) presented under Article 40 of the Euratom Treaty describes the difficulties within EU (European Commission 2007). On account of the eastern expansion and as a majority of the new States of the EU follow the Vienna Convention, the EC observes, “The Commission is aiming at harmonising the nuclear liability rules within the Community.... In order to finalise and improve the proposals already made, the discussion should notably focus on developing a harmonised liability scheme and mechanism to ensure the availability of funds in the event of damage caused by a nuclear accident”. The European Economic and Social Committees in their opinion to NIP (EESC 12 July 2007) say, “for greater acceptability of nuclear power, the current system (liability insurance of EUR 700 million) is inadequate for this purpose”. In fact some of the recent literatures from Europe (Handrlica 2010) advocate further EU involvement in the area of nuclear liability by means of a European Nuclear Liability Directive.

In Europe, there are already strong signals of reform. Austria in 1998 enacted a new Federal Law on *Third Party Liability for Nuclear Damages caused by Radioactivity* where in the founding principles were completely transformed. Hinteregger (1998) summarises the changes as, “liability is unlimited in amount, legal channelling is to a great extent eliminated, there is no exclusive jurisdiction—Austrian court has jurisdiction and Austrian law will be applicable if nuclear damage occurs in Austria, regardless of where it was caused”. The Austrian law should be seen in the context of countries tired of waiting for constructive reforms. In the developing world, India has enacted its *Civil Liability for Nuclear Damage Act 2010* (discussed in detail in Chap. 3).

In 2011, UK announced its intent to harmonise the *Nuclear Installations Act 1965* in tune with the revised 2004 Paris and Brussels Protocols (UK Department of Energy and Climate Change (“DECC”) 2011). UK government has also made it clear that they will not apply the priority principles. One may note that such reforms initiatives are an exception. The main changes reflected in the revised law would include (DECC 2012):

Increase in the categories of damage for which operators are liable include, “personal injury and loss of life (“personal injury”) and property damage (i) economic loss arising from property damage; (ii) the costs of measures of reinstatement of the impaired

environment; (iii) loss of income deriving from a direct economic interest in any use or enjoyment of the environment; and (iv) the costs of preventive measures”.

Broadening the geographical scope to damage suffered in certain non-Paris countries (non-nuclear countries and certain other countries that have equivalent reciprocal arrangements) as well as the UK and other Paris countries.

A significant increase in the financial liability of the operator from currently 140 million pounds to Euro 1200 million.

As expected, it took another nuclear disaster to restart the comatose negotiations towards achieving a universal and harmonised liability regime.

2.7.1 Fukushima Nuclear Disaster

On 11 March 2011, a 9.0 Richter scale magnitude earthquake hit northeastern Japan resulting in a tsunami, with waves as high as 30–38 m (IAEA 2011). The earthquake and tsunami combined caused the blackout of four Nuclear Power Plants at Fukushima Daiichi (Fukushima accident). OCED Fukushima Press kit (2012) states that at the plant site, the tsunami was estimated to be 14–15 m; the plant had been designed to withstand up to 4–5 m. The accident was rated as Level 7 on the International Nuclear Event Scale, the same classification as of Chernobyl. On account of explosions in the plants, reports suggest there was radiation release to the environment. People living around the plant up to 20 km were compulsorily evacuated by the government (Prime Minister Office Press Briefing 2011). A “planned evacuation zone” of 30–50 km zone, north of the plant was also established (Sugimoto et al. 2012).

Osaka (2012) states that major Japanese industries such as—agriculture, fishing, tourism, and other businesses were heavily impacted. The US had put import restrictions of sand lance (a small fish) from Fukushima Prefecture (Buck and Upton 2012). Since the accident occurred on the eastern side of Japan, bordering the Pacific Ocean there has been no substantial transboundary impact on other countries. Few reports suggest considerable amount of radiation has entered into sea, however, none of the reports confirm that the impact could be disastrous (Buck and Upton 2012; and Madigana et al. 2012). A UNSCEAR (2012) press release, suggests that it may take years to know the full impact. As such is the case of transboundary damage, so far, liability and compensation issues have been limited only to Japanese jurisdiction (OCED Fukushima Kit 2011). It is interesting to note that Japan has not acceded to any of the international nuclear liability conventions when the accident occurred. However, on 15 January 2015 Japan joined CSC and with its acceptance, the CSC will be effective from 15 April 2015. They have their own domestic legislation, without reciprocity. Had the accident occurred in the west of the country, though highly unlikely, considerable damage could have been caused in Korea. The Fukushima nuclear accident emphasises the need for undertaking reforms that are acceptable to more countries.

The current slow pace of reforms on the liability regime, reflects the inability of the international community to achieve a universal harmonised regime. Based

on this, Pelzer (2010) argues “even if one accepts that a globally unified liability regime most probably is not achievable and that adherence to the international regime by a number of States is ‘not even wanted’ there is nevertheless the urgent need to strive for harmonisation in larger geographical regions which qualify for establishing risk community”. He views that the recent developments from the EC; the preparations for establishing a unified nuclear liability regime within the EU member States as most desirable. This is the route South Asia should consider—formation of a ‘South Asian Nuclear Risk Community’.

Cooper (2011) sums-up the state of affairs, “The need to revisit and revise regulations regarding financial responsibility for nuclear accidents has been clear and compelling for at least a quarter of a century (since Chernobyl) and has been made overwhelmingly obvious by Fukushima”. Also Reyners (2013) hopes that the Fukushima accident could serve as a catalyst for real progress in the nuclear liability regime. The international community expects that the Fukushima accident will lead to real progress.

The Fukushima nuclear accident transformed the discussion on nuclear risk paradigm. The IAEA (July 2012 and August 2012) in response to the accident, re-emphasise the need to achieve a ‘global nuclear liability regime’. To take stock of the safety of nuclear energy in the wake of Fukushima accident, the IAEA in June 2011 convened a Ministerial Conference and adopted a ‘Draft Action Plan on Nuclear Safety’ (Action Plan) (IAEA 2011). On the question of nuclear liability regime the IAEA Action Plan states,

Member States to work towards establishing a global nuclear liability regime that addresses the concerns of all States that might be affected by a nuclear accident with a view to providing appropriate compensation for nuclear damage. The IAEA International Expert Group on Nuclear Liability (INLEX) to recommend actions to facilitate achievement of such a global regime. Member States to give due consideration to the possibility of joining the international nuclear liability instruments as a step towards achieving such a global regime.

Taking the initiative put forward by the IAEA Action Plan, the International Expert Group on Nuclear Liability (INLEX) recommended actions to achieve such a global regime (IAEA 2012). Overall, the recommendations request the States to participate in the existing international regimes, taking advantage of the higher level of flexibility offered by these conventions. A review of the recommendations suggest, either it was not given a comprehensive terms of reference or it did not thread the difficult part of reforms. Continuing to emphasis on adherence when countries have serious difficulties on becoming party of the present regime is a distressing sign from a world body.

In Europe, the European nuclear plant’s ‘stress test’ emphasises the central role played by EC, particularly calling countries to legislate on liability and insurance. In the case of South Asia, a case is made in the subsequent chapters that South Asia being a nuclear-risk zone, the regional forum—the South Asian Association for Regional Cooperation (SAARC) in view of its standing should establish a forum to discuss nuclear safety and liability issues. The reason being, South Asia is largely a single geographical unit which is politically and culturally connected. Though

India remains the largest in size and a link to all other countries, the nuclear power program that is either planned or have ambitions by four countries—Bangladesh, India, Pakistan and Sri Lanka out of eight SAARC nations draws a parallel to the European nuclear dilemma—geographical proximity and actions of a responsible state. In the nuclear liability discourse, a major drawback is that there is little consideration of the voice of non-nuclear countries. In South Asia, Nepal, Bhutan and Maldives, are unlikely to initiate a nuclear program but could be adversely affected in case of a nuclear disaster. As the mapping exercise in Chap. 5 shows during an accident, these non-nuclear countries could well be part of the radiation exposure zone. A detailed discussion of the importance of SAARC, a regional forum within South Asia, though not a legal union, (unlike the EU) towards the establishment of a regional nuclear risk community is discussed in Chap. 4.

2.7.2 *Nuclear Exporter's Principle: Achieving the Impossible?*

Parallel to government and intergovernment efforts, the Carnegie Endowment for International Peace (CEIP) in 2011 led the world's major civilian nuclear power plant vendors (excluding India and China) in the development of a common understanding of the parameters that should guide the exporters of nuclear power plants (<http://nuclearprinciples.org/about/history/>). These principles are referred to as the 'Nuclear Power Plant Exporters' Principles of Conduct'. The principle on Compensation for Nuclear Damage states:

Before entering into a contract to supply a nuclear power plant to a Customer, the Vendor will independently make a reasonable judgment that the Customer State has in force, or will have in force before fuel is delivered in the Customer State's territory, a legal regime providing adequate and prompt compensation for the public in the unlikely event of an accident, with protection in effect equivalent to one or more of the following best practices:

- 4.1 A legal regime for compensation and nuclear liability that, *inter alia*:
 - 4.1.1 Contains adequate liability limits and financial protection consistent with current international standards;
 - 4.1.2 Is backed by Customer State guarantees;
 - 4.1.3 Ensures that claims for compensation by possible victims will be channelled to the operator of the nuclear power plant(s) that would be strictly and exclusively liable and channelled to one single competent court;
 - 4.1.4 Includes compensation for personal injury, property damage, environmental damage, loss of income, economic loss, and preventive measures;
 - 4.1.5 Does not allow compensation amounts to be set aside or reduced by unilateral strict reciprocity requirements; and/or
- 4.2 A treaty relationship with the Vendor State under either the IAEA's Vienna Convention on Civil Liability for Nuclear Damage, as amended or, if eligible, the Organisation for Economic Cooperation and Development's Paris Convention on Third Party Liability in the Field of Nuclear Energy, as amended; and/or

- 4.3 The IAEA's Convention on Supplementary Compensation for Nuclear Damage (CSC)—which is the IAEA's unified global nuclear liability regime that any State can join if it is a Party to the Vienna Convention or Paris Convention or has a domestic law that is consistent with the CSC Annex. Such action would enable global treaty relations crucial to assure worldwide compensation and liability protection during plant operation and transnational transport

CEIP's exercise has been unprecedented, considering the nature of industry. All major exporters of nuclear power plants are party to these voluntary Principles. The principles have been adopted by nine companies based in Canada, France, Japan, Russia, South Korea and the United States—all having major stake in world exports, and to India in particular. These principles are the outcome of a voluntary initiative; are in the nature of a soft instrument and thus Principles, and are not legally binding. Even so, each company has independently undertaken to implement the Principles in the course of its business activities. In practise, this is easier said than done, as the business opportunities may occur in regions, with legal and political systems that are at variance. By way of example, India's liability law (*The Liability for Civil Nuclear Damage Act 2010*) is seen as being inconsistent with international liability regime. India on the other hand has argued that the law strengthens the international regime (Chap. 3 discusses in detail India's liability law). Further, there is a view from countries like India that these Principles are seen as a strategic move against companies from India, hindering them from exploiting lucrative export markets. Countries could strategically restrict imports if such companies are not part of 'Principles of Conduct' (Ram Mohan 2011). France which has a major business interest in India, has in some ways already broken away from the group. The President of France during an interview stated, "Regarding civil nuclear liability, we obviously respect Indian law. It is the sovereign decision of a country that has witnessed catastrophes like the Bhopal gas tragedy" (French Embassy in New Delhi 2013).

2.8 Conclusion

Many countries have embarked on the journey of harnessing energy from nuclear resources, even after witnessing the consequences of the bombings in Japan and the Chernobyl accident. Technology supplier countries argued that though studies deliberate the probable magnitude of an accident, such outcomes are rare. Interestingly, the supplier countries ring fenced themselves from possible liability claims through the use of bilateral treaty provisions, domestic legislations and also through advocating adoption of unique principles, in particular liability channelling and limits on liability. Many countries have adopted these founding principles in their domestic legislations. The Chernobyl nuclear power plant accident was an eye-opener. States realised that the existing regime was entirely incapable of dealing with nuclear disasters of such magnitude. Major reforms were agreed to and brought about by establishing a new regime and strengthening old liability regimes.

However, today none of the reforms can be termed as successful. Adherences to these reforms are scantier than the original conventions. The 1997 Vienna Protocol has only 10 ratifications. The purpose of the Joint Protocol has been defeated; Europe which had faced the brunt of the Chernobyl disaster still does not have a harmonised liability regime, and many countries continue to adhere to only the original conventions. The 2004 Protocol to Paris Convention has only 2 contracting Parties (Norway and Switzerland).

Even after 25 years of Chernobyl, the international nuclear liability regime is extremely inconsistent and does not inspire worldwide confidence. The goal of harmonisation and universal adherence still has a long way to cover. Fukushima has given yet another chance to reform the regime.

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<http://www.springer.com/978-81-322-2342-9>

Nuclear Energy and Liability in South Asia
Institutions, Legal Frameworks and Risk Assessment
within SAARC

M.P., R.M.

2015, XIX, 142 p. 11 illus. in color., Hardcover

ISBN: 978-81-322-2342-9