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Inadequacies of current liability regimes in the nuclear industry

A Master's Thesis submitted for the degree of
"Master of Science"

supervised by
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Affidavit

I, **GABRIELA BANU**, hereby declare

1. that I am the sole author of the present Master's Thesis, "INADEQUACIES OF CURRENT LIABILITY REGIMES IN THE NUCLEAR INDUSTRY", 67 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

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Abstract

Nuclear industry needs an effective and adequate liability regime. Significant attention has been given to develop an international nuclear liability regime in order to promote appropriate compensation for nuclear damage during the years. This was reflected in the various conventions, as followed: The Paris Convention on Third Party Liability, The Vienna Convention on Civil Liability for Nuclear Damage, The Brussels Supplementary Convention, The Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage, The Protocol to Amend the Paris Convention on Nuclear Third Party Liability, The Protocol to Amend the Brussels Convention Supplementary to the Paris Convention and The Convention on Supplementary Compensation for Nuclear Damage.

Despite the efforts, the attempt to improve the regime has not been completely successful. Current regimes have not been widely ratified and left many shortcomings, which include: the exclusive liability to the operator of the nuclear installation, the limitation of liability in quantum and limitation in time for making claims, the exclusive jurisdiction for claims to the installation states, a narrow definition of damage, lack of an adequate compensation fund and lack of members.

The tragic events in Chernobyl, Three Mile Island or Fukushima have illustrated that accidents can happen and the consequences can be huge.

With this in the mind the present work brings recommendations, for an improved and effective regime to govern the nuclear liability system: no limitation liability in quantum and duration, proportionality liability of the state, manufacturer and operator, access to neutral tribunal, a broad definition of damages, no statute of limitation, the establishment of an adequate compensation fund and increased membership.

Many of these recommendations can be found in the national nuclear laws of different states. For harmonization the national law and practice with the international nuclear regime, it is important that both national and international system to converge. The ideas put forward might be controversial, however it could go a long way to improve the system.

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List of Abbreviations

BSC Brussels Supplementary Convention

CSC Convention on Supplementary Compensation

IAEA International Atomic Energy Agency

JP Joint Protocol

NEA Nuclear Energy Agency

PC Paris Convention

US United States

VC Vienna Convention

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Chapter 1

Introduction

Worldwide the energy demand increased significantly, bringing together the concerns about greenhouse gas emissions produced by oil and gas sources. Additionally, the unpredictable political variations for exporting of the countries with oil resources, as well as the unpredictable variations of the prices in the oil field, arose the interest in the nuclear energy. Nuclear power is an important source for the future development of constantly growing energy demand, being considered as one of the most clean energy source.

Clean energy will be needed a lot in the next 20 years, especially in the areas where the estimation of population growing is significant. The energy demand grew by 26% from 2000 to 2010 and it is estimated that it will grow to 45% under current policies up to 2014. The electricity demand almost doubled from 1990 to 2011 and it's predicted to grow with 81% from 2011 to 2035 (from 19.002 TWh to 34.454 TWh) under current policies up to 2014. The population growth and the increasing standards of living, especially in the developing countries, will lead to a dramatic energy demand over the time.

On the other hand, producing nuclear energy is not so easy considering the amount of costs, which arises from the construction of a nuclear power plant. If there are capital costs at the beginning, the operational costs are smaller than of other kinds of power plants. Nuclear Energy is considered a cheap energy, as long as the power plant is already built. In this respect, nuclear power plants can be owned by state or a number of separate entities and each of these owners may have a parent/subsidiary relationship to other companies.

1.1 Economics of Nuclear Energy and Areas of Growth

Evaluating the economics of nuclear power, several aspects have to be taken in consideration, like: the capital costs and the financing costs, the operating costs, the system costs and the external costs. Evaluating the capital costs of a nuclear power plant, the financing, the construction site preparation, the construction, the production and the commissioning are the elements to be met. The capital costs include the cost for site preparation, construction, manufacture, commissioning and financing a nuclear

plant. The capital costs include also the building of the nuclear reactor, meaning the costs for workers, steel, concrete, thousands of components and many systems to produce electricity, cooling, ventilation, information, control and communication. The capital costs can be calculated in terms of the production capacity of the plant and can be expressed in cost like investment costs and not used production costs. However, all these costs vary significantly from country to country, existing a huge difference between the costs in the emerging industrial economies and the mature economy of Europe and North America. “These changing in costs are coming from differentiated labor costs, more experience in the recent building of reactors, economies of scale from building multiple units and streamlined licensing, project management within large civil engineering projects and location. “ (World Nuclear Association, 2014) It’s important to note that the financing costs of the new generation power plants are strong depending on the construction periods, which mainly they are long periods. In the same time, the financing costs are also influenced by the accumulated debts and their interest, as well as the risk capitals. It is hard to determine the exact costs of a nuclear power plants, considering all the implications around, however the third generation design is cheaper and faster to construct as the previous ones. Generation III and generation III+ (Advanced LWRs and AP1000) are considered evolutionary models for the nuclear industry. Nevertheless, a new generation reactors, generation IV are up to be started with stronger, more economic and more safer models than before. In evaluating the economics of a nuclear power, the decommissioning and waste disposal must to be taken into account. The General Electric Advanced Boiling water Reactor (ABWR) was the first third generation power plant approved and the first two reactors were delivered to Japan in 1996 and 1997, where they were successfully and in time installed. The costs of the construction were around $2000 per KW. Chinese Nuclear Power Industry could become a strong competitor to the Western Nuclear Power Industry because of its own new design reactors, which are estimated to the capital costs of $1500 per KW and $1300 per KW. It is expected that the first AP1000 will cost around $3500 per KW. Although many people are skeptical about the new development of the nuclear power, France is a good example for the good development and management of the Nuclear Power. In other words, the nuclear power plant construction is characteristic for large projects around the world, whose costs and delivery challenge is sometimes under-estimated. (World Nuclear Association, 2015)

1.1.1 Nuclear Fuel Cycle

The Nuclear Power Plant is just one component of the nuclear fuel cycle, as showed in Figure 1. Many countries do not have to posses most of the components of nuclear fuel cycle, for example enrichment and reprocessing. The nuclear fuel elements needed for the Nuclear Power Plants could be obtained from other countries as part of the nuclear trend.

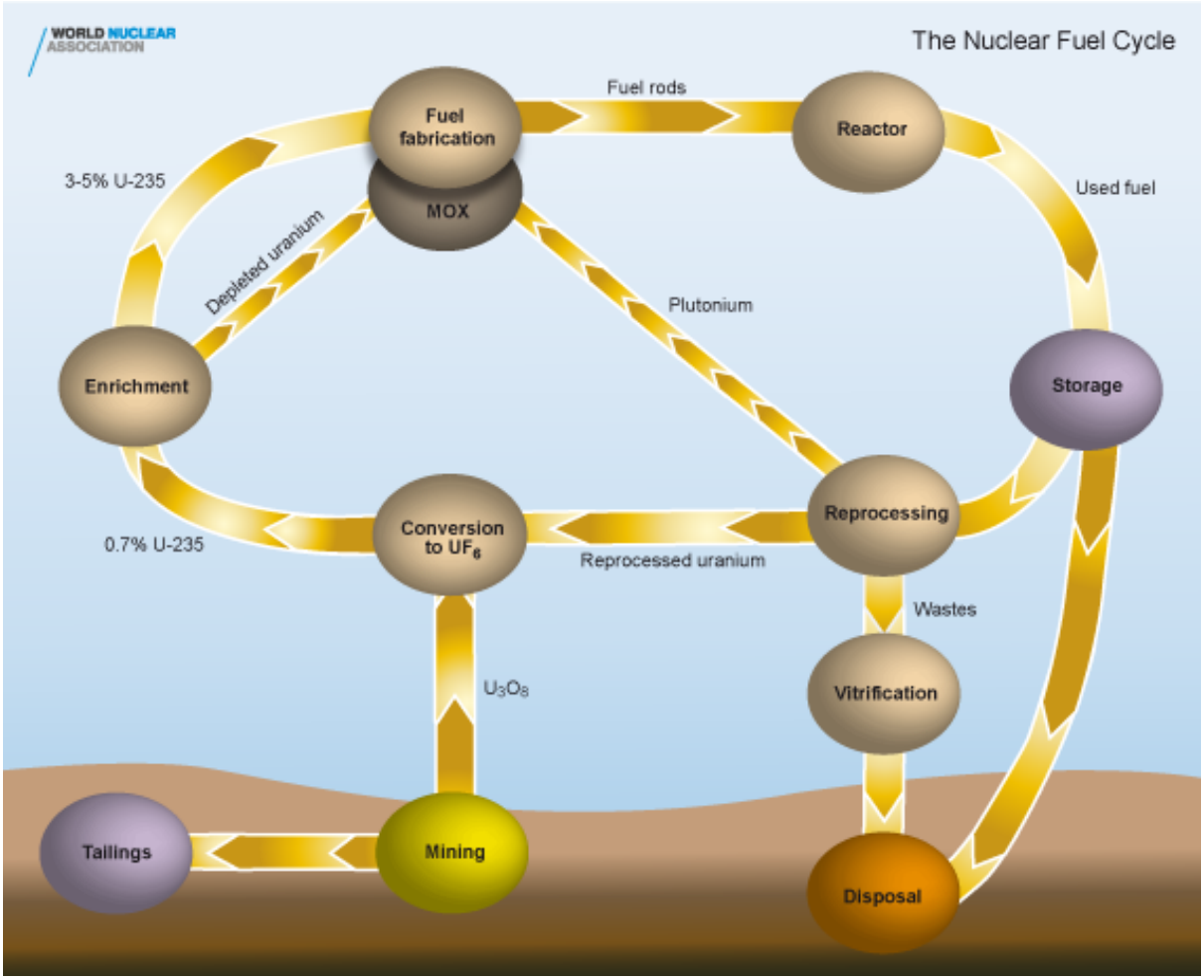

Figure 1: Fuel Cycle Components (World Nuclear Association, 2015)

However, all these processes can have a common risk: the radioactivity.

1.2 Nuclear Law

For a successful implementation of the nuclear energy, the nuclear law has been established as a requirement. It is relatively new, evolving, based mainly on the work

of experts and the development of science and technology. The nuclear law is the specific law for the nuclear energy. It is different from national and international law. When the nuclear energy creates special risks to health and safety of persons, and to the environment, the situation must be handled efficiently.

The nuclear law, as any other law, must comply with the constitutional and institutional requirements of any state's political and legal system. Its fundamental principles are distinguishing it from the national law. (Table 1)

Table 1: Principles of Nuclear Law

The safety principle	- prevention principle – prevent damage that might occur because of use of nuclear technology - protection principle
The security principle	- protect and account types and quantities of nuclear material that may expose security risks
The responsibility principle	- entities which perform nuclear activities with radiation risk have responsibility for safety
The approval principle	- prior permission to be obtained for activities involving fissionable material and radioisotopes, like authorization, license, permit, certificate
The continuous control principle	- the regulator must monitor the activities to be sure that they are conducted safely and secure according the terms of authorization
The compensation principle	- states adopt measures to provide effective and adequate compensation for major damage to persons, property and environment in case of nuclear accident

The sustainable development principle	-environmental protection from degradation for an economic and social development
The compliance principle	-Trans-boundary radiological contamination – building a international law of nuclear energy -a principle of customary international law - the territory of a State must not be used in such a way as to cause damage in another State;
The independence principle	-independent regulatory authority
The transparency principle	- public, media and other entities involved must be informed regarding all the implications using nuclear techniques
The international co-operation principle	- keeping close relations among States and international organizations when comes about nuclear activities and techniques

Nuclear law has its own status and acts in many different fields: radiation protection, nuclear safety, nuclear security, non-proliferation and liability and compensation of nuclear damage. (Table 2)

Table 2: Fields of Nuclear Law

Radiation Protection	Legislation for the safe handling of ionizing radiation sources
Nuclear Safety	Legislation for radiation sources, which can be material that emits radiation through the spontaneous decay of some radionuclides and equipment, which generate radiation

	(e.g. dental X ray equipment).
Nuclear Security	Legislation to protect and account types and quantities of nuclear material that may expose security risks.
Non-Proliferation	Legislation to protect the use of nuclear material or technologies for nuclear weapons and explosives.
Liability and Compensation of Nuclear Damage	Legislation to establish the liable entity to compensate the victims in case an incident occurs at a nuclear installation.

The nuclear law is highly complex and technical, acting in many technical areas, like: agriculture, medicine and industry.

This paper concentrates on the nuclear liability and compensation regimes associated with accidents and incidents coming to pass at Nuclear Power Plants. Over the years, Nuclear Energy improved the safety of its reactors developing new generation reactors, even though some untested, to facilitate the economic and safety of the Power Plants. Despite these efforts, nuclear industry still faces a strong public concern against the nuclear facilities. Nuclear incidents and accidents occurred over the time at nuclear power plants raising the worries of the public because of the devastating effect they produced. Last major accident, the Fukushima Daiichi accident in Japan, happened in 2011 and it proved that even with advanced technology, mistakes can occur in the design and build of the reactors. In the case of Fukushima, the designers of the plant could not foreseen that a tsunami of 7 meter height produced by an earthquake would hit the plant and would stop the back up system, which supposed to stabilize the plant in case of an incident. In 1956 the first nuclear reactor was constructed raising the question of the effects of nuclear accidents.

As a response, a nuclear liability regime and compensation system has been established through various conventions as a part of the nuclear law:

- *The Paris Convention on Third Party Liability* adopted in 1960 under the auspices of OECD
- *The Vienna Convention on Civil Liability for Nuclear* Damage adopted in 1963

under the auspices of IAEA

- *The Brussels Supplementary Convention* adopted in 1963 under the auspices of OECD
- *The Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage* adopted in 1997 under the auspices of IAEA
- *The Protocol to Amend the Paris Convention on Nuclear Third Party Liability* adopted in 2004 under the auspices of OECD
- *-The Protocol to Amend the Brussels Convention Supplementary to the Paris Convention* adopted in 2004 under the auspices of OECD
- *The Convention on Supplementary Compensation for Nuclear Damage* adopted in 1997 under the auspices of IAEA

This paper will investigate the development of the international nuclear liability regime focusing on issues like coverage, limitation in time and amount, courts jurisdictions, liability of the operator and relevance to the national legislations. The paper will include tables in order to make a clear and concise imagine about the similarities and differences in the actual liability regimes. Identifying the advantages and disadvantages of international nuclear liability system compared with the national nuclear legislations of non-member states could lead to a further step towards an effective international nuclear law.

Firstly, the Chapter 1 will make a brief introduction in the nuclear industry, presenting a brief description of the economics and areas of growth in the Nuclear Energy, as well as of Nuclear Fuel Cycle. The chapter will continue with the introduction in the nuclear law, emphasizing that the paper will concentrate on the nuclear liability and compensation regimes associated with accidents and incidents coming to pass at Nuclear Power Plants. Chapter 2 will present the historical background of the liability regime concerning nuclear incidents. For a better understanding and a better view of the liability regimes instruments, a Table with the Lists of Conventions on International Nuclear Liability for Nuclear Damages will be introduced. The paper continues, with a detailed overview about the international legal instruments concerning liability and compensation for nuclear damage, followed by a comparison structure on the improvements made and still existing inadequacies. After that the focus of the author turns to the national legal instruments and makes a comparison between international and national legal instruments concerning the nuclear liability regimes. The author will open to the views what is new about these legislations and would identify the problems in the actual international liability regime, emphasizing the importance that both

national and international system to converge for the harmonization of the national law and practice with the international nuclear regime. In Chapter 3, after presenting examples of the nuclear accidents, the author will analyze the inadequacies existing in the international liability regime in the moment the accidents happened. Chapter 4 will conclude with the recommendations given by the author in respect of future development of the international nuclear liability regime, highlighting the areas that need to be improved and showing the advantages they are to bring.

Chapter 2

Nuclear Liability Regime

2.1 Historical background

The concept of nuclear liability regime has its origin in the Brookhaven Report of 1957, being considered the starting point for the nuclear liability law. This report arose in view, for the first time in history, the potentially risky consequences of a nuclear accident that might have trans-boundary effects.

As a result, United States Congress adopted in 1958 the Price-Anderson Act. In 1960, The Paris Convention on Third Party Liability for Nuclear Damage was adopted under the auspices of the Organization for European Economic Cooperation, known nowadays as the Organization for Economic Co-operation and Development. Actually, this was the first major step made for the development of an international nuclear third party liability regime. In 1963, the Brussels Supplementary Convention was adopted, followed by the other two Protocols in 1964 and 1982. In 1963, a new Convention under the auspices of the International Atomic Energy Agency was adopted, The Vienna Convention On Civil Liability for Nuclear Damage. The Vienna Convention is opened to all states, while the Paris Convention is open only to OECD countries and to any non-member states with the permission of the other member states. A new nuclear liability regime was established, whose inadequacies came into light after the Chernobyl accident.

Chernobyl accident was an eye-opener for the nuclear liability law drafters, showing the world the devastating effect of a nuclear accident. The effect of the accident was trans-boundary, creating damages on human lives, human health, property and the environment in countries far away from Ukraine. The accident became an eye-opener to the need to develop an effective and adequate international liability and compensation regime. Efforts had been made at international and national level to create an effective liability regime. New amendments and protocols were adopted at international level with the scope to create a newer and better nuclear liability system.

Table 3: List of Conventions on International Nuclear Liability for Nuclear Damage

Convention	Brief description	Year of Adoption	Year entering in force	Signatories	Parties
PC	-it establishes a nuclear liability and compensation regime to compensate victims of a nuclear accident; -it is open only to OECD member countries as of right and to non-member countries with the consent of all convention states.	1960	1968	19	16
BSC	-it establishes a scheme of supplementary compensation to that required by the Paris Convention for the victims of a nuclear accident -it is opened, the same like PC, only to the OECD member countries	1960	1963	3	12
VC	-same like PC -it is open to all the states	1963	1977	13	40
JP	its aim is to bring together the geographical scope of	1988	1992	22	28

	PC and VC				
Protocol to Amend the VC	-it improves the requirements of the original regime by adding more available money to compensate more victims for a broader range of damages -it was created to attract more new member states	1997	2003	15	5
The Protocol to Amend the PC	-it improves the requirements of the PC by adding more available money to compensate more victims for a broader range of damages	2004	Not in force		2
The Protocol to Amend the BSC to the PC	-great improvements in the issues like geographical coverage and recoverable damages	2004	Not in force		3
CSC	-created with a global scope, meaning that it opens doors to all the states, either nuclear states or non-nuclear states; -it has a legal channelling regime, as well as an economic channelling regime	1997	2015	19	7

Despite all the efforts, the international liability regime still has big lacunae. For all the apparent progress to update the convention and draw new states into the international nuclear regime, things are moving slowly. The Convention on Supplementary Compensation for Nuclear Damage (CSC) adopted in 1997 and ratified by United States of America and other few states entered into force only this year because of insufficient member states with the requisite installed nuclear generating capacity. The Protocols amending the Paris and Brussels Conventions, adopted in 2004, have not entered into force, because it has been ratified only by 3 states. The 1997 Protocol amending the Vienna Convention is yet in force, however it has only 15 contracting parties (and not all of them nuclear generating states). States with important nuclear energy capacity are not part of any regime or others have adopted relevant national legislation that reflects the general principals of the convention mentioned above (for example, India). (Burns, 2012)

2.2 Description of the Conventions on International Nuclear Liability for Nuclear Damage

Governments of many industrial countries understood the importance of nuclear power as an attractive source of produced energy, enabling the economic growth of their countries, although there were many barriers to overcome. First, the fear of ionizing radiation, in case of a nuclear incident, which would strongly effect human health, public and private property, the environment and the economy. Another obstacle was the financial claims in case of nuclear incident for the damages produced. It was clear that a new law has to be developed to cover this field. As a result, the basis of a nuclear liability law has been adopted and it is applied in many industrialized countries with slight variations from country to country and only to a “nuclear incident”. The activities, which do not involve high level of radioactivity does not fall within the scope of the special regime.

In early 1950s, it was the first time acknowledged the trans-boundary effects of a nuclear accident. As a result, OECD together with United Nations created two special nuclear liability regimes to compensate victim equitability.

The Paris Convention

The Paris Convention on the Third Party Liability for Nuclear Damages is the first international nuclear liability instrument adopted in 1960 under the auspices of the Organization for Economic Co-operation and Development. It entered into force on the 1st of April 1968 and it has 15 parties. The convention provides that the operator of the installation plant has the exclusive liability for the damages produces after a nuclear accident. It also establishes the competent court for claims and the applicable law in case of a nuclear incident. This convention represents the base of the future development of the international third party liability regime and it was adopted of many countries as a model for the de nuclear law.

According to Paris Convention, the "operator" is liable for the damages occurred and has to compensate the third party, if the nuclear substances are in installation at the time of accident. If the accident happened during the transportation of the nuclear substances, than the sender is responsible, until the receiver has taken charge of the substances on the base of a written contract. However, there are limited cases when the operator is not responsible, like: armed conflict, civil war, insurrection, hostilities and serious natural disaster, which have an exceptional character. There were cases when operators were held responsible for the damages occurred after a nuclear accident due to natural disasters, on the base that the operator should have foreseen the possibility of such events and should have taken the necessary measures. Under this Convention, the operator is liable only for damages any other than those on the site of the accident and it is determined by the national law of the country, which can decide upon nuclear damage claims. So, the national law is deciding the compensation as well as the equitable distribution. According to Paris Convention, the maximum liability to be imposed to a nuclear operator may not be higher than SDR 15 million and not less than SDR 5 million. However, parties may also fix a higher or lower limit, for more or less dangerous installations or activities. In case of more than one liable operator, then they are all liable jointly and severally. The convention states that operators must have and maintain insurance or other financial security (bank guarantee, liquid assets, mutual funds) and has to be approved by the installation state according the convention, for the established amount. The time limit for claim is ten years from the date of the incident, with the possibility of exceptions under national law. The courts having jurisdiction are those from the contracting party where the incident has occurred. In case the place of accident can't be determined with certainty or the incident has happened outside the jurisdiction of any party, special

rules will apply. In 1990, the NEA Steering Committee has recommended to designate a single court as the competent court, which became mandatory obligation under the 2004 Protocol to Amend the Paris Convention. The role of this single court is to ensure consistency of decisions and the equitable distribution of compensation. The courts having jurisdiction decide according the terms of convention or national law in the matters not specified in the convention and must apply the terms of the convention or the national law without discrimination on the grounds of nationality, domicile or residence.

The Brussels Supplementary Convention

In 1963, The *Brussels Supplementary Convention* established a *new finance system* for the victims of nuclear damage through public funds. The Convention set up a compensation system based on three tiers (see Table 4):

- In the first tier, the compensation provided by the nuclear operator up to the maximum liability amount stated by national law.
- In the second tier, the compensation provided by the state of the operator of the Nuclear Power Plant.
- In the third tire, the compensation provided by the contracting parties according their nuclear capacity and gross national product (GDP).

The Brussels Supplementary Convention was ratified by twelve contracting states and entered into force on the 4th of December 1974. The weakness of the convention is that it applies only to incidents within one of the member states and only for damage for which a Paris Convention state operator is liable.

The weakness of this Convention is that it applies only for members in the Paris Convention.

The Vienna Convention on Civil Liability for Nuclear Damage

In the same year International Atomic Energy Agency (IAEA) adopted its own nuclear liability regime through the *Vienna Convention on Civil Liability for Nuclear Damage*. The Vienna Convention is similar with the Paris Convention, stating the same basic principles. However, it exists several differences between the two Conventions, like:

the Vienna Convention stipulates only a minimum amount of $5 million, allowing the state to set its own maximum level, the operator liability is stated to be absolute in the Vienna Convention and it specifically stipulates that a state has to guarantee the payment of compensation in case the operator's financial security fails. The convention has been amended by a 1997 *Protocol*.

The weakness of the first generation nuclear liability regime is the limited geographical coverage, as well as the similar provisions. The Chernobyl accident became an eye-opener that it is not necessary to have two similar conventions with different geographical regimes.

The Joint Protocol

The Paris and Vienna Convention were joined together by the *Joint Protocol* adopted in 1988 and its aim is to bring together the geographical scope of the two. The Joint Protocol entered into force in 1992. It has 28 contracting parties. Actually, after the 1986 accident at the Chernobyl, the international nuclear committee recognized the need to enlarge the geographical application of the liability regimes stated in Vienna Convention and Paris Convention and to improve the benefits available. Chernobyl nuclear accident ended with loss of life, personal injuries and illnesses including severe psychological stress, property damage, damage of the environment and other socio-economic disruptions. Despite all these, the affected countries could not claim compensation in respect of nuclear damage incurred, because it existed no international nuclear liability regime to which the former Soviet Union was party and under which victims in neighboring countries would have had a right to claim compensation. As a result, the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention was adopted to fulfill all these needs. It is open to parties at the Paris Convention, Brussels Supplementary Convention or Vienna Convention, so that victims from Vienna Conventions can ask compensation for damage due to a nuclear incident from an operator in Paris Convention and Brussels Convention. The Joint Protocol states the following provisions, which are actually the principles of the international nuclear regime:

- 1. The *absolute liability* of the operator of a nuclear installation, meaning that the victim doesn't have to prove the fault of any party for compensation claims in case of a nuclear incident. The operator is strict or absolute liable in all the cases, no matter of the fault, except in case of armed conflict, insurrection, civil

war and hostilities. Comparing with the tort law principle, which render a defendant liable for a plaintiff's damages only where it can be proved the defendant owned the duty that caused the damage and breached that duty through negligence or an international act or omission, the strict liability principle provides large measures of equity that would not otherwise be available for the victims. This concept was created to simplify the legal procedures. The concept has been applied in different fields.

- 2. The *exclusive liability of the operator of the nuclear power plant*, meaning that the operator of the nuclear installation is liable for all the claims in case of a nuclear accident. It is the heart of the international nuclear liability regime, even if many countries didn't introduce this principle in their law and influenced them to adhere to any Convention. It is a highly debated principle, having as a base the simplification of the legal procedures in case of claims for compensation after a nuclear accident. It was created also with the purpose to encourage the development of nuclear energy. The weakness of this principle is that it limits the liability only to the operator, which financial situation can be limited to pay for all the damages after a nuclear incident or can simply not afford to pay it. In this case, the victims will have no possibility to claim to other parties.
- 3. *The limitation on the amount of liability.* The limitations protect individual nuclear operators, thus it is often controversial. A country may fix a higher level for financial security or a lower limit for less dangerous installations or activities. If more operators are available, then they are all jointly and severally liable. This was created to protect the operator from ruin. Private insurance is one of the most utilized methods by the operator to financially secure their liability. Besides insurance, there are other financial securities, which an operator may use: bank guarantee, pledges liquid assets, establishes a mutual fund or set up an operating pooling scheme. The weakness of this principle is that imposing a limit in amount victims are disadvantage to be fully compensated from the operator in case of a nuclear accident. It is another controversial principle, which was not adopted by many states in their national nuclear law.
- 4. *The liability is limited in time.* Generally, compensation rights are extinguished under both Conventions if an action is not brought within ten years. Actually, private companies limited their coverage in time, usually not more than ten years, because they tried to avoid claims for illnesses (cancers), which instituted after twenty or thirty years after the nuclear accident occurs,

being extremely hard to prove if it was caused by the nuclear incident or actually by some other factors. This limitation is not specified in many nuclear national laws, proving once again the weakness of the international regime.

- 5. *Insurance or other financial security.* This principle provides that the operator must be ensured or have a financial security according the limit of its liability. The states with the nuclear installation should ensure that they have the necessary funds to pay the compensation to all victims in case of a nuclear incident, without discrimination.
- 6. *Exclusive jurisdiction*. This principle provides that victims are allowed to bring claims only in front of courts of law of the state of the operator of the installation plant. Actually it brings a strong limitation of the victims to apply for claims in the court of laws of their own states. The principle was changed in many national laws for unlimited jurisdiction. The weakness of this principle is that the applicable law should be the law of the state where the nuclear incident occurs and not of the operator of the installation plant.
- 7. *Non-discrimination.* This principle provides that all victims have the same right for claims for compensation in case of damage caused by a nuclear accident, no matter of their nationality, domicile or residence.
- 8. *Definition of nuclear damage*. Damage occurred from a nuclear accident is provided as being property, health, loss of life. The weakness of this principle is that it is not provided as damage environmental damages, economic losses and many others, which occurred due to the nuclear accident as an indirect consequence.

The Joint Protocol was not successful to fulfil all the needs, which occurred to be improved in the international regime after the Chernobyl accident. The Protocol only joined the two regimes (Vienna Convention and Paris Convention), which at that time, meaning 1988, had only 24 parties, and not all these parties ratified the Joint Protocol.

The Protocol to amend the Paris Convention and associated the Brussels Convention

The Protocol to amend the Paris Convention and associated Brussels Convention was created with the scope:

- to enlarge the geographical coverage of complains for damages in case of nuclear incidents;
- to increase the financial amounts for claims in case of nuclear incidents; new

limits of liability were set.

The definition of nuclear damage was increased also for environmental damages and for economic losses. Furthermore, the units of account were changed to the euro to avoid fluctuations in the value of Special Drawing Rights (SDR). Special Drawing Rights (SDR) is the unit of currency of the International Monetary Fund and it's approximately equal to 1.5 US dollars. The 2004 Protocol gives the possibility of states, which have in the national law the provision of unlimited liability of the operator, to join the Convention.

The protocol was amended three times, in the following years: 1964, 1982 and 2004. Although it has enlarged the scope, the protocols are not yet in force.

The weakness of the regime is that the compensation can be claimed only when the damage occurred and it was suffered in the territory of the parties to the Convention.

The Protocol to Amend the Vienna Convention

The 1997 Protocol to Amend the Vienna Convention was one of the most significant move made in the development of the nuclear law. The protocol means more money available, more victims compensated and more damage compensated. Despite the many provisions it contains to encourage the adherence to it, few states actually signed the protocol. There are only 12 contracting parties to the Protocol, the latest being Jordan, which has acceded in January 2014. The Protocol entered into force in October 2003.

The weakness of this regime is that despite of many years of difficult negotiation to reach an agreement concerning this protocol, the interest to joint it was unexpectedly low. Important nuclear power generating countries, like: Canada, China, India, Korea and South Africa haven't shown the expected support as initially it was thought.

Nevertheless, the multitude of Conventions and the lack of connectivity among them created a confusing situation among states belonging to old Conventions, but not to the new Protocols or Joint Protocol or states belonging to two, three or more Conventions.

It is clear that there is a necessity for creating a unique regime with global scope.

The Convention on Supplementary Compensation for Nuclear Damage

The *Convention on Supplementary Compensation for Nuclear Damage* (CSC) was created with the scope to provide more funds for compensation the nuclear damages, establishing a two tiers system, as follows:

- first tier, the operator will be responsible for providing the necessary funds
- second tier, the member states to the Convention will be responsible for providing the necessary funds.

The CSC was adopted on the 12th of September 1997 together with the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage. The Convention provided that at least five signatory states with minimum of 400GW of installed nuclear capacity have to join the Convention before it can enter into force. Five countries ratified the Convention, however it was still not enough to complete the requirement of 400GW of installed nuclear capacity. India and China, even if they have such an important current or planned nuclear capacity, they didn't apply to any international nuclear liability convention, relying on their own arrangements. The CSC allowed the United States of America to join the Convention without being necessary to amend its national law, the 1957 Price-Anderson Act, which "provides for an economic channeling to the operator instead of the legal channeling approach provided in the conventions." (Davies, 2014) The United States of America plays an important role in the Convention, as one of the major nuclear power, participating with an important financial amount at the supplementary compensation fund.

On the 15th of April 2015, CSC entered into force, after Japan ratified the Convention on the 15th of January 2015. The entering into force of the Convention improved the number of nuclear power plants covered by a nuclear liability regime (meaning, the Paris Convention, the Vienna Convention and the Convention on Supplementary Compensation) from 193 to 340 nuclear power plants. (United States Mission to the International Organizations in Vienna, 2015) "This number can increase to 380 if Canada and India would join the Convention on Supplementary Compensation." (United States Mission to the International Organizations in Vienna, 2015) Nevertheless, this convention was established to create a global nuclear liability regime. It is hard to achieve it, considering that many countries with important nuclear

activity do not belong to any nuclear liability instrument. In this purpose the Convention opens doors to all states, nuclear states, non-nuclear states, legal channeling regime or economic channeling regime. States neither belong to the Paris Convention nor Vienna Convention can be member, but they have to have the national legislation consistent with the provisions of the CSC. As the other conventions, the jurisdiction of claims belongs to courts in the countries concerned. United States of America supports the Convention of Supplementary Compensation, while France considers the Paris Convention and Joint Protocols, influencing other countries to wait to see which convention will prevail, delaying the process of harmonization of the nuclear regime.

The problem in this regime is the way of contribution of the nuclear states to the International Fund (90% nuclear states according their installed capacity, 10% member states including nuclear states). It is a fair formula, based on the need basis, however can be counter productive for countries like France or others with an important nuclear activity. As a result, important nuclear countries refuse to join the convention diminishing its main scope to form a global regime.

Many nuclear states implemented *national legislation for nuclear liability*, which vary from states to states, and play an important role next to the international nuclear liability regime. In this respect, nuclear states have different positions, as followed:

- nuclear states parties in one or more international Conventions for nuclear liability and implemented also their own legislation for nuclear liability; national nuclear legislations are applied based on the principles of the international Convention ;
- nuclear states parties to an international Convention for nuclear liability and with a poor developed national nuclear liability regime (for example: Russia);
- nuclear states not member in any international Conventions for nuclear liability, however implemented a national nuclear liability regime (for example: South Korea, India, Canada); in this case, the national nuclear liability regime have provisions different as those written in the international Conventions, which can be taken as an example for the future development of the international nuclear liability regime (for example: operator's right to make recourse, provision implemented by the Indian Nuclear Act);
- nuclear states not party to any international Conventions for nuclear liability and not having any national legislation for nuclear liability (for example: China).

For harmonization the national law and practice with the international nuclear regime, it is important that both national and international system to converge. If a state wants to adhere to a Convention on nuclear liability, this state has to implement its national law according the principles of the international nuclear liability regime. There is one exception from this rule: United States of America. United States of America is a party in the Convention for Supplementary Compensation, even though its national nuclear legislation is based on another system than that provided in the international nuclear liability instruments. The International nuclear liability system provides a legal channeling system, while the United States of America provides an economic channeling system. The legal channeling system refers that all the liability is channeled to the operator of the nuclear installation. The economic channeling provides that the liability is channeled to any person, which is found liable for a nuclear damage. The acceptance of United States of America to join the Convention on Supplementary Compensation has its explanation in the financial contribution, which USA can bring to the supplementary compensation fund.

National law for nuclear damage plays an important role in the contracting states and non-contracting states, however can be contra productive leading to different applications, interpretations of the liability regimes and may create disharmony among states, parties in the same regime.

As a conclusion, significant attention has been given to develop an international nuclear regime with the purpose to establish a global nuclear regime in order to provide appropriate compensation for nuclear damages, although progress towards extending new prospects in the international nuclear liability conventions has at time been slow.

2.3 Improvements brought by the international nuclear regimes in case of an accident occurs at a nuclear power plant

For a clear imagine about the development of the international nuclear liability regime through the Conventions, the following chapter will present in Tables the actual liability regime and will focus on issues like amounts of compensations for victims, compensation of the nature of damages, time limitation for claims and coverage of entitlement by territory of the states.

Table 4: Amounts of Compensations for Victims under the International Nuclear Regimes

Paris Convention (PC) PC as amended by the 2004 Protocol	22.5 million EURO maximum 7.5 million EURO minimum (this can be seen as a weakness of the system) EUR 700 million minimum
Brussels Supplementary Convention (BSC)	1st tier (operator's tier): 22.5 million EURO maximum 2nd tier (operator's state tier): between 1st tier and 262.5 million EURO 3rd tier (fund of the BSC contracting parties): between 262.5 million EURO and 450 million EURO Total amount available: 450 million EURO (to increase the compensation to 450 million EURO was the main aim of BSC).
BSC as amended by the 2004 Protocol	1st tier (operator's tier): EUR 700 million minimum 2nd tier (operator's state tier): between 1st tier and EUR 1.2 billion 3rd tier (fund of BSC contracting parties): between EUR 1.2 billion and EUR 1.5 billion Total amount available: EUR 1.5 billion minimum No maximum provision.
Vienna Convention (VC)	Minimum USD 5 million, based on USD gold value on 29 April 1963 (USD 35 per one troy ounce of fine gold)

VC as amended by the 1997 Protocol	Interesting to note that no maximum provision can be found under VC. 450 million EURO minimum No maximum provision.
Convention on Supplementary Compensation for Nuclear Damage (CSC)	1st tier (operator/state's tier): 450 million EURO 2nd tier (fund of CSC contracting parties): 450 million EURO. Amount expected: 900 million EURO (225 million EURO exclusively reserved to cover trans-boundary damages)

(Nuclear Law Bulletin , 2014)

As a remark to the International Contribution Fund under the Convention on Supplementary Compensation, the contribution of the member states is made on-the-need basis, as following:

- nuclear states contribute with 90% from the total amount; the contribution of each nuclear state depends on their nuclear capacity
- non-nuclear states and nuclear states contribute with 10% from the total amount;

It is a clear and logic formula, however not positively taken by some nuclear states (for example: France), because of the contribution provision.

Table 5: Compensation of the Nature of Damages Suffered under the International Nuclear Regimes

Paris Convention (PC)	Personal and property damages, to or loss of life of any person and to or loss of any property.
PC as amended by the 2004 Protocol	Personal and property damages, to or loss of life of any person and to or loss of any property, economic loss, cost of preventive measures, loss of incomes, environmental damages.
Vienna Convention (VC)	Personal and property damages, to or loss of life of any person and to or loss of any property, any other allowed by the law of the competent court.
VC as amended by the 1997 Protocol	Personal and property damages, to or loss of life of any person and to or loss of any property, economic loss, cost of preventive measures, loss of incomes, environmental damages.
Convention on Supplementary Compensation for Nuclear Damage (CSC)	Personal and property damages, to or loss of life of any person and to or loss of any property, economic losses, cost of preventive measures, loss of incomes, environmental damages.

(Nuclear Law Bulletin , 2014)

Table 6: Time Limitation for Claims under the International Nuclear Regimes

Paris Convention (PC) PC as amended by the 2004 Protocol	10 years for all nuclear damages from the date of the nuclear accident. National law can permit longer. 30 years for loss of life and personal injuries from the date of the nuclear accident. 10 years for other nuclear damages from the date of the nuclear accident.
Vienna Convention (VC) VC as amended by the 1997 Protocol	10 years for all nuclear damages from the date of the nuclear accident National law can permit longer. Same as PC as amended by the 2004 Protocol.
Convention on Supplementary Compensation for Nuclear Damage (CSC)	10 years for all nuclear damages from the date of the nuclear accident.

(Nuclear Law Bulletin , 2014)

The time frame for bringing a claim, which is 10 year from the date of the nuclear accident is similar among Paris Convention, Brussels Supplementary Convention and Vienna Convention and was highly criticized as being too short. The Chernobyl accident was again an eye-opener to the conventions' drafters showing how inefficient a limitation in time and amount can be.

An interesting point as referring to Vienna and Paris Convention is that national law of contracting parties lead to different applications and interpretations of the liability

regime and created a disharmony even among the contracting states of a particular regime. (Adisianya, 2009)

Table 7: Coverage of Entitlement by Territory for the States under the International Nuclear Regimes

Paris Convention (PC)	-covers nuclear damages, which occurred in a PC state -covers nuclear damages, which occurred in a non-contracting state to the PC (the national law of the respective state has to provide it) In this respect, the national law plays a major role for contracting states and non-contracting states. The Convention lays down the general obligations of a state, while the national law is important in providing and determining. It can influence the application and interpretation of liability regimes and can bring disharmony among the contracting states parties in the same regime.
PC as amended by the 2004 Protocol	-covers nuclear damages, which occurred: - in a PC state - in a VC state - in a 1997 Protocol to amend the VC state - in a Joint Protocol state - in a non-contracting state in the PC
Brussels Supplementary Convention (BSC)	-nuclear damages, which occurred in a BSC state -nuclear damages, which occurred in a

	non-contracting state in the PC(the national law of the respective state has to provide it)
BSC as amended by the 2004 Protocol	-nuclear damages, which occurred only in a BSC state (with the remark that the operator be legally responsible under the PC)
Vienna Convention (VC) VC as amended by the 1997 Protocol	-nuclear damages, which occurred in a VC state -the law is silent, meaning that there is not an express provision. -applicable to nuclear damages anywhere suffered, except the non-contracting state if the national law of the contracting state doesn't allow it or the non-contracting state has a nuclear installation in its territory or maritime zones or does not afford equivalent reciprocal benefits.
Convention on Supplementary Compensation for Nuclear Damage (CSC)	-applicable for nuclear damages anywhere suffered -compensation limited to damage suffered in the territory of CSC state.

(Nuclear Law Bulletin , 2014)

As a remark, Paris Convention had only 14 member states and Vienna Convention had only 10 member states before the Chernobyl accident. According the stipulation that parties not expressly cover damages in non-contracting states, a party in the Paris Convention would consider a party in the Vienna Convention as a non-member state. It means that it would not provide compensation in event of an accident, which happens in a Paris Convention country, but causes damages in a Vienna Convention country only if it is provided by the national law of a Paris Convention state where the

nuclear installation of the liable operator is situated. The same situation is applicable also for the contracting states of Vienna Convention though not binding on the contractual state. (Adisianya, 2009) The eye opener of this complicated situation was the Chernobyl accident, when it was realized that it is not necessary to have two similar conventions with different geographical regimes.

In conclusion, it could be said that improvements have been made since the Chernobyl accident in the field of nuclear liability regimes. However, the present situation of a no-complete connection among the conventions is more confusing than before the Chernobyl accident. States can belong to Paris Convention or/and Vienna Convention without belonging to Paris Convention as amended by the 2004 Protocol or/and Vienna Convention as amended by the 1997 Protocol or/and Joint Protocol. Another situation when states can belong to Vienna or /and Paris Convention and Paris Convention as amended by the 2004 Protocol or/and Vienna Convention as amended by the 1997 Protocol without being part of the Joint Protocol. Moreover, states can belong to two or three or four of these conventions.

2.4 Nuclear Civil Liability Regimes in Various Countries

As mentioned before, the provisions in the national legislations can bring new views over the nuclear liability regimes, offering new dimensions for the international nuclear liability regimes and contributes to a progressive development of a universal global regime. The strict liability of the operator is the heart of the nuclear liability regime. However, Indian Civil Liability for Nuclear Damage, as well as the Korean nuclear legislation introduces the element of recourse of the operator.

Canada

Canada is not a contracting party to any of the international nuclear liability Conventions. It developed its own nuclear liability legislation based on the principles of the international liability regime. The main supervisory authority in the field of nuclear energy is the Ministry of Energy, Mines and Resources. Its Regulatory Agency for nuclear issues is the Canadian Nuclear Safety Commission. Canada adopted its Nuclear Liability Act in 1970 and entered into force in 1976. (Saxena, 2014)

The operator is liable for nuclear damages in case of loss of life and personal injuries,

damage or loss of property or damage resulting from such loss or damage. Nuclear damages, which cross Canadian borders are not under the liability of the operator. The operator is liable for trans-boundary nuclear damages only if it exists such an agreement between Canada and the state affected of the nuclear accident. However, environmental damage, deferred damage and costs of preventive measure are not provided under the Canadian Nuclear Liability Act. “Example is the arrangement between Canada and U.S (Canada — U.S. Nuclear Liability Rules) which became effective as on 11.10.1976, provides that Canadian operators are liable for injury or damage that is sufficient in the U.S. but caused by a nuclear incident occurring in Canada. Similarly, the local Canadian Courts having jurisdiction for such incidents are also competent to adjudge in such case where U.S. citizens claim compensation for damage or injury resulting therefrom.” (Saxena, 2014) The operator must have an insurer approved by the competent Ministry, unless the nuclear installation is operated by the Canadian State. The court jurisdiction is the place where the nuclear installation exists and where the incident occurs.

Canada signed the Convention on the Supplementary Compensation, however still hasn’t ratify it. Canada is a good example for a global liability regime, where states bring their legislation in compliance with the instrument they want to ratify, so that to bring a harmony within the national and international nuclear legislation.

France

France is a contracting party to the Paris Convention and lately also to the Joint Protocol. The main supervisor authorities in the field of nuclear energy are the Ministry for Industry and Regional Development and the Ministry for Research and Technology. The French Nuclear Liability Act was adopted in 1990 and provides that the operator is liable for nuclear damaged suffered in the territory of contracting parties to the Paris Convention and to nuclear incidents and damages occurring on the high sea. According with the Paris Convention, the operator is liable for damages occurring at the nuclear installation or on site property. Regarding trans-boundary damages, there is no provision for compensation to be paid mentioned in the French Act. In case of the failure to pay compensation by the financial guarantor, insurer or operator the State will pay the compensation to the victims up to the liability limit of the operator. (Saxena, 2014)

Important to realize is that France have an important number of nuclear power plants under operation, making it one of the important nuclear country. Its adherence to the

Convention of Supplementary Compensation is highly wished, even if France doesn't show interest. Besides that the International Fund in the mentioned regime totally disadvantage France, touching toughly its economy in case of adherence.

The United Kingdom

The UK is a contracting party to both Paris Convention and the Brussels Supplementary Convention. Its legislation follows the rules provided in the mentioned Conventions. It covers damages occurring to persons and property caused by the radioactive properties, ionizing radiation and contamination in the territories of contracting countries. In case of trans-boundary damages in the territory of non-contracting parties, the damages are not covered. As mentioned in the Conventions, the liability of the operator is limited in time and in amount. The Nuclear Power Plants are operated by the British Energy plc., which is owned by the UK Government and the commercially operating AEA Technology plc. under the Atomic Energy Act 1946.

As a positive example, United Kingdom made changes to its legislation putting it in line with the amendments adopted in 2004 and increased the operator liability from 224 million $ per incident to 1,6 billion $. It is much more than minimum necessary under Paris Convention and Vienna Convention. United Kingdom, as an important nuclear country, brought changes in its legislation regarding damage, economic loss and finance, making a step forehead the Conventions where it is a party.

Peoples Republic of China

China, though one of the world's fastest growing nuclear energy producers and owner of a significant number of nuclear power plants, is not a contracting party to either Paris or Vienna Convention. Moreover, China has never developed an own legislation system addressing the use of nuclear energy in China and for nuclear liability. All regulations are dealing only with nuclear safety and nuclear exports. The limited provisions of the laws and quasi-administrative regulations will continue to be used in China for a certain period concerning nuclear liability issues. It is a long way to go for Peoples Republic of China in enacting the Atomic Energy Law and to improve the legal regime of the nuclear liability. (Yuan, 2012)

China, as an important nuclear power, should adopt a nuclear liability regime in compliance with the international nuclear regime, but in the same time new provisions, like unlimited liability and proportional liability would be a step forward for an effective

nuclear legislation.

North Korea

Similar like Peoples Republic of China, North Korea has lacks any regimes.

Russia

Russia has been forced to consider the issue of nuclear liability and compensation. Russia signed the Vienna Convention in 1996 and ratified it in 2005. Since 1996, Russia is trying to adopt a federal act to cover liability for nuclear damage, called “the Bill”, but unsuccessfully. The bill covers the basic principles of civil liability for the operator of a nuclear plant and describes the mechanism for its financing and court procedures for claims for compensation in case of nuclear damage. The bill introduces joint and several liabilities in case the accident occurred due to more operators. The maximum limit of liability is USD 150 million, but shall not be less than USD 5 million. The compensation time limit is 10 years from the date of a radiation accident. However, there is no limitation in time for claims for compensations at persons. (Lebedeva, 2014) The adaptation of “The Civil Liability for Nuclear Damage and its Financial Security” bill in Russia was necessary because of the inability to provide compensation in case of a nuclear damage from the federal budget, the limitation of the operators to fully cover the compensation of such damage and the condition of the domestic insurance market, where private insurers cannot act in absence of proper legislation and would allow Russia to establish its legal regime for civil liability for nuclear damage.

Russia has many contracts for building new nuclear power plants and for supplying nuclear equipment in different countries, making it an important player on the nuclear market.

No special improvements to note for the international liability regime. The provision in the 1996 Bill of no time limitation can be considered a step forward for the future international liability regime.

Germany

Germany is a contracting party to the Paris Convention. Germany has unlimited operator liability and requires in security per nuclear power plant 2.5 billion euro.

(Tromans, 2010) Following the Fukushima Daiichi nuclear accident the German Federal Government decided to close the use of nuclear energy for electricity generating purposes. As a result, relevant legislation was enacted with the purpose to close seven oldest nuclear power plants.

Germany makes a step back due to the public concern after the Fukushima accident. The external factors are the major elements, which influence the development of the German nuclear legislation. Germany, as a strong economic power, should consider to develop its nuclear power energy and to export its technology in the future.

The unlimited liability of the operator is one of the recommendations, which should be provided also in the international nuclear liability regimes, proving once again the flexibility of the national legislations in front of the international regimes.

Sweden

The Swedish government considered the idea of unlimited liability, however decided to require insurance for around 302 million euro. (Tromans, 2010)

Finland

In Finland, the legislation adopted in 2005 provides for unlimited liability and requires, at least, 700 millions Euro insurance. (Tromans, 2010)

Austria

Austria is a non-convention State and operates no nuclear power plants, except a research reactor. In 1998 Austria adopted a new Federal Law on Civil Liability for Damages Caused by Radioactivity, which doesn't keep the basic principles of the Conventions. The legislation provides unlimited liability, not channeling to the operator, wider definition for the damage covered, provision to facilitate proof of causation, and jurisdiction for the Austrian court with the applicability of the Austrian law, when damage occurred in Austria regardless where damage was caused. (Tromans, 2010)

Switzerland

In Switzerland, the own nuclear legislation provides the unlimited liability of the operator and requires the operator to have an insurance in the amount of 1,1 billion CHE.

The unlimited liability, which can be found in the Swedish, Swiss, Finish and Austrian legislations for nuclear liability proves one again the flexibility of the national nuclear law comparing it with the international nuclear regime. However, these are not the only countries, which provide such a requirements.

South Africa

South Africa is not a party to any international nuclear liability regime. It has an emerging program for the development of the nuclear energy in the state. In this respect, South Africa would like to adhere to the Convention on Supplementary Compensation. Its national nuclear legislation is providing mostly the principle of the international nuclear liability law. Important to mention, South Africa is a member in the Convention on Nuclear Safety.

Iran

Iran is not party to any international nuclear liability convention. Iran would like to adhere to the Convention of Supplementary Compensation. In this respect, Iran should develop its national liability legislation in concordance with the principle of the international nuclear liability regime and should adhere to the Convention on Nuclear Safety. Currently, Iran holds nuclear installation on its territory.

Japan

Japan is not party to either Paris or Vienna Convention, however it signed in January 2015 the Convention on Supplementary Compensation, which entered into force, due to Japan adherence, in April 2015. Japan has a good structured own nuclear liability regime since 1961 based on a collection of laws, as followed:

- *Civil Code*
- *Indemnity Act* (established with the purpose to secure the compensation for the nuclear damages against a financial deficit)
- *Indemnity Order* (established with the executional scope of the Indemnity Act)
- *Compensation Act* (established with the purpose to compensate the damages occurred as a result of a nuclear incident),
- *Compensation Order* (established with the executional scope for the Compensation Act).

Actually, Japan developed its own nuclear liability regime, independent from the

international nuclear liability agreements. According to Japan's legislative framework:

- The operator is absolutely liable.
- The operator is exclusively liable.
- The liability is not limited in amount.
- Financial security of the operator of the nuclear power plant at maximum 1.04 billion EURO up to June 2011.
- Where nuclear damage exceeds the financial security amount, the government, authorized by the National Diet, may help a nuclear power plant operator to compensate the damage to the necessary extent.
- Claims can be brought in front of the court of law up to 20 years from the date the nuclear damage occurred and within 3 years from the date of discovery of the damage.
- The legislative power invested to mediate the claims for nuclear damages is a committee specialized in nuclear liability regimes and compensation system. (Legal Affair Section of the OECD Nuclear Energy Agency, 2011)

The operator of a nuclear power plant is strictly and exclusively liable for damages, which occur in case of a nuclear incident according Japanese law. However, in case of an earthquake or tsunami the question of exoneration is pertinent. In this case, the Government has to take the action to compensate victims and to stop the spreading of the damage. However, Japan, due to its earthquake prone archipelago, has an interesting view on natural disaster, classifying it as "huge natural disaster beyond all expectations of humankind". As example, the earthquake from Kobe in 1995, registered as 6.9 on Richter scale and having 5000 deaths as a result, was not classified by Japanese as a great natural disaster having an exceptional character. Regarding the Fukushima accident, the government of Japan didn't suggest that Tokyo Electric Power Company should be exonerated from the liability because of the exceptional character of the natural disaster. In the same time, Tokyo Electric Power Company didn't invoke this clause for exoneration in its favor.

As a remark, the 2004 Protocol to amend the Paris Convention and the 1997 Vienna Protocol do not have the clause according which the operator is exonerated of the liability for nuclear damage caused because of natural disasters. The exoneration can occurred only as a result of armed conflict, hostilities, civil war, or insurrection. The Convention on the Supplementary Compensation provides the clause of exoneration of liability for nuclear damage of the operator of the nuclear power plant in case the accident, which caused the nuclear damage, occurred due to natural disasters with

exceptional character. Nevertheless, the law of the installation state can provide on contrary to the Convention on the Supplementary Compensation.

The operator has no liability limits according Japanese law. Each nuclear installation has to be insured under the Compensation Law requirements or can create a deposit at the legal affair office. In case of an accident victims would be compensated from the cash or the deposited securities. (Legal Affair Section of the OECD Nuclear Energy Agency, 2011) In case the damage exceeds the maximum amount of financial security of JPY 120 billion, the operator remains liable (unlimited liability) and the government, authorized by the National Diet, shall give the necessary financial assistance to the operator for the compensation of the damage. Following the Fukushima accident, the government of Japan supported Tokyo Electric Power Company (TEPCO) under the framework of Compensation Act to compensate damage caused by the accident.

According the Indemnity Act, the nuclear operator, which is not able to cover its financial obligations through insurance or other financial security, “the government may indemnify that operator in respect of compensation which it (the operator) has been obliged to pay”. (Legal Affair Section of the OECD Nuclear Energy Agency, 2011) This is an important aspect in the Japanese law, because many operators cannot obtain insurance or other financial securities because the danger of some risks, like earthquake, volcanic eruptions or tsunamis. The Japanese law distinguishes the natural disasters from the exceptional natural disaster cases, so the government may indemnify the operators. So, nuclear damage caused by an earthquake or volcanic eruption is subject of such an indemnity agreement. (Legal Affair Section of the OECD Nuclear Energy Agency, 2011)

Regarding the trans-boundary nuclear damages, Japan was not a part of any international conventions until January 2015, relying on its own legislation. Japanese courts have jurisdiction to apply for claims, but the applicable law for claims is not necessary to be that of Japan. In case the claim, which happened outside Japan, is claimed in a foreign court of law, the claimant has to obtain an executional judgment from a Japanese court of law for the enforcement in Japan (“judgment on judgment”). (Legal Affair Section of the OECD Nuclear Energy Agency, 2011)

Japan nuclear legislation is a good structured law and conforms generally to the international nuclear liability regimes. It showed that good practices and improvements in the nuclear legislation could lead to an effective legislative preparedness in case of

a nuclear incident. It has provisions that might be provided in the international nuclear liability regimes to cover the inadequacies, which exists in the current Conventions for nuclear liability (as example, the unlimited liability of the operator, compensation for rumor related damages). Nevertheless the operator could not exonerate itself from the liability for accidents caused by “grave natural disaster”.

India

India is not a contracting party to any of the international nuclear liability Conventions. It has its own nuclear liability legislation based on the principles of the international liability regime with a few, but controversial exceptions. The reason why India adopted a nuclear liability regime different from one of the main principle of the international nuclear liability regimes, it comes from the tragic event of Bhopal chemical leak. Bhopal chemical leak accident was an eye-opener for India to establish an effective nuclear liability regime, which corresponds with its interests and needs. It is considered as the worst industrial disaster. Many thousands of people died immediately after the accident because of the inhalation of toxic fumes. (Kumar and Patil, 2014) The company, Union Carbide Corporation (UCC) left the government of India to deal with the damages and it paid compensation only in 1989. In 2005, India signed a cooperation agreement on civilian nuclear issues: the collaboration was never consumed because 3 years later Indian Parliament passed a Nuclear Liability Bill which put a great charge on both nuclear operator as well as suppliers in terms of liability in case of an accident, reason why there were no more US investments in nuclear energy space in India. The supplier community considered the Indian law as deviant from international legal instruments such as Convention for Supplementary Compensation and the Vienna and Paris Conventions. In 2010 India adopted the Liability Act for nuclear damages and in 2011 the Liability Rules for nuclear damages. Section 17 from the Civil Liability for Nuclear Damage Rules provides that the operator shall have the right for recourse in the following cases:

- such right is expressly provided for in a contract in writing;
- the nuclear incident has resulted as a consequence of an act of supplier or his employee, which includes supply of equipment or material with patent or latent defects or sub-standard services;
- the nuclear incident has resulted as a consequence of an act made on purpose to cause nuclear damage .

Section 17(b) created much international consternation. The Liability Act has not changed the major principle of channeling the right to the operator, but extended the right of the operator to recourse. It's a new provision in the nuclear liability law. The international nuclear liability law provides an exclusive liability of the operator, however in the case the nuclear incident happens as a result of supplier's negligence, the operator is still liable for the damages caused, while the supplier remains free of fault. The victims of the nuclear incident might not get the compensation because the funds of operator, which is the only liable alone, are not sufficient. Under the Liability Act, the operator can make recourse against the supplier and the supplier becomes liable for the nuclear damages occurred as the result of the nuclear incident.

India has a very ambitious nuclear program, which may lead it in the near future to a balancing negotiation power and may modify certain nuclear liability principles. It may be that in the future it will not be so easy, from the public policy perspective, to explain the exclusion of certain groups, like suppliers from the liability in certain situations. (Gruendel, 2012)

Nevertheless, United States of America suppliers considered the Indian legislation too risky to invest in the country, so they stopped the collaboration on nuclear field. The U.S. Government tries to find solutions not to keep American companies out of the Indian nuclear market. The Government is conducting a policy of persuasion with the scope of signing a bilateral agreement in which the Indian Government would decrease the restrictions impose on the suppliers on nuclear field. From Russia point of view Indian nuclear liability law is not dangerous for their suppliers, so they continued the cooperation with the country. France approach was different from Russia, presenting significant concerns about the Indian law. However, France took a midway position between India's believe that their liability law is completely convergence with the Convention on Supplementary Compensation and U.S. position that it's a total deviation from the international nuclear regime.

On the 15th of January 2015, USA and India had an agreement on the civil nuclear issue. The Indian government agreed to limit legal liability of the US suppliers in the event of a nuclear power plant catastrophe and raised the possibility of an insurance pool, which will, in theory, moderate the risk of US suppliers in India. (Roberts, 2015) The insurance pool will be raised from private money as well as public money by the government of India. However, the" key sticking point is what's going to happen on liability in terms of suppliers versus operators, as far as the liability extend to both."

(Tiezzi, 2015)

Indian law has to be seen as an evolution point for the nuclear liability law, setting a new dimension towards nuclear supplier's liability and a new dimension in the development of the international liability regime.

2.5 International Nuclear Liability System versus National Legislations for Nuclear Liability

As an illustration, there is a set of international conventions prepared to provide compensation to victims for damage arising from nuclear incidents, however the number of states, which ratified or implemented these conventions are still limited. With this in the mind, it is appropriate to ask if more States should join or not the international nuclear liability regime. For a better understanding and for a better differentiation between the systems, a comparison between the international nuclear liability system and the national legislations for nuclear liability will be presented in the following lines. The first and most important comparison is the uniformity under the convention and the variety under the national laws. From this point of view, the victims have a significant advantage under the nuclear liability convention, mainly because of the generalization of rules for the protection of potential victims. Most national laws do not meet the rules of protection for the victims as it is provided in the conventions. In this case, the protection of the victims is entirely depending on where the damage or incident occurred and what the national law of the country where the accident happened provides. However the international nuclear liability regime has its own disadvantages compared to national law. (International Expert Group in Nuclear Liability , 2010) The disadvantages are the following:

- Amounts limitation of liability of the operator, while a considerable number of non-convention States allow unlimited liability.
- Limitations in the definition of "nuclear damage" as compared to some national laws.
- Limitations in time, which in some cases is shorter then provided under national law.
- The third persons, which are liable under the national laws cannot be liable under the international conventions. (International Expert Group in Nuclear Liability , 2010)
- Exclusive jurisdiction of the courts of that states. Victims of a trans-boundary

accident will be forced to sue in a foreign State because of the exclusive jurisdiction of the courts of that State. So, the victims cannot sue only in the State where the nuclear damage or incident occurred.

- The existence of several Conventions, which are in force, but ratified only by some states and Conventions, which are not yet in force decrease the uniformity of a unified nuclear liability regime. However, the CSC and the Joint Protocol seek to unify the Paris and Vienna Conventions.
- The strict liability of the operator is the heart of the international nuclear liability regime. Indian Civil Liability for Nuclear Damage, 2010 (Indian Act) holds, however, the supplier of the nuclear material or equipment " with patent or latent defect or substandard services" liable for the operator. (Saxena, 2014) Korean legislation introduces the element of fault based on the liability of the supplier.

Overall, the provisions in the national legislations can bring new views over the nuclear liability regimes, offering new dimensions for the international nuclear liability regimes and contributes to a progressive development of a universal global regime.

Chapter 3

Case Studies

In order to better understand the implications of a nuclear accident, this chapter will present short scenarios of nuclear accidents, which occurred in the past and influenced the development of the international nuclear liability regime and the inadequacies, which were in the liability regime at the time the incidents occurred.

Nuclear accidents can occur in states, which are Contracting Party to one or more nuclear liability Conventions or in states, which are not Contracting Parties in any of the nuclear liability Conventions. Same situation, the damage can occur in states, which are Contracting Party to one or more nuclear liability Conventions or in states, which are not Contracting Parties in any of the nuclear liability Conventions. The nuclear damage can be only in the state with the nuclear installation or can be also in other states.

Nevertheless, nuclear power plants accidents occurred in the history of nuclear energy having a common point, the devastating long-term effect over the people and the environment. The Three Mile Island accident (United States of America), the Chernobyl accident (Ukraine) and the Fukushima Daiichi accident (Japan) are considered serious nuclear disaster due to their major devastating effects. (Figure 2) For a better understanding of the impact of the nuclear accident, a list has been created with the most important nuclear accidents, which happened since 1961. (Table 8)

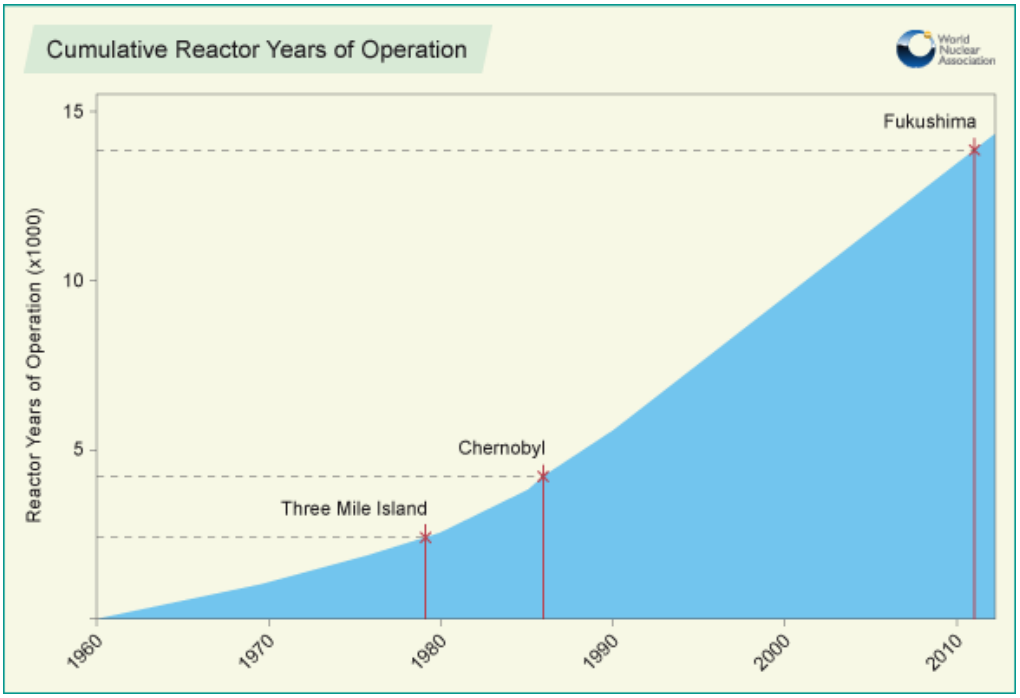

Figure 2: Three Serious Accidents (World Nuclear Association, 2015)

Table 8: List of Most Important Nuclear Accidents at a Nuclear Power Plant

Name	*Year*	*Level*	*Cause*	*Effects*
Chernobyl, Ukraine	1986	7	-human operational failure; -emergency shutdown of the reactor ended with an explosion at the core	-high radiation contamination -many death (31people) -trans-boundary effect -long-term effect on health of the people (for example: cancer) It is said to be the worst nuclear accident ever.
Fukushima, Japan	2011	7	-equipment failure -nuclear reactor meltdown	-radiation contamination -no death -no trans-boundary effects
Three Mile Island, Pennsylvania, USA	1979	5	-human operating loss -nuclear reactor	-radiation contamination -no long-term effect registered on human

			meltdown	health -no trans-boundary effect It is said to be the worst commercial nuclear accident, which happened at a nuclear power plant
SL-1 Experimental Power Station, Idaho, USA	1961	4	-human operating loss -steam explosion, creating nuclear reactor meltdown	-radiation contamination -human death(3 operators died) -not trans-boundary effect
Saint-Laurent, France	1969	4	-human operating loss -melting of 50 kilogram of uranium in a gas cooled reactor	-radiation contamination -no trans-boundary effect -no human death -it is said to be the worst nuclear accident, which happened in France
Buenos Aires, Argentina	1983	4	-human operating loss, during a fuel plate configuration	-one death -17 people high radiation exposure
Tokaimura, Japan	1999	4	-human operating loss -highly enriched uranium(more then usual) added in the precipitation tank	-human death (2 workers at the nuclear plant) -high radiation contamination at the nuclear plant -radiation contamination of the surrounding areas

3.1 The Impact of Chernobyl

At the time of Chernobyl disaster three international nuclear liability Conventions were in force: The Paris Convention, The Brussels Convention Supplementary to the Paris Convention and the Vienna Convention. However, the regime could not help to compensate the victims. By the time of the accident the Soviet Union was not a contracting party in any of the international nuclear liability regimes. Additionally, the Soviet Union had no own nuclear legislation on liability regime. The state was in a deep communistic regime with no intention to collaborate with other countries, even if the nuclear accident caused enormous damages outside the territory of the Soviet Union.

Chernobyl accident had a devastating effect. It killed thirty people immediately. Thousands of people died of cancer as an effect to the radiation exposure. Thousands of children were borne with deformities. Even nowadays there are reported cases of cancer and deformities as a long-term effect of the nuclear accident. It caused damages estimated at 7 billion USD. Hundreds of thousands of people had to leave their homes after the accident. The most affected countries after the accident were Belarus, Ukraine and Russia.

It was the first time when the International Nuclear Community realized that it's not enough to establish an international liability regime, but there is also vey important to attract as many states as possible to adhere the regime. By the time of the accident, there were only 24 parties in the Conventions. Paris Convention had 14 members, while Vienna Convention had 10 members. The parties in the Paris Convention considered that a party in the Vienna Convention as non- contracting state and would not provide compensation as provided in the Paris Convention in case of an event which occurred on the territory of an Paris Convention state, producing damage on the territory of a Vienna state. It shows how complicated and not prepared for such a disaster was the international liability regime. The geographical coverage, the compensation system as well as the stipulated limited amounts showed that even if Soviet Union had been a party in the regime, the amount of compensation would have been insignificant compared with the devastating effects of the accident.

After the Chernobyl accidents states realized the importance of cooperation and the importance of creating an efficient international nuclear liability regime. It initiated an international work and comprehensive law-making at both national and international

level.

3.2 The Impact of Fukushima

Fukushima Daiichi nuclear disaster was a series of equipment failures, nuclear meltdowns and releases of radioactive materials at the Fukushima, Nuclear Power Plant, following the Tohoku earthquake and tsunami on 11 March 2011.

It is the largest nuclear disaster since the Chernobyl disaster of 1986 and only the second disaster (along with Chernobyl) to measure Level 7 on the International Nuclear Event Scale. By the time of the accident, Japan was not part of any international conventions. However, its nuclear liability regime was good structured and constantly revised (every ten years). In the case of Fukushima Daiichi nuclear disaster the liability for damages belonged to the Tokyo Electric Power Company (TEPCO). Under the Japanese law, the operator of the nuclear installation, in this case Tokyo Electric Power Company had:

- Exclusive liability, meaning that it was considered liable for all the damages, which occurred due to the nuclear accident;
- Absolute liability, meaning that the victims don't have to proof the fault of TEPCO, because TEPCO is liable for the nuclear damages occurred after the accident;
- Unlimited liability in amount, meaning that TEPCO had to compensate all the damages without having a limited amount for the compensation;
- Limited liability in time, meaning that victims of the Fukushima nuclear accident have to bring claims against TEPCO in front of the Japanese courts of law in 20 years from the date the accident occurred and within 3 years from the date the damage was discovered;
- The obligation to have an insurance or financial security. TEPCO didn't have insurance due to the risk of earthquakes and tsunamis' events, which cannot be insured, however it had an Indemnity Agreement with the Japanese Government on the amount of 120 billion Japanese Yen (89,64 billion EURO), which represents the amount the company would have had to be insured by the insurance companies.

Following the events after the Fukushima nuclear plant accident, the problem arose in the compensation issues, to distinguish the victims:

- which suffered damages as a result of the nuclear accident and exposure to

the radiation contamination and,

- which suffered damages as a result of the earthquake and tsunami.

TEPCO received from the government the financial amount in value of 120 billion Japanese Yen (89,64 billion EURO) according the Indemnity Agreement and compensated a part of the nuclear damage occurred as a result of the accident. Hundreds of thousands of people were evacuated from the area and all of them had to be compensated. Even if the amount for compensation exceeded the amount TEPCO was insured through the Indemnity Agreement, TEPCO was still considered liable, due to the unlimited liability. In this respect, the government established a fund for compensation, which represented the government and the Japanese nuclear power plants operators' support to enable the payment of the compensation to the victims of the nuclear accident. TEPCO will have to return the money received through this fund in time.

Nevertheless, the Fukushima Daiichi accident was "a watershed event". (Nuclear Law Bulletin , 2014) It has change the view that was leading the nuclear power plant safety requirements previously and the safety expectations worldwide. The previous view was that a nuclear event can happen due to internal factors to the plant, and not external as it happened in case of Fukushima accident. This accident showed that external factors could have devastating impacts on the nuclear power plant and the protection against events caused by external factors are as important as the protection against internal factors. (Nuclear Law Bulletin , 2014) Overall, the immediate aftermath the Fukushima accident, polls indicated that the negative feeling against the nuclear energy increased dramatically up to 50%. Countries around the world took precautionary steps to improve the safety of nuclear power plants.

Notably, Fukushima accident is playing a catalytic role in the future development of the international nuclear liability regime. Japan recognized for the first time the importance to be part in an international treaty, even if its nuclear liability law is good structured and based on constant improvements. After my opinion, sharing practices and recognizing that these networking needs to be strengthen among the states, is one of the biggest achievements, which Fukushima accident brought for the future development of a global liability regime. Once it was determined that it is a problem in the regime, there is a great deal of difficult work to be completed. Nevertheless, analyzing the compensation costs of the accident, the provision of unlimited liability in amount as well as the compensation system provided in the Japanese nuclear law can

be taken as a good example in the development of the international nuclear liability regime.

Fukushima Daiichi accident happened in a time when the Convention on Supplementary Compensation, as well as the 2004 Protocol amending the Paris Convention was not yet in force. If Japan had been party to the Convention on Supplementary Compensation in the time of the accident, the Convention would have been in force providing a compensation amount of 450 million EURO under the first tier plus another 450 million under the second tier from the International Fund of the Convention's contracting parties. For the Convention on Supplementary Compensation to enter into force must have been ratified, accepted or approved by at least five states, which have together minimum of 400GW installed nuclear capacity. After the tragic event at Fukushima, Japan ratified the Convention on Supplementary Compensation, which entered into force in April 2015.

If this accident would have happened in a state party to the Paris Convention, Brussels Supplementary Convention or Vienna Convention, the compensation requirement for the damages occurred as a result of the nuclear accident would have been much too low (450 million EURO according the Paris Convention's maximum liability amount and 5 million USD according the Vienna Convention's minimum liability amount). If this accident would have happened in a state party to the 1997 Protocol amending the Vienna Convention, the compensation requirement for the damages occurred from the nuclear accident would have been higher than in the Conventions mentioned before, more specifically the minimum amount of 450 million EURO. These amounts show the distressing state the international third party liability regimes are. (Kus, 2011)

The disasters at Fukushima and Chernobyl have demonstrated the world that accidents can occur and their effects are tragic. After the Chernobyl accident, the main goal of the international cooperation was to prevent an accident to happen again. This failed. Additionally, the accident put a serious test on the international co-operation and international nuclear law drafters after 25 years from the Chernobyl accident. Even if Japan has solid national third party liability legislation and there were no trans-boundary effects, both accidents, Chernobyl and Fukushima, demonstrated once again that countries should not cope with a nuclear catastrophe alone. However, the question arises where and how the international regime show weakness.

Add to this picture, the Fukushima Daiichi and Chernobyl accidents have common

features, regarding the amount of damage, which could have been much higher if the accident would have happened close to major population centers or if the wind direction had been different at the time of the accidents. Another common aspects are that both countries were not party to any of the international liability regime at the time of the accident and in both cases the insurance remained out from compensating the victims.

With this in mind, the paper continues to present the inadequacies, which exists in the current liability regime and states recommendations as a new view in the development of the international liability regime.

Chapter 4

Recommendations

The mishmash of poorly ratified treaties ruling the international liability regime does not compose a legitimate nuclear regime for those put at risk by this activity. A new liability regime should be drafted, which include:

- No limitation liability in quantum and duration;
- Proportionality liability of the state, manufacturer and operator;
- Access to neutral tribunal;
- A broad definition of damages;
- No statute of limitation;
- The establishment of an adequate compensation fund;
- Membership.

1. Unlimited liability

Some countries considered that the provisions in the national laws put victims in a more favorable positions, so they didn't adhere to any convention. One of the main differences which is provided in the national nuclear regime and it is different in the international liability regime is the *unlimited liability* of the operator.

a. The limitation should be *unlimited in amount*.

A nuclear accident can have extremely devastating effects, highly acknowledged by the states as the tragic accidents at Chernobyl and Fukushima happened. What has changed since 1950 is that the nuclear industry became a strong player in the world. At first, the limitation of the operator was imposed with the scope to encourage the investments in the nuclear industry and to ensure the protection by allowing the availability of a minimum amount in the event of a nuclear accident. Despite this, the limitation of liability is still maintained in many countries, except Germany, Japan, Austria and Switzerland, and lately followed by Denmark, Finland and Sweden. (Kus, 2011)

It is well known that an unlimited liability can not be secured, however many nuclear power plants' operators have a strong running business, well demonstrated by the Fukushima's power plant operator, the Tokyo Electric Power Company. The limitation

is specified in the Conventions with the scope to protect individual nuclear operators, according IAEA and thus is often controversial. However, few states have chosen an unlimited liability, because of the danger to ruin the operator and to encourage it to take actions to avoid ruin. (Currie, 2008) So, the current liability regime protects the operator. A ruined operator cannot anymore afford to pay the compensations for the damages caused and the insurance cover cannot be unlimited. As a conclusion, the unlimited liability amount can lead to ruin the operator, while the limited liability may lead to ruin the victim. (Currie, 2008) All these arguments show that actually the main problem starts from the exclusive liability of the operator. Because the liability refers exclusively to the operator, the limitation of the amount comes to protect the operator not to be ruined and to obtain insurance cover. Low limits make the insurance cheaper. In case of a nuclear incident the limitation in the amounts are far away from the real amounts that could be necessary to cover all the costs from the damages occurred. This means the potential victims may not be fully compensated.

An operator cannot fully cover the potential cost of a nuclear accident. It means that the cost of operating nuclear power plant would increase significantly. Although the Conventions increased the amount of compensation in case of nuclear damage, the limit is still grossly inadequate. As example, in Germany the total potential damage of a reactor meltdown is estimated to 5,000 billion euros (K. Rennings, 1992); Belarus suffered economic damages of US$235 billion, after Chernobyl accident, according to one estimate. (Embassy of the Republic of Belarus, 2005)

b. The limitation should be *unlimited in time*.

It's hard to determine a limitation in time, when nuclear damage may not been known for many years, even for generations. Actually, many damages, like illnesses (cancer) can occur after twenty – thirty years after the nuclear accident happens, and it's extremely hard to prove if it was caused by nuclear incidents or other causes. In many states there is a 30 years time limitation period, which is sometimes not enough, considering the long-term effect of a nuclear accident. Conventions provides a limitation in time of 10 to 30 years from the date the accident occurred and claims can be brought in front of the courts of law within 2 and 3 years from the date of discovery. Chernobyl accident proved how inefficient the limited time and amount was.
In 1986, as Chernobyl accident happened, it exposed the weakness of the first generation liability regimes. It gave a clear image how destructive a nuclear accident can be and how inefficient the limitation in time and amount is. New generation

convention was established, which provides 30 years limitation in time from the date of the nuclear accident. However, 30 years is still a limitation in time, when an exposure to excess ionizing radiation can bring negative effects on human beings and it can take longer time than 30 years until it's visible on victims. So, under the new Brussels Supplementary Convention and the New Paris Convention, the time limit is 30 years for loss of life and personal injury claims and 10 years for other damages. In the Convention on the Supplementary Compensation the limitation in time and amount remains unchanged. (Adisianya, 2009)

The recommendation for the unlimited liability in time is essential, because the claims for nuclear damages could be brought in front of the courts any time after the accident. It should improve a lot the system, giving the claimants time to bring complain and to obtain the compensation for the damage suffered many years ago.

The recommendation for an unlimited liability comes as a necessary solution for the protection of the victims of a nuclear incident to be fully compensated in amount and at any time of discovering. This clause can be found in many national liability regimes extending the possibility of compensation and stating the improvements, which have to be brought in the development of the international nuclear regime.

2. Proportionality liability of the state, supplier and operator

The center of the international nuclear liability regime is the principle of exclusive liability of the operator. This principle was highly contested by many states, influencing in some cases the decisions of the state not to join the Conventions. The liability of the operator is well - established in the conventions. It means that in the case of an accident, all claims are to be brought against the nuclear operator, no matter of the fault. Under the law the operator will be always liable for all the damages occurs as a result of a nuclear incident. This prevention was highly criticized because it gives immunity to the supplier or builder of the nuclear facility in front of the law. Indeed, it simplifies a lot the procedure, but in the same time disadvantage the operator of the installation plant and the victims, in case the insurance of the operator don't cover all the compensation costs arose from the nuclear damages. There are more parts, which can cause a nuclear accident and all these parts should be liable in case of a nuclear accident. For example: the manufacturer could intentionally or by negligence produce defective parts, the supplier or the builder could intentionally or by negligence deliver

and install defective parts or defectively install the parts, as well as the carrier could destroy or alter parts intentionally or by negligence during the transport during the transport. All responsible parties should have liability. The responsibility should be split among the parties involved. Limiting the liability on one party will prejudice the victims, who will be able to bring claims only against one party. In the same time, limiting the liability on one party it privileges the other parties involved and may have contributed to the nuclear accident.

The proportionality liability of the supplier and operator may bring an improvement to the nuclear liability system. The criteria for the proportionality should be chosen according the countries and technology. Countries should be delimitated according:

- *States, which produce technology, sell it and use it* should have a higher liability in front of other countries, which only buy it and use the energy or countries, which only use the energy (90%)
- *States, which don't produce the technology, only buy it and use it*, should have higher liability than countries, which only buy the energy, but lower than countries, which produce technology, sell it and use it (70%)
- *States, which only buy the energy,* should have a lower liability in front of the other countries, which produce the technology, sell it and use it or buy the technology and use the energy (10%)

Regarding technology, it should be made delimitation between:

- *Technologies, which have been proven for long time (50%)*
- *Technologies, which are new and haven't been proven for long time (20%) or haven't been proven yet (30%)*

This proportionality support the building of new nuclear power plants and modernizing the old ones with the new technologies, which are safer and easier to maintain.

A starting point of proportional liability of the state, supplier and operator can be:

- *20% state*
- *20% supplier*
- *60% operator.*

This proportionality can be modified according the criteria mentioned above: countries and technologies.

The advantage of this recommendation is that splitting the liability to more parties could be a better guarantee that the victims would get the compensations and the parties involved would afford to pay the compensations. The exclusive liability

principle, as well as the limited amount liability principle would be changed to a proportionality liability and an unlimited amount. The unlimited amount principle was created to protect the operator from ruin, however in this case the principle can be modified to an unlimited amount, because more parties have the financial power to cover a higher amount for compensation.

It was a hard work to find equilibrium between the economic interest and the public interest, when writing these conventions for nuclear liability. At the beginning, the favorite one was the nuclear industry, preferring economic interest to public interest. In time, the public interest became more important in front of economic interest. When analyzing the conventions and identifying their differences, their advantages and disadvantages, it helps us to better understand the need to one international harmonized liability regime as an alternative to the present complicated liability regime systems. (Adisianya, 2009) However, channeling the liability to one operator is a major back step for the harmonization of the regime.

For India, The Liability Act did not modify the principle of exclusive liability of the operator, but extended the right of recourse of the operator against the supplier. As mentioned before, this is a pioneer provision in the nuclear law and can be seen as an evolution point for the nuclear liability law.

For an international harmonization and an adequate regime, extending the right of recourse of the operator against the other parties involved, could be a step ahead for the development of the international nuclear law.

3. Access to neutral tribunal

The international nuclear regime assigns exclusive jurisdiction to the installation states, preventing victims to make claims in their own states. It is clear that victims have a huge disadvantage applying in the courts of law of the operator, raising concerns regarding the neutrality of the courts and laws and the limitations of the compensation. Victims should have the right to claim in their national courts for compensation. Applicable law should normally be the law of the state where the damage was produced, providing that jurisdiction can be obtain over those who are liable. (Nuclear Law Bulletin , 2014)

The advantage of this recommendation is that the victims would benefit from the ordinary rules of the tort law, which applies in their countries. Even more, for an equilibrate and adequate nuclear regime, victims should have the right to bring claims in their national court of law against any entities, which they may consider liable for the accident, as long as they prove the fault of the entity for causing the nuclear damage.

Another approach could be to create an International Nuclear Court. There are numerous international bodies created by the treaties to adjudicate legal issues in their jurisdiction. In this respect, the author of this paper would like to emphasize the importance of creating an International Nuclear Court with the scope to facilitate the judgment of nuclear issues based on the global liability regime, which is the intend to be created.

4. A broad definition of damages

The definition of recoverable damages should be as broad and clear as possible. It should cover:

- property damages of all sorts,
- economic losses of all sorts,
- damages to the biodiversity,
- environmental damages of all sorts, including maritime and all the damages in connection with it,
- health damages,
- damages caused to the tourists and consumers of fish and to the fishing industry,
- damages, which occurs due to perception of radiation, even if it was never proven and it led to loss of markets and loss of opportunities.

Damages can be any damage, whether material or moral.

The advantage of this recommendation, as well as the other ones mentioned above is that any damage caused by a nuclear accident would be compensated. It's hard to predict the damages that might occur as a result of nuclear accident, as well as the time (especially in health issues) and the costs of the damages that might occur, considering the devastating nature of such an accident.

5. The establishment of an adequate compensation fund

The states with the nuclear installation should ensure that they have the necessary funds to pay the compensation to all victims in case of a nuclear incident, without discrimination. It is hard to foresee all the damages a nuclear incident can cause. As the development is going towards the unlimited liability of the operator, the states with nuclear installation have to reevaluate regularly their compensation amounts to ensure that the amounts reflects the available capacity in the insurance markets, as well as other sources of financial security. In the same time, they have to set up financial mechanism, which can cover all the compensations in case the insurance and other financial securities are not enough to cover all the damages.

Perhaps the best example is Japan, which made extraordinary efforts to implement its national nuclear liability scheme in order to compensate the losses created by the Fukushima Daiichi accident. The Japanese government developed mechanism to fund compensation in case the amount exceeded the required financial insurance of the operator.

Another key point is that it might happen many unforeseen reasons or situations why the liable party cannot or does not pay the compensation for the damage caused. If the liable party does not or cannot pay the compensation or in case the liability regime fails for some reasons, the compensation still has to be paid and the reparation for the environment still has to be done. It also can happen that the liable company is insufficiently capitalized and cannot pay anymore. Secondly, a company can exonerate itself from liability for accident and claim an applicable exception. Thirdly, damage can occur to the environment, but not necessarily to any private interest. (Currie, 2008) However, in any cases the compensation has to be paid.

The Convention on Supplementary Compensation established a system for contribution for International Fund as followed: 90% nuclear states according their installed capacity, and 10% member states including nuclear states. It's a fair formula, the contribution being on-the –need basis. However, some nuclear states can see this as a threat to their economical interest. One of them is France, which is an active nuclear state and therefore, is unwilling to join the Convention on Supplementary Compensation.

For an adequate compensation fund each nuclear installation has to be insured. In case the damage exceed the amount of insurance, the operators and the suppliers still

remain liable according the proportionality principle (60% the operator, 20% the supplier) and the government should give the necessary financial assistance to the operator for compensation the damage. Additionally, an International Fund should be established and the contribution of the states should be as follow: 50% nuclear states with generating capacity more than 10GW, 40% nuclear states with generating capacity less than 10GW and 10% non nuclear member states. This recommendation has the point that it will not disadvantage states with high nuclear generating capacity and it will provide the necessary funds to pay the compensation to all victims in case of a nuclear incident, without discrimination.

For an effective compensation system, it is recommended to establish a single insurance group with a central office, which will be specialized only on the insurance of nuclear power plants. Considering the high risk, which involves to insure a nuclear power plant, this single insurance group on nuclear damages resulting from nuclear installations' incidents and accidents would be able to answer fast to all the claims coming from the victims, even if the amounts of claims are enormous thinking of the catastrophic effect of a nuclear accident, have an effective structure and organization able to deal with the compensation system for nuclear damages taking the victims as priority and could cover higher amounts. In the same time, it would improve the public acceptance in the nuclear installations.

The state plays an important role in the compensation of the victims, however he is not the only player when it comes to obtain a higher amounts to compensate the victims of a nuclear accident. The operators of nuclear power plants could join their forces and contribute through a compensation fund to increase the amount of compensation. As an example: after the Fukushima accident, the government together with the Japanese operators from the nuclear power plants gathered a fund to compensate the victims as a respond to the insufficient funds of the operator of Fukushima nuclear plant. Suppliers, manufacturer, carriers and all the other companies involved in the nuclear industry should contribute to form an additional fund for compensating the damages occurred as a result of a nuclear accident.

A greater solidarity among the state, nuclear or non-nuclear, could help enormously to improve the compensation system, increasing the compensation amounts through compensation funds and improving the public trust.

Nevertheless, a good mechanism for adequate compensation fund regardless fault,

exception and finance securities of the liable company can ensure the payment of the compensation.

6. Membership

The international nuclear liability system is complicated, heavily hedged with exceptions and Protocols. Some conventions are not in force, and those, which are in force, don't have members many major nuclear countries. So *membership* is one of the situations, which Conventions should improve in the next future.

The membership of nuclear liability Conventions is critical, mostly because projects for new plants are prepared to be building in countries, which are not members to the Conventions (for example: China, India). A high increase of nuclear generation is predicted in Asia, mostly China, South Korea, Japan and India. In the same time, countries with nuclear generation, like Russia and United Kingdom are partly to only one Convention. United Kingdom is party only to the Paris Convention. Russia is party only to the Vienna Convention. France was long party only to the Paris Convention, however in 2014 became a member of the Joint Protocol. Also many of these countries are not member to the Joint Protocol, which has the goal to bring together the geographical scope of Paris and Vienna Convention. Nevertheless, the Convention on Supplementary Compensation has few members, even it was created with the aim to achieve a global nuclear liability regime and opens doors to all states, regardless if they are nuclear or non-nuclear states, party or non-party in a Conventions or having legal channeling regime or economic channeling regime. The variety of treaties combined with the different national legislations lead to different provisions and applications creating a disharmony among the states and influence them to wait to see which convention will prevail.

The recommendation to increase the number of members in the international nuclear liability regime has the advantage to facilitate the development of a future global liability regime. It is important to mention that states draft and implement their national law in conformity with the instrument they wish to ratify. Conventions and treaties serve as a reference point for harmonization of the national law with the international law. So, national law plays an important role under the liability conventions.

The recommendations mentioned above are meant to give flexibility in the

international nuclear liability regime in order to reflect the interests of the states. They might not be the perfect response to fill all the gaps existing in the regime, however they can be seen as a starting point for an effective liability regime, with the scope to improve it.

Chapter 5

Conclusion

Nuclear industry needs an effective and adequate liability regime. Significant attention has been given to develop an international nuclear liability regime in order to promote appropriate compensation for nuclear damage during the years. This was reflected in the various conventions, as followed:

- *The Paris Convention on Third Party Liability* adopted in 1960 under the auspices of OECD
- *The Vienna Convention on Civil Liability for Nuclear* Damage adopted in 1963 under the auspices of IAEA
- *The Brussels Supplementary Convention* adopted in 1963 under the auspices of OECD
- *The Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage* adopted in 1997 under the auspices of IAEA
- *The Protocol to Amend the Paris Convention on Nuclear Third Party Liability* adopted in 2004 under the auspices of OECD
- *-The Protocol to Amend the Brussels Convention Supplementary to the Paris Convention* adopted in 2004 under the auspices of OECD
- *The Convention on Supplementary Compensation for Nuclear Damage* adopted in 1997 under the auspices of IAEA

Despite the efforts, the attempt to improve the regime has not been complete successful. Current regimes have not been widely ratified and left many shortcomings, which include:

- the exclusive liability to the operator of the nuclear installation;
- the limitation of liability in quantum and limitation in time for making claims
- the exclusive jurisdiction for claims to the installation states
- a narrow definition of damage
- lack of an adequate compensation fund
- lack of members.

The tragic events in Chernobyl, Three Mile Island or Fukushima have illustrated that accidents can happen and the consequences can be huge. After the Chernobyl

accident, the main goal of the international cooperation was to prevent an accident to happen again. This failed. Additionally, the Fukushima accident put a serious test on the international co-operation and international nuclear law drafters after 25 years from the Chernobyl accident. Even if Japan has solid national third party liability legislation and there were no trans-boundary effects, both accidents, Chernobyl and Fukushima, demonstrated once again that countries should not cope with a nuclear catastrophe alone. However, the question arises where and how the international regime show weakness.

With this in the mind the present work brings recommendations, for an improved and effective regime to govern the nuclear liability system:

- No limitation liability in quantum and duration;
- Proportionality liability of the state, manufacturer and operator;
- Access to neutral tribunal;
- A broad definition of damages;
- No statute of limitation;
- The establishment of an adequate compensation fund;
- Membership.

The idea put forward might be controversial, however it could go a long way to improve the system. The recommendation for an unlimited liability comes as a solution for the protection of the victims of a nuclear incident to be fully compensated in amount and at any time of discovering. This clause can be found in many national liability regimes extending the possibility of compensation and stating the improvements, which have to be brought in the development of the international nuclear regime. The scope of the recommendation regarding proportionality liability is that splitting the liability to more parties could be a better guarantee that the victims would get the compensations and the parties involved would afford to pay the compensations. Access to neutral tribunal has the advantage that the victims would benefit from the ordinary rules of the tort law, which applies in their countries. The author goes even further and comes with the proposal to establish an International Nuclear Court, which could facilitate the judgment of nuclear issues based on the global liability regime, which is the intend to be created. Nevertheless, a broad definition of the damage considers any damage caused by a nuclear accident to be compensated. Sometimes it's hard to predict the damages that might occur as a result of nuclear accident, considering the devastating nature of such an accident. In the same time, the author comes with the proposal of an improved compensation system that would not

disadvantage states with high nuclear generating capacity and it would provide the necessary funds to pay the compensation to all victims in case of a nuclear incident, without discrimination. Regarding increasing the number of member states, it would facilitate the development of a future global liability regime. Many of these recommendations can be found in the national nuclear laws of different states. For harmonization the national law and practice with the international nuclear regime, it is important that both national and international system to converge.

The recommendations brought in this paper are meant to bring an improvement in the international nuclear system. An effective nuclear liability regime could enhance the public acceptance of Nuclear Power.

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