Legal Affairs
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Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident

Workshop Proceedings
Lisbon, Portugal
8-10 October 2019

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NUCLEAR ENERGY AGENCY
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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NUCLEAR ENERGY AGENCY

The OECD Nuclear Energy Agency (NEA) was established on 1 February 1958. Current NEA membership consists of 34 countries: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, Norway, Poland, Portugal, Romania, Russia (suspended), the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Türkiye, the United Kingdom and the United States. The European Commission and the International Atomic Energy Agency also take part in the work of the Agency.

The mission of the NEA is:

- to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for the safe, environmentally sound and economical use of nuclear energy for peaceful purposes.
- to provide authoritative assessments and to forge common understandings on key issues as input to government decisions on nuclear energy policy and to broader OECD analyses in areas such as energy and the sustainable development of low-carbon economies.

Specific areas of NEA competence include the safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information. The NEA Data Bank provides nuclear data and computer program services for participating countries.

Cover photos: Lisbon (Dominik Dancs/Unsplash); Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, 8-10 October 2019, Lisbon, Portugal.

Foreword

The First International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident was organised by the OECD Nuclear Energy Agency (NEA) in co-operation with the French authorities and held in November 2001 in Paris, France.[1] Its purpose was to integrate third party liability and compensation issues into an essentially technical emergency exercise, the International Nuclear Emergency Exercise INEX 2000, a simulated nuclear accident at the Gravelines nuclear power plant in France. The emphasis of the workshop was placed on the manner in which the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy[2] and the 1963 Brussels Convention Supplementary to the Paris Convention[3] would apply to the indemnification of damage incurred by victims in states parties to those conventions as a result of a nuclear accident scenario.[4]

The Second International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident was held in Bratislava, Slovak Republic, in May 2005.[5] The workshop, co-organised by the NEA and the Nuclear Regulatory Authority of the Slovak Republic, was based on two fictional scenarios aimed at testing the implementation of various third party liability regimes with a special focus on an assessment of the indemnification measures that would be taken if a nuclear incident occurred in a state party to the 1963 Vienna Convention on Civil Liability for Nuclear Damage,[6] and more specifically a state party to both the Vienna Convention and the 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention.[7]

The Third International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident also took place in Bratislava, Slovak Republic, in co-operation with the Nuclear Regulatory Authority of the Slovak Republic and was held in October 2017.[8] This workshop assessed the implementation of the international nuclear liability conventions applicable at the

1. For more information on the First International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, see www.oecd-nea.org/jcms/pl_13642 (accessed 24 Apr. 2024).
2. Convention on Third Party Liability in the Field of Nuclear Energy of 29th July 1960, as amended by the Additional Protocol of 28th January 1964 and by the Protocol of 16th November 1982 (1960), 1519 UNTS 329 (Paris Convention or PC).
3. Convention of 31st January 1963 Supplementary to the Paris Convention of 29th July 1960, as amended by the Additional Protocol of 28th January 1964 and by the Protocol of 16th November 1982 (1963), 1041 UNTS 358 (Brussels Supplementary Convention or BSC).
4. The nuclear liability conventions use solely the term "nuclear incident" whatever the extent of the incident, which is not the case for the International Nuclear and Radiological Event Scale (INES), which only considers as an "accident" events rated at level 4 to 7. For the purposed of this report, wherever the term "nuclear incident" is used, it shall be interpreted in accordance with the relevant provisions of the nuclear liability conventions, specifically Article 1(a)(i) of the of the Paris Convention; Article 1(a)(i) of the Revised Paris Convention; Article I.1.l of the Vienna Convention; Article I.1.l of the Revised Vienna Convention; Article I.i of the CSC, unless it is otherwise understood by the context of the concerned paragraph.
5. For more information on the Second International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, see www.oecd-nea.org/jcms/pl_14018 (accessed 24 Apr. 2024).
6. Vienna Convention on Civil Liability for Nuclear Damage (1963), IAEA Doc. INFCIRC/500, 1063 UNTS 266, entered into force 12 Nov. 1977 (Vienna Convention).
7. Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (1988), IAEA Doc. INFCIRC/402, 1672 UNTS 293, entered into force 27 Apr. 1992 (Joint Protocol).
8. For more information on the Third International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, see www.oecd-nea.org/jcms/pl_19983 (accessed 24 Apr. 2024).

time in conjunction with, *inter alia*, non-convention states regimes, assuming all the modernised international instruments have come into force. The exercise therefore focused on the implementation of the following instruments: i) the Paris Convention and the Brussels Supplementary Convention, both as amended by the 2004 Protocols;[9] ii) the Vienna Convention and the 1997 Protocol to amend the Vienna Convention;[10] iii) the Joint Protocol; and iv) the Convention on Supplementary Compensation for Nuclear Damage.[11] Discussions focused on the legal aspects of compensating victims having suffered nuclear damage due to a nuclear incident occurring at a land-based nuclear power plant, which would cause transboundary damage.

The Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident (the "Lisbon Workshop" or the "Workshop")[12] took place in Lisbon in October 2019. It was organised in collaboration with the Instituto Superior Técnico and the Faculty of Law of the University of Lisbon (Portugal). It addressed topics identified by the 2017 Bratislava workshop participants for further discussion, i.e. the challenges of determining the nuclear damage to be compensated, and transboundary claims handling.

The Workshop's primary objective was to clarify the definition of "nuclear damage" within the context of the specified heads of damage provided under the nuclear liability conventions[13] and to help countries assess whether it could be considered as such under their own legislation. The Workshop addressed challenges associated with certain heads of nuclear damage that are inherently complex to ascertain or could potentially be compensated under different heads of damage. Furthermore, it explored the feasibility and necessity of establishing national mechanisms in each country to comprehensively define nuclear damage in the event of a nuclear incident, with the aim of mitigating potential disputes. The Workshop also aimed to raise awareness regarding the intricacies involved in establishing an effective claims handling process and underscored the importance of proactively organising such procedures well in advance. To address all these issues, the following sessions were organised during the Workshop:

- Session 1. Loss of life or personal injury;
- Session 2. Loss of or damage to property;
- Session 3. Economic loss;
- Session 4. Costs of measures of reinstatement of impaired environment;

9. Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960, as amended by the Additional Protocol of 28 January 1964, by the Protocol of 16 November 1982, and by the Protocol of 12 February 2004, entered into force 1 Jan. 2022, official consolidated text provided in: NEA (2024), "Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960, as amended by the Additional Protocol of 28 January 1964, by the Protocol of 16 November 1982 and by the Protocol of 12 February 2004", NEA Doc. NEA/NLC/DOC(2017)5/FINAL (Revised Paris Convention). Convention of 31 January 1963 Supplementary to the Paris Convention of 29 July 1960, as amended by the Additional Protocol of 28 January 1964, by the Protocol of 16 November 1982 and by the Protocol of 12 February 2004, entered into force 1 Jan. 2022, official consolidated text provided in: NEA (2024), "Convention of 31 January 1963 Supplementary to the Paris Convention of 29 July 1960, as amended by the Additional Protocol of 28 January 1964, by the Protocol of 16 November 1982 and by the Protocol of 12 February 2004", NEA Doc. NEA/NLC/DOC(2017)6/FINAL (Revised Brussels Supplementary Convention).
10. Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage (1997), IAEA Doc. INFCIRC/566, 2241 UNTS 302, entered into force 4 Oct. 2003 (1997 Protocol to Amend the Vienna Convention or Revised Vienna Convention). For the purposes of this report, the "Vienna Conventions" will hereinafter refer to the Vienna Convention and the Revised Vienna Convention jointly.
11. Convention on Supplementary Compensation for Nuclear Damage (1997), IAEA Doc. INFCIRC/567, 36 ILM 1473, entered into force 15 Apr. 2015 (CSC).
12. For more information on the Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, see www.oecd-nea.org/jcms/pl_19954 (accessed 24 Apr. 2024).
13. The nuclear third party liability conventions (the "Conventions") established the framework for defining nuclear damage and determining its compensation. These Conventions include the Paris Convention, the Revised Paris Convention, the Vienna Convention, the Revised Vienna Convention and the CSC. For the purposes of this report, "modernised" international instruments or "modernised" Conventions will hereinafter refer to the Revised Paris Convention, the Revised Vienna Convention and the CSC.

- Session 5. Costs of preventive measures; and
- Session 6. Transboundary claims handling.

Over 140 participants from 29 countries (of residence) attended the Workshop, including non-NEA member countries such as Brazil, India, Singapore, South Africa and Ukraine. Participants came from the public and private sectors and represented governments, regulatory authorities, academia, the judiciary, operators, suppliers, law firms, the European Commission (EC) and the International Atomic Energy Agency (IAEA).

To prepare for the Workshop, expert groups were established to elaborate background notes for each session's topics, facilitating discussions during the Workshop. The groups comprised various experts, including legal experts in nuclear liability or environmental law, economists, radiological protection or nuclear emergency management experts, insurers, and representatives of nuclear operators. In total, 42 experts from 16 NEA member and non-member countries participated in this process. These individuals are listed in the "List of experts" provided in Annex B of this report.

To compile comprehensive information on the national laws of each NEA member country, a questionnaire was distributed to the members of the NEA Nuclear Law Committee (NLC) ahead of the Workshop (the "Questionnaire"). This Questionnaire requested specific references to each country's national legislation, including regulations and case law, which describe, define or otherwise interpret the concept of "nuclear damage" and address issues related to transboundary claims handling.

The NEA received responses to the Questionnaire from 20 countries. These responses were shared with the expert groups and incorporated into their respective background notes. Following the Workshop, the background notes were revised to include any additional information contributed by the speakers and the participants at the Workshop, and subsequently integrated into this report, along with the conclusions drawn from the relevant sessions.

This publication was approved by the NLC on 22 October 2024 via the written procedure, and prepared for publication by the NEA.

Acknowledgements

The Nuclear Energy Agency (NEA) extends its sincere appreciation to the Instituto Superior Técnico (IST) for hosting the 4th International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident and the members of the expert groups (see Annex B to this report) for their commitment and contribution in preparing the material for the workshop, including the chairs of each of the expert groups: Professor Vanda Lamm (Expert Group 1 "Loss of life or personal injury"), Mr Andrey Shkarbanov (Expert Group 2 "Loss of or damage to property"), Mr Ben McRae (Expert Group 3 "Economic loss"), Ms Florence Touïtou-Durand (Expert Group 4 "Costs of measures of reinstatement of impaired environment"), Professor Taro Hokugo (Expert Group 5 "Costs of preventive measures"), and Mr Roland Dussart-Desart (Expert Group 6 "Administrative challenges of handling nuclear damage compensation claims (claims handling)").

Finally, many members of NEA staff made invaluable contributions to the development of this publication, in particular Ms Emma Leguillon, Ms Elena de Boissieu, Mr Mathis Coggiola and Ms Robyn Jordan. Finally, the graphic and editorial support provided by Mr Laurie Moore and Ms Elisabeth Villoutreix as well as the thorough revision and valuable comments by Mr Carlo Piovano are gratefully acknowledged.

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Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident

Introductory session

Further to a successful 3rd International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident in Bratislava in 2017 ("the Bratislava Workshop"), the Lisbon Workshop identified two topics to focus on in more depth: defining nuclear damage and international claims handling.

I. Background

Setting the scene for the Lisbon Workshop

In 2017, the Bratislava Workshop provided an overview of the challenges of implementing a nuclear liability regime and how such a regime would operate in practice. It was attended by over 170 participants from 33 countries. As a preparation for the Bratislava Workshop, the participating countries were asked to complete a questionnaire that formed the basis for the workshop's sessions. Considering the scope of material to cover in the three-day Bratislava Workshop, all topics could not be covered in-depth. Therefore, after the Bratislava Workshop, participating countries and the NEA Nuclear Law Committee were consulted about the subjects to further study in detail during a future workshop. It was agreed that the focus of the Lisbon Workshop would be on: i) determining the concept of nuclear damage; ii) compensation; and iii) transboundary claims handling.

Definitions of "nuclear damage" in nuclear liability conventions

The first topic considered for further discussion was the concept of nuclear damage. The definitions of "nuclear damage" found in the original Conventions (i.e. the Paris Convention and the Vienna Convention) covered loss of life or personal injury and damage to or loss of property, along with the concept of "any other loss" provided in the Vienna Convention. However, circumstances such as large nuclear power plant accidents like the one that occurred in Chernobyl in 1986, the development of environmental law, and the impact of nuclear incidents on the economy led to the introduction of new concepts of nuclear damage, including damage to the environment and economic loss, which were integrated into the Revised Paris Convention, the Revised Vienna Convention and the CSC.

These Conventions also integrated the precondition that nuclear damage is damage which arises out of or results either from the radioactive properties, or combination of radioactive properties with toxic, explosive, or other hazardous properties of nuclear fuel or radioactive products, or waste, or with any of them, or radiation from ionizing radiations emitted from any source of radiation inside a nuclear installation.[1]

1. See Article 1(a)(vii) of the Revised Paris Convention; Article I.1(k)(i) of the Vienna Conventions; Article I(f) of the CSC.

In addition, the definitions of "nuclear damage" in the Conventions are subject to the interpretation of national courts and national legislation. The Conventions stipulate that the nature, form and extent of the compensation as well as the equitable distribution thereof, shall be governed by national law. This leads to a variety of interpretations across countries that are party to the Conventions. The Conventions ensured that certain categories of damage were covered but left the remaining decisions up to the discretion of national courts. While courts can intervene when there are disputes on the type of nuclear damage and the compensation amounts, these proceedings are often protracted and victims do not have the time, financial and material means, and/or the mental strength to follow the procedure. The main purpose of the Lisbon Workshop was to improve the process of determining nuclear damage to be compensated in order for victims to be indemnified accurately and efficiently.

Compensation disputes

Providing detailed definitions of nuclear damage would accelerate the compensation process and minimise judicial proceedings. However, few countries have undertaken this. Insurers are less reluctant to cover certain clearly defined heads of damage and this results in lower insurance premiums. As an example, the United Kingdom (UK) implementing law of the Revised Paris Convention provides certainty and a measure of predictability, leading the insurance pool to provide coverage for all the Revised Paris Convention heads of damage except the 30-year prescription period. Insurers need clarity on what they are responsible for paying in the event of an accident.

When a transboundary accident occurs and there are treaty relations between the installation state (i.e. the state in whose territory the nuclear installation of the liable operator is situated) and the affected state (i.e. the state in whose territory nuclear damage is suffered), the competent courts are generally those of the incident state (i.e. the state in whose territory the nuclear incident occurred), which, in the case of a nuclear incident at a nuclear power plant, will be the installation state. When there are no treaty relations, the competent court is determined according to private international law, which can sometimes take several years to determine. It is therefore important for states to be linked by treaty relations.

When there is a dispute on the interpretation or implementation of the definition of "nuclear damage" provided under the international nuclear liability conventions, states that are party to the same Convention(s) may submit their case to the relevant court or tribunal. These are the European Nuclear Energy Tribunal for the Paris Convention, and the International Court of Justice for the Revised Vienna Convention and the CSC.

However, very few countries have attempted to clarify the definition of nuclear damage. The primary examples are Canada, which has a specific tribunal; and Japan, which has set up a comprehensive scheme. Romania, Slovenia and Ukraine have also taken steps, but this is something countries could consider improving. After the Fukushima Daiichi Nuclear Power Plant accident in Japan ("the Fukushima accident"),[2] a Dispute Reconciliation Committee for Nuclear Damage Compensation (DRC) was established. The DRC serves two purposes: to mediate disputes between victims and the operator, and to issue non-binding guidelines determining the heads of damage to be compensated.[3]

2. The Great East Japan Earthquake struck northeastern Japan on 11 March 2011, some 370 kilometres northeast of Tokyo. The magnitude 9.0 earthquake and ensuing tsunami caused widespread devastation. The earthquake and tsunami also triggered the accident at the Fukushima Daiichi nuclear power plant site operated by the Tokyo Electric Power Company (TEPCO). Damage to the reactor units at the site resulted in the release of radiation and the Japanese government's decision to order an evacuation and to establish restrictions on habitation of the area within 20 kilometres of the plant. Approximately 140 000 persons were evacuated following evacuation orders or voluntarily; and aerial navigation, shipping and planting restriction orders were issues. There were no direct casualties from the nuclear incident, but more than one thousand people died during the evacuation (most of them were senior citizens).
3. For more information, see NEA (2012), *Japan's Compensation System for Nuclear Damage as related to the TEPCO Fukushima Daiichi nuclear accident*, OECD Publishing, Paris.

Case specific guidelines are as necessary as general guidelines, as the meaning of nuclear damage will depend on the specific circumstances of the accident, applicable conventions, national legislation and case law, as well as the interpretation of the competent court. The Lisbon Workshop aimed at determining the extent of "nuclear damage", in order for individual countries to be able to assess whether this is consistent with their national legislation and legal framework. Additionally, some heads of damage may overlap; therefore, an understanding of what each head of damage would cover in a given context is important to avoid multiple compensations for the same damage.

Finally, each country must consider the need to set up a system to help determine what nuclear damage is in the event of an accident so the operators and insurers know exactly the extent of the compensation, and victims know what they can claim.

Claims handling

Claims handling is critical to a successful functioning of the nuclear liability regime. Without an adequate system in place, particularly for transboundary claims handling, the effectiveness of the nuclear liability regime would be purely theoretical.

The Fukushima accident is a particularly important example of claims handling. A bill to amend the Japanese Nuclear Damage Compensation Act was adopted in December 2018 in response to the accident.[4] It requires nuclear operators to publish their policy for the execution of nuclear damage compensation, including the claims handling process, the financial security coverage and the dispute resolution mechanism.

Insurers were not involved in the claims handling of the Fukushima accident so the operator, TEPCO, dealt with the entire claims handling process on its own, processing almost three million applications (as of October 2019). They did so by setting up a website that was available in as many as four languages at a given time. This accounted for potential transboundary claims as well as claims made by foreigners visiting or residing in the country. As of the day of the Lisbon Workshop, the website was still available.

TEPCO simplified their original 56-page claim form to allow victims to receive adequate compensation in a timely manner and without requiring access to much of their personal paperwork. TEPCO's handling of the Fukushima accident also shed light on the logistical considerations of hiring, training and co-ordinating personnel to deal with the three million applications processed, as well as acquiring enough materials and office space to conduct the claims handling operation.

The Lisbon Workshop intended to explore the complexity of implementing a claims handling system and the practical issues involved, such as the need for national and international co-ordination with various authorities and private actors, the impact of treaty relations with affected countries, and the interpretation of the competent court if victims decide to litigate. An efficient claims handling process requires thorough preparation, including introducing IT systems and websites; co-ordinating between fund providers; clarifying the responsibilities between all the actors involved; launching an International Nuclear Claims Handling Exercise, and possibly legal exercises. These paths are some of the potential options to explore to facilitate future claims handling operations.

II. Government perspective

Mr Roland Dussart-Desart, **Chair of the Nuclear Law Committee**, introduced the various functions of governments in the nuclear liability regimes. From the government's perspective, there are a number of challenges when dealing with a nuclear incident and compensating victims. Indeed, it acts as legislator, regulator, sometimes operator and financial security provider. As legislators and

4. Act No. 90 of December 12, 2018 to partially amend the 1961 Act on Compensation for Nuclear Damage.

regulators, governments are required to comply with various international, regional and national commitments. If a government is also the operator of a nuclear installation, they will act as a main stakeholder; and as providers of financial securities, they can act as insurers. A government can even sometimes be the victim of a nuclear incident, e.g. if critical infrastructure is damaged. Despite playing all of these roles, government is still expected to faithfully apply the principles of non-discrimination, transparency, fairness, and equity and to take into account the interests of all the victims and the state.

The main concern is whether the definitions of "nuclear damage" in the modernised Conventions provide more questions than answers, with a new definition of damage that is more complex and which raises the issue of whether governments need additional clarifying legislation to determine the scope of damage or if the relevant provisions can be directly applied. This varies from one government to another.

Clarification of these definitions of damage may address remaining gaps in insurance coverage, and it is therefore necessary to establish a common basis. This would mean attaining an understanding for those elements that are common within the members of a nuclear insurance pool or within the mutuals, at least partially, for the same heads of damage and which have been accepted by the state, if it must provide a financial security to fill gaps of the coverage. Public authorities will face the challenge of assessing the fulfilment of that need.

Another issue arises concerning the equitable distribution of funds. In a major nuclear incident, it is possible that most or all of the funds could be absorbed by the cost of emergency measures alone, preventing late claimants from receiving any indemnification. Some states have adopted priority rules to prevent the issue of late claimants being deprived of indemnification. While priority rules protect the rights of future claimants, particularly those submitting claims under the 30-year prescription for bodily injury, they can deprive present day victims from indemnification in favour of hypothetical future claims. Additionally, the later the claim is submitted, the more difficult it is to establish a causal link, thereby tying up compensation for future claimants that could have been used for present victims. States may try to limit the amount of compensation for damage to ensure adequate compensation for all victims; however, this would likely lead to lengthy litigation that would further delay the indemnification of victims.

In 2013, a group of experts from the European Union (EU) issued recommendations regarding the organisation of claims handling. The group consulted with insurers, mutuals, representatives of the government and the operators to create a set of recommendations that included: i) setting up a claims management system well in advance of an accident; ii) organising a "one-stop-shop" for claims registering and recording;[5] iii) organising an EU-wide claims handling communication system; iv) organising a single desk for claims handling, a similar recommendation to the "one-stop-shop"; v) organising an assessment of insurers' abilities by national authorities; vi) setting up rules for advance payments on compensation; and vii) clarifying how claims management costs are borne.[6]

The Brussels Supplementary Convention brings about additional challenges with regard to the exhaustion of the various tiers of compensation and the distribution of funds. Additional clarification is required regarding when a tier can be considered exhausted, when it is justified to call for the second tier, how the installation state can cope with the payment of claims from the third (international) tier while dealing with a nuclear incident and how other parties to the Brussels Supplementary Convention check on the distribution of funds from the various tiers. These questions must be clarified in advance to facilitate a smooth claims handling process.

5. The applicable data protection regulations may introduce additional issues regarding the transfer of data, but it is possible the regulations themselves will provide a solution.
6. This may cause issues by having so many bodies intervening in the claims payment process, e.g. the operators, the insurers, the mutuals and potentially the state.

III. Operator's perspective

Ms Fiona Geoffroy, **Senior Legal Advisor at the Energies Legal Department EDF (Électricité de France)**, introduced the role that the operator plays in the nuclear liability regimes, emphasising how the Lisbon Workshop highlighted the ongoing need to improve upon responses from the Bratislava Workshop. The operator holds a key role in the legal framework for nuclear third party liability. The operator is required to establish financial security coverage for its liability under the Conventions. This means that the operator is responsible for carrying cause for tender and negotiating with insurers over policy coverage and premiums prior to any nuclear incident occurring. In the event of a nuclear incident, the operator still plays a key role as the government's representative in estimating the damage and engaging the supplementary compensation funds available under the Brussels Supplementary Convention or the CSC, if applicable. Most claims can be directed to the operator or the insurer, requiring very close co-operation between the two. Therefore, it is in the operator's best interest to streamline the claims handling process as early as possible. The operator will also be required to play a role in the compensation committee if one is established. The Fukushima accident and the work of the DRC can be used as an example for this purpose.

The challenges of defining nuclear damage and establishing a claims handling system, which were identified at the Bratislava Workshop, are issues that operators would like to examine more deeply. The definitions that arise from the nuclear liability conventions are the result of a compromise between the contracting parties, and there are some issues that may still be clarified as regards these definitions. As it has been more than 20 years since the adoption of the Revised Paris Convention, national laws have evolved and nuclear case law has developed. These developments can help in further defining nuclear damage and the claims handling process, providing practical guidance.

The definitions of "nuclear damage" provided in the modernised Conventions maintains the original heads of damage: loss of life or personal injury and damage to or loss of property, while also providing a list of other heads of damage that must be recognised as "nuclear damage" and accounted for. The explanatory reports of the relevant Conventions (e.g. the *Exposé des Motifs of the Revised Paris Convention* and *the Exposé des Motifs of the Revised Brussels Supplementary Convention)* [7] provide invaluable assistance in attempting to determine the mind-set of the drafters of those Conventions, thereby providing critical assistance in interpreting these definitions. However, the courts still maintain an important function as the extent of all heads of damage shall be determined by the competent court.

A clear understanding of what is to be covered by the new heads of damage is essential for government, operators, insurers and victims alike. A common understanding of such definitions will facilitate claims handling, speedy distribution of funds, and the operation of additional funding mechanisms, such as the ones provided in the Brussels Supplementary Convention and the CSC.

The Conventions do not mention the claims handling process. While operators are required to maintain financial security, there is no obligation under the Conventions to establish claims handling procedures. However, it is in the operator's best interest, as well as all other impacted parties, to establish adequate claims handling procedures well in advance of a nuclear incident.

7. See NEA (2024), *Exposé des Motifs of the Paris Convention as amended by the Protocols of 1964, 1982 and 2004*, adopted by the Contracting Parties to the Paris Convention on 18 Nov. 2016, NEA Doc. NEA/NLC/DOC(2020)1/REV1/FINAL (*Exposé des Motifs of the Revised Paris Convention*). NEA (2024), *Exposé des Motifs of the Brussels Supplementary Convention as amended by the Protocols of 1964, 1982 and 2004*, adopted by the Contracting Parties to the Brussels Supplementary Convention on 23 Dec. 2010, NEA Doc. NEA/NLC/DOC(2017)4/REV1/FINAL (*Exposé des Motifs of the Revised Brussels Supplementary Convention*).

Prior to any accident, these mechanisms should be tested through emergency exercises to determine their efficacy. It is also important to consider the registration of transboundary claims and include a method for processing claims in a multilingual context. In addition to the communications aspects and the practical question of claims payment, including advance payments, which becomes more difficult in the absence of any guidance from the Conventions, there needs to be a common understanding of when funds can be called for under the various tiers of the Brussels Supplementary Convention or the CSC. Regarding this point, additional clarification is needed on whether priority rules for personal injury or death claims with a 10- to 30-year prescription period are considered when determining whether a tier is exhausted.

An efficient claims handling process is critical to ensuring that compensation is dispensed adequately and in a timely manner. It also minimises judicial interpretation, which can often be expensive and time consuming, delaying victim compensation and increasing the expenses for operators.

Finally, nuclear liability regimes need not limit itself to seeking guidance solely from other nuclear incidents. Despite not being a nuclear incident, the fire at the Lubrizol industrial lubricant and fuel additive plant in Rouen, Normandy (France) could be used as an example for how to interpret preventive measures and economic loss. Additionally, this accident may result in the first application of the EU Directive on Environmental Liability[8] in France and could be used to help define reinstatement of impaired environment. While the Fukushima accident provides invaluable feedback and guidance, experience and case law from other fields can also enrich the discussion on nuclear incidents.

IV. Insurance perspective

Mr Peter Lodewyckx, **Senior Advisor at the Belgian Nuclear Insurance Pool**, discussed the necessity of a coherent legal framework to ensure adequate compensation to victims. Victims must be compensated in a timeframe that spans from the immediately after the nuclear incident to 10 to 30 years in the future. To do this efficiently, there must be an adequate claims handling process in place. Under the Brussels Supplementary Convention, there are three tiers of compensation. Insurers are responsible for covering claims under the first tier. To do so, insurers must quantify the nuclear damage correctly and as quickly as possible to establish reserves and know when their cover will be exhausted. Quantifying damage relies upon a clear understanding of the different heads of damage. While some are quite straightforward, such as property loss or damage and certain types of economic loss, others are more complicated, such as personal injury and death and reinstatement of impaired environment.

Property loss and damage is due essentially to the radioactive fallout or the decontamination procedures, the costs of which are fairly well known, especially after the Fukushima accident. Economic loss relies mostly on market prices and values, which are also rather well defined. Reputation damage may be slightly more complex, but it is still something insurers are used to dealing with in other types of claims. Preventive and evacuation measures are relatively easy to quantify, as action will hopefully be taken very quickly, if not immediately, so the costs will be known to insurers in a reasonable amount of time.

Personal injury and death

Insurers face more issues when it comes to personal injury and death, as well as for reinstatement of impaired environment. Concerning personal injury, the main issue for quantifying damage is establishing a causal link. While there can be some direct damage, the vast majority of personal injury or death will be related to the absorbed dose. In cases where there is a very high absorbed

8. Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with Regard to the Prevention and Remedying of Environmental Damage, *Official Journal of the European Union* (OJ) L 143, 30 Apr. 2004 (EU Directive on Environmental Liability).

dose (approximately >1 000 mSv), victims will suffer radiation sickness and the causal link will be clear. With lower doses, where risk of cancer is the primary concern, causality is harder to determine as injury or death may take place over a much longer period of time. An exposure over 100 mSv generates an estimated probability of about 1% of cancer risk per 100 mSv. There is no proven correlation between exposure under 100 mSv and cancer risk. Most victims will be exposed to these lower doses, which necessitates a clear way to determine causality.

There are three ways to attempt to determine causality: Linear No Threshold Model, the probability of causation, and epidemiological evidence. The Linear No Threshold Model states that the line of 1% per 100 mSv is extended towards zero and based off that a certain probability for a given number of years is calculated. Using this formula, all cancers that appear in the 10- or 30-year prescription period are considered to be caused by the accident, requiring incredibly large reserves.

The probability of causation, on the contrary, looks at the radiological risk and compares it to the risk of having a naturally occurring cancer to determine whether there is a causal link. However, this does not determine whether the causal link is significant, and it is largely left up to the courts to determine whether it is significant, which is not an ideal solution.

Epidemiological evidence might be the most appropriate method for determining a causal link, but the extensive amount of time required to draw an accurate assessment make it a non-viable solution. The stochastic effects of low radiation doses, long latency periods, and very high baseline for cancer in the western world create significant challenges in quantifying personal injury or death.

Reinstatement of impaired environment

Another issue for insurers is reinstatement of the impaired environment. Unlike the issue of causality in personal injury and death, the issue of reinstatement for insurers revolves around a lack of clarity in the definitions found in the Conventions. There is a lack of consensus on what constitutes environment, the threshold for impairment, what constitutes reasonable measures of reinstatement, who the competent authorities are, and the timeframe for recognising an impairment. Transboundary claims only add to the confusion because there may be different definitions and interpretations between countries for some or all of these questions, even in the event the affected countries have treaty relations.

Insurers need a coherent legal framework with minimum room for interpretation so they are able to quantify their amounts as quickly as possible. Clarity is needed to determine their reserves and ask the state to intervene with subsequent financial securities and, in some cases, to have priority rules, so that victims are ensured adequate compensation.

The Lisbon Workshop endeavoured to identify, discuss and further investigate issues related to defining what nuclear damage is and how to set up a coherent claims handling process.

Chapter 1. **Loss of life or personal injury**

Conclusions from the Workshop[1]

- The effects of ionising radiation: The observation of the transition and effect of ionising radiation on human cells could help the scientific community break down the current limitation, as knowledge of the effect of low doses is sparse.
- Knowledge of nuclear law needs to be spread more widely, allowing national jurisdictions to enable their courts to gain insight into the challenges that will emerge in the event of a nuclear incident.
- Mental anguish increases disparities and raises the questions as to how it will be addressed.
- The insurance and mutual industries are working on adapting the system to reflect the extended 30-year prescription period.

1 The key takeaways from each session of the Lisbon Workshop are provided in the "Conclusion" section of this report.

I. Personal injury under the nuclear liability conventions

1. The nuclear third party liability conventions

a. The applicable conventions

The nuclear liability conventions provide the legal framework for the establishment of nuclear damage and its compensation, including the specific head of damage related to loss of life or personal injury.

b. The texts concerning loss of life and personal injury

All the Conventions provide the same definition of "loss of life and personal injury", and more specifically provide that:

> "Nuclear damage" means (…) loss of life or personal injury (…) to the extent that the loss or damage arises out of or results from ionising radiation emitted by any source of radiation inside a nuclear installation, or emitted from nuclear fuel or radioactive products or waste in, or of nuclear substances coming from, originating in, or sent to, a nuclear installation, whether so arising from the radioactive properties of such matter, or from a combination of radioactive properties with toxic, explosive or other hazardous properties of such matter.[2]

This definition does not contain any explanation of what can be encompassed in this head of damage, and remits the task of defining it to national courts which have greatly varying laws and procedural rules.[3]

In addition, the modernised Conventions (the Revised Paris Convention, the Revised Vienna Convention and the CSC) have added other new heads of damage, which means that in the event of a nuclear incident, there will be a greater number of victims, entailing more compensation claims for the same amount of available funds.

Both the Revised Paris Convention and the Revised Vienna Convention have extended the prescription period for the lodging of a claim for compensation from the previous 10 years (under the Paris Convention, the Vienna Convention and the CSC) to 30 years from the date of the nuclear incident.[4] Both allow national legislations to provide for extinction prescription beyond 30 years, which will affect the priority rules.[5]

2. The Questionnaire

The data collected from these responses to the Questionnaire shows the following information:

- A large majority of the responding countries provide for national legislation on loss of life or personal injury, whether through the direct application of an international nuclear liability convention or explicitly in their national law.
- Only one of the responding countries provides for a specific definition of exactly what a "personal injury" would constitute, while the majority does not provide for a specific definition nor for any guidelines to determine it.

2. Article 1(a)(vii) of the Revised Paris Convention (see also Article I.1.k of the Revised Vienna Convention and Article I.k.i of the CSC).
3. IAEA (2020), *The 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage – Explanatory Texts*, IAEA International Law Series, No. 3 (Rev. 2), IAEA Doc. STI/PUB/1906, IAEA, Vienna (*Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*), p. 16, footnote 47, and p. 34, footnote 118.
4. Article 8.a.i of the Revised Paris Convention and VI.1.a.i of the Revised Vienna Convention.
5. Article 8.c.i of the Revised Paris Convention and VI.1.c of the Revised Vienna Convention.

- A majority of the responding countries provide for a specific prescription period in order to submit a claim for personal injury (with most of these countries providing for 30 years from the nuclear incident; and a few of these countries providing for 10 years from the nuclear incident); whereas a minority of the responding countries do not provide for a specific prescription period.
- A minority of responding countries provide for the specific compensation of mental anguish in the context of a nuclear incident, while half of the responding countries provide for the specific compensation of mental anguish in the context of other industrial accidents; whereas other countries do not provide for compensation of mental anguish at all.
- A minority of responding countries envisage the possibility of compensation for an "indirect" loss of life; whereas most of the responding countries do not.

In the event of a nuclear incident, nuclear liability principles will be interpreted in light of national general tort law and so will the definition of "nuclear damage" and of "personal injury". There is therefore no specific pattern nor consensus that can be deducted from the responses to the Questionnaire.

As of October 2019, there was no clear definition nor guideline in order to compensate loss of life or personal injury in the event of a nuclear incident.

II. Physical personal injury

The Conventions provide for compensation for loss of life and personal injury to the extent that they arise out of or result from ionising radiation.[6] However, none of the Conventions define "personal injury" in the context of a nuclear incident, nor do they provide measures for its determination.

The Conventions therefore remit these questions to national courts or national laws (general laws existing prior to the accident, or specific laws and regulations established afterwards) or on a case-by-case basis by a competent authority deciding upon a claim.

According to whether international conventions have direct or indirect effect in the national legal order, some national legislations, regulations or case law may have explicitly provided for loss of life or personal injury in the context of nuclear damage. However, as outlined by the responses to the Questionnaire, national legislations have not yet harmoniously provided guidelines, legislations or rules to determine what "personal injury" would be in the context of a nuclear incident or any other context.

Whilst some provide indications, for example that it could be a "deterioration of health", or that certain conditions may be taken into account (e.g. mental anguish), national courts will face a hurdle when attempting to define what a physical personal injury is.[7]

There is therefore a gap, which will need to be resolved in the event of a nuclear incident.

1. Direct and indirect physical personal injury

"Personal injury" could be understood in layman's terms as any injury, bodily or mental, caused to a person. The distinction between bodily and mental injury is often artificial as it could be considered that all aspects of the injury should be taken into account and interpreted as a whole. Considering the different perspectives and elements of interpretation available within each country, all personal injuries, irrespective of their nature, could be regarded as covered by the Conventions.

6. See Section I.1 above. Loss of life or personal injury that could arise following evacuation or other preventive measures are not dealt with specifically in this Chapter.
7. See Section I.2 above.

a. Direct physical personal injury

Direct physical personal injury could be considered as a straightforward concept and would concern any condition that is ascertainable as a physical injury detectable on a human body.

b. Indirect physical personal injury

Indirect personal injury could be considered as not occurring as the direct result of the accident but rather as a consequence of other injuries that the victim incurred. It may be difficult to ascertain and therefore to compensate in the event of a nuclear incident.

The distinction between direct and indirect personal injuries may be subtle. Mental anguish[8] may be considered as an indirect physical injury or as purely non-physical personal injury as opposed to bodily injuries with straightforward physical manifestations.

A distinction may be drawn between pain and suffering linked to the physical condition the victim has incurred as a direct result of the accident (e.g. cancer, broken bones) which are deemed as physical pain and suffering; and mental pain and suffering which could be understood as any type of negative emotion that the victim suffers as a result of having to endure the physical pain and trauma of an accident. An overlap with mental anguish may arise rapidly.[9]

The distinction between physical and non-physical damage is made even more complex by the fact that mental anguish may also cause effects upon the body, like stress-triggered diseases, cardio-vascular diseases and high-blood pressure, eczemas and/or autoimmune disorders. A stress-related significant loss of appetite may result in rapid and unhealthy weight loss. Stress is also one of the triggers of premature death. As such, an indirect physical personal injury may result in various physical consequences that could warrant compensation.

2. Major physical personal injuries that may arise

Within physical personal injuries, the following may be considered by national courts as constituting damage to be compensated in the event of a nuclear incident.

a. Loss of life

Loss of life as a result of radiation exposure may occur early after the accident in the event of exposure to radiation (early loss of life; e.g. workers of the Chernobyl nuclear power plant) or decades after the accident (postponed loss of life; e.g. as a result of exposure-related cancers). The former is more readily identifiable as linked to the accident.

According to a 2013 report of the World Health Organization (WHO)[10] which contains a health risk assessment and an evaluation of the risks of cancers, non-cancer diseases as well as public health considerations, "there were no acute radiation injuries or deaths among the workers or the public due to exposure to radiation resulting from the Fukushima Daiichi accident". However, radiation experts dispute whether this sort of exposure could have led to the development of this particular type of cancer.

The postponed loss of life in the event of a nuclear incident may not be, and typically is not, exposure-related, which can make it difficult to link to the accident. It can be due to the presence of communicable diseases during evacuation and at shared shelters (e.g. acute diarrhoea, respiratory diseases, measles and other vaccine-preventable diseases) as well as the temporarily impaired treatment of non-communicable diseases.

8. See Section III below.
9. See Section III below.
10. For further reading, see WHO (2013), "Health risk assessment from the nuclear accident after the 2011 Great East Japan earthquake and tsunami, based on a preliminary dose estimation", WHO Press, Geneva.

The conditions at the evacuation centre (e.g. cold, interrupted medical rescue, limited access to special medical treatment) may also result in a "new" physical personal injury or in the aggravation of existing symptoms in chronically and critically ill patients (e.g. patients on dialysis, on post-transplant critical care, insulin-dependent, or those with lung, cardiovascular, and other non-communicable diseases). All these conditions may eventually result in loss of life, especially in the case of pre-school children, the sick or the elderly (e.g. in the case of evacuations of hospitals or nursing homes).

The early or postponed loss of life could also take the form of an accident-related suicide.[11]

b. Personal injury

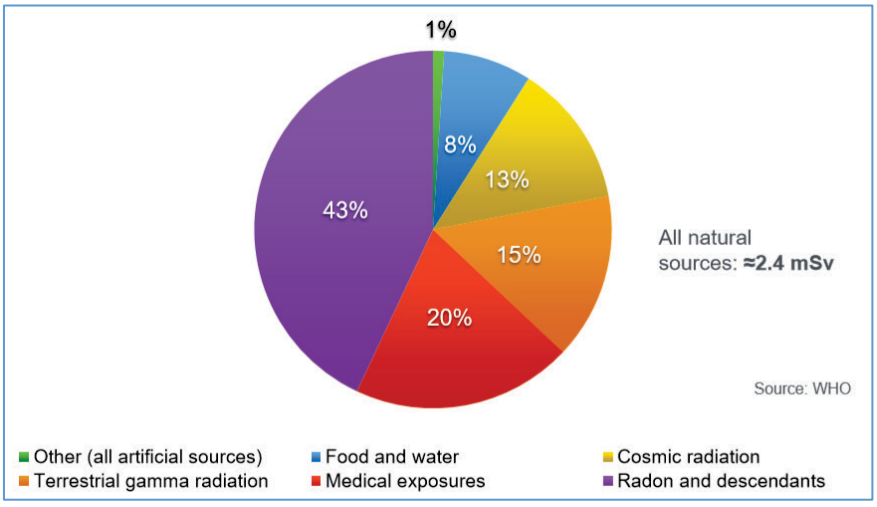
Personal injury may be directly linked in time to the nuclear incident, and therefore more readily identifiable.

However, it could also occur early after the accident or even decades afterwards. Personal injuries may be directly caused by the absorbed radiation, with effects on health; or they may not be directly linked, mainly resulting from the post-accident evacuation and living conditions.

- i. Radiation-related health effects

It is important to note that human beings are constantly being exposed to radiation, in some form or another, as illustrated in the graph below.

Figure 1.1. **Typical exposure to ionising radiation**

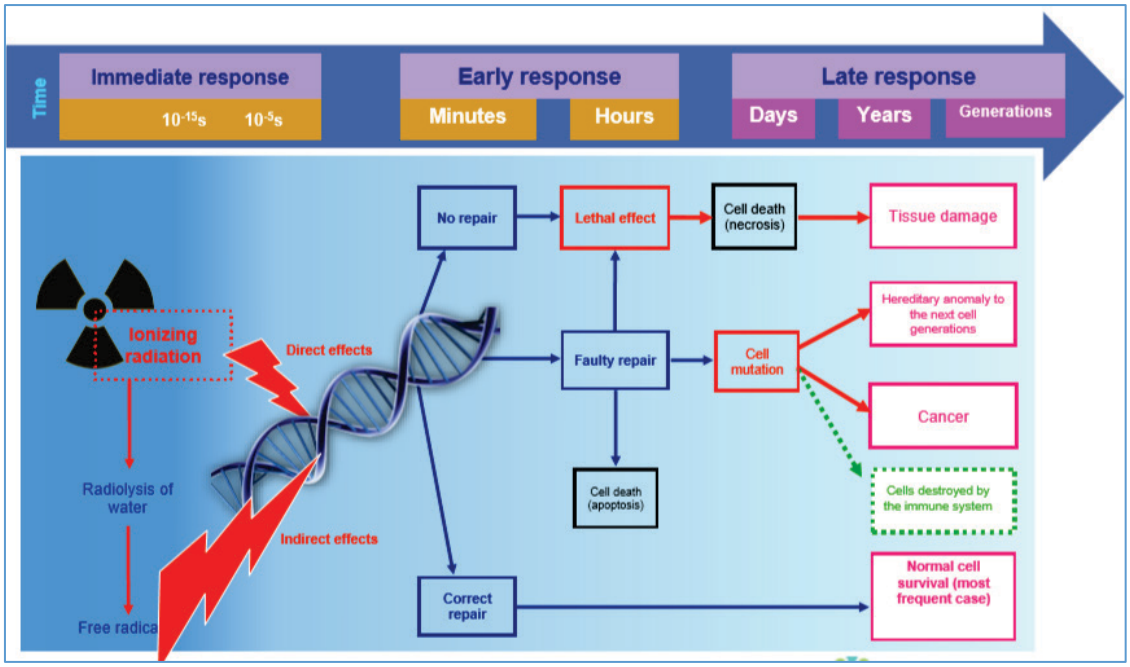


Source: Rosário, P. and Krull, I. (2019), "Health effects of ionizing radiation", presented at the Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, Lisbon, October 2019. Adapted from WHO (2016), Communicating radiation risks in paediatric imaging: Information to support healthcare discussions about benefit and risk, WHO Publishing, Switzerland, pp. 15-16.

When a cell incurs a direct or indirect effect of ionising radiation, effects occur either immediately or over time. The DNA repair mechanism usually works and the cell repairs itself. However, some cells may not be able to repair themselves. When this happens to a great number of cells it can lead to tissue or organ damage. Cells can also repair incorrectly and suffer mutations which then pass on to the next generation of cells, resulting in cancer.

11. See Section IV below.

Figure 1.2. **Biological effects of radiation**



Source: Rosário, P. and Krull, I. (2019), "Health effects of ionizing radiation", presented at the Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, Lisbon, October 2019.

In order to illustrate the impact of radiation, the example of the Fukushima Daiichi accident is examined with regard to cancer developed after the accident. According to the 2013 WHO analysis,[12] people living in the proximity of the Fukushima Daiichi nuclear power plant were exposed externally to radiation from the radioactive cloud and ground deposits; and internally from inhalation and ingestion of radionuclides.

These mainly included iodine-131 (131I) (a half-life of eight days) – inhaled and ingested with contaminated food or water, which concentrates in the thyroid gland, and caesium-137 (137Cs) (a half-life of 30 years), which implies a long-term risk of exposure through ingestion and exposure from deposit on the ground.

The Fukushima Health Management Survey[13] has estimated individual doses based on typical scenarios of evacuation and time spent indoors and outdoors. Based on this survey and the dose assessments performed by WHO and by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the average lifetime effective doses for adults in the Fukushima prefecture were estimated to be around 10 mSv or less, and about twice that dose for 1-year old infants[14] as exposure to radioactive iodine is typically higher for children because of the size of their thyroid glands and the nature of their metabolism.

On this basis, WHO specifically assessed the risk of thyroid cancer. The greatest risk was found amongst girls exposed as infants. There have been recent reports about thyroid cancer cases in children exposed to low doses of radioactive iodine as a result of the Fukushima accident. However, WHO advises to interpret them with caution as the estimated post-

12. For further reading, see WHO (2013), *supra* note 10.
13. Ishikawa, T. et al (2015), "The Fukushima Health Management Survey: estimation of external doses to residents in Fukushima Prefecture", *Scientific Reports* 5, 2015, https://doi.org/10.1038/srep12712 (accessed 24 Apr. 2024).
14. See 2013 WHO Report, *supra* note 10.

Fukushima thyroid doses were substantially lower than in Chernobyl, therefore the risk of a large excess of thyroid cancer due to radiation exposure is lower.

Regarding the risk of thyroid cancer in exposed infants and children, the level of risk is also uncertain as it is difficult to verify thyroid dose estimates by direct measurements of radiation exposure. The highly-sensitive thyroid screening of minors will probably detect a large number of thyroid cysts and solid nodules, including a number of thyroid cancers. At the same time, similar or even slightly higher rates of cysts and nodules were found in prefectures not affected by the nuclear incident. The substantial number of cases that have already been observed in the Fukushima Health Management Survey have been considered likely due to the sensitivity of the screening rather than to the post-accident radiation exposure. However, further analysis of epidemiological data will have to be performed.

According to the 2013 WHO Report, the lifetime radiation-induced cancer risks other than thyroid cancer are significantly smaller than the lifetime baseline cancer risks. From a global health perspective, the health risks directly related to radiation exposure are low in Japan and extremely low in neighbouring countries and the rest of the world.

The 2013 WHO Report also looked at the question of in-utero exposure. Despite consensus on increases in the lifetime risk of cancer and the risk of childhood leukaemia following in-utero exposure, there remains some debate over the extent of the risk of child onset cancers other than leukaemia. Following postnatal radiation exposures at early ages, there is no clear evidence of an increased risk of solid cancers from exposures in the moderate dose range, although some other types of cancer are seen at high doses.

- ii. The dose threshold for radiological impact on the human body

The effects of ionising radiation are categorised in two types: determinist effects and stochastic effects.

Deterministic effects (or tissue reactions) directly concern the radiation dose that is absorbed by a person. As the dose increases, so does the severity of the effects on the human body. This deterministic effect typically has a threshold below which an effect on the human body does not occur. These deterministic effects are also considered acute or early effects of exposure.

The dose thresholds for these deterministic effects are well established, and are detailed as follows:

Table 1.1. **Summary of threshold doses for some deterministic effects**

Deterministic effect	Absorbed dose to affected organ (mGy)
Temporary sterility	100 (testes)
Permanent sterility	6 000 (testes), 3 000 (ovaries)
Bone marrow effects	500 (to bone marrow)
Erythema	3 000-6 000 (skin)
Burns	5 000-10 000 (skin)
Temporary hair loss	4 000
Cataracts	1 500 (lens of the eye)

Source: Adapted from Niu, S., P. Deboodt and H. Zeeb (eds.) (2010), *Approaches to attribution of detrimental health effects to occupational ionising radiation exposure and their application in compensation programmes for cancer*: A practical guide, Occupational Safety and Health Series, No. 73, International Labour Organization Publications, Geneva, p. 9.

Deterministic effects are unlikely for the general public as these high doses occur by direct contact.

Stochastic effects (cancer or heritable effects) are probabilistic in nature. The probability of the effect increases with the dose. However, the severity of the effect does not depend on the dose received. Stochastic effects are assumed to have no threshold. These stochastic effects are long-term effects, as they may manifest later on. The effects of radiation at high doses are well documented, leading to deterministic effects. The higher the dose, the more likely the effect will appear. To the contrary, there is limited research on the effects of radiation at low doses, as a control group cannot be set up.

At low doses, stochastic effects are dominant as the threshold dose for deterministic effects is not reached. This risk is quantified at around 5%/Sv.[15]

The effects of ionising radiation can be categorised into dose ranges, as follows:

Table 1.2. **Effects of ionising radiation on human health**

Dose range (mSv)	Effects on human health
<10	No direct evidence of human health effects
10-1 000	Generally stochastic effects, some deterministic effects at the higher range
1 000-10 000	Acute radiation syndrome; increased incidence of certain cancers in exposed populations at higher doses
>10 000	Fatal always

Source: Adapted from UNSCEAR (2017), Frequently Asked Questions, www.unscear.org/unscear/en/areas-of-work/radiation-faq.html (accessed 24 Apr. 2024).

In the dose range of up to 10 mSv, there is no direct evidence of health effects. It should be noted that at these low doses of radiation, there is still considerable uncertainty about the overall effects. It is presumed, for operational purposes, that all exposure may involve some additional risk of cancer, although this may be a conservative approach. To determine precisely the risk at low doses by epidemiology would require samples comprising millions of people. Such an analysis would be complicated by the absence of a control group which had not been exposed to any radiation. In addition, there are thousands of substances in everyday life besides radiation that can also cause cancer, including tobacco smoke, ultraviolet light, asbestos, chemicals and others.[16]

Between 10 and 1 000 mSv, the effects that are expected are mainly stochastic, with an increase in the probability of contracting cancer of about 5% per 1 000 mSv.

Above 1 000 mSv, deterministic effects are predominant, with a severity that is dependent on the dose. These may lead directly to death.

In order to analyse the scenario of loss of life in a nuclear incident, an estimation of doses to be received by the affected individuals is required. Considering past experience, it is unlikely that the threshold for deterministic effects is exceeded by the population, even at the most severe scenarios. The high dose levels needed for the onset of deterministic effects are only observed at close proximity to the radiation source, where only the presence of emergency workers is expected.

15. ICRP (2007), The 2007 Recommendations of the International Commission on Radiological Protection, ICRP Publication 103. Ann. ICRP 37 (2-4).
16. IAEA (2019), Factsheet “Radiation in everyday life”, available at: www.iaea.org/Publications/Factsheets/English/radlife (accessed 24 Apr. 2024).

For the general population, the expected health effects in a nuclear incident are stochastic, and therefore not subject to a dose threshold. The most likely scenario for this type of effect would require an exposure leading to an increase in the risk of deadly cancer, at the rate of 5% per 1 000 mSv.

- iii. Non-radiation-related health effects

Non-radiation-related health effects could include physical, psychosocial or mental health consequences, as outlined above.[17] In addition, injuries may arise from the physical effects of evacuation and living in temporary accommodation, or a sudden change of living conditions. For instance, when people who were used to spending their days outdoors (e.g. farmers, fishermen, sportsmen) are forced to stay indoors with no access to the garden; or people who were used to walking are forced to drive, this could lead to an abrupt change in their lifestyle. This abrupt deterioration or merely change of living conditions produces not only stress but also a higher rate of bodily conditions like diabetes, liver dysfunction or hypertension.

For example, the displaced Fukushima population suffered psychosocial and mental health effects following evacuation, relocation, rupture of social links, disconnection of family ties (lost homes and employment) as well as rumour damage and stigmatisation. Mental anguish[18] could comprise items such as pain and suffering, depression and emotional distress (e.g. resentment, sadness and loss of enjoyment of life, fear, grief, anxiety, anger, shock), the inability to perform certain functions, loss of consortium, post-traumatic stress disorder (PTSD), loss of appetite, lack of energy and purpose, mood swings, sexual dysfunction, sleep disturbances or insomnia, alcoholism and insidious fear of a death from radiation exposure. This list is not exhaustive.

According to WHO,[19] psychological problems such as hyperactivity, emotional symptoms, and conduct disorders have also been reported among evacuated children. While no significant adverse outcomes were observed in the pregnancy and birth survey after the disaster, a higher prevalence of postpartum depression was noted among mothers in the affected region.[20]

c. Criteria to establish loss of life or personal injury

After the Fukushima Daiichi accident, guidelines were established by a committee in Japan to assist claimants in their compensation process.

With regard to death or personal injury, the Interim Guidelines on Determination of the Scope of Nuclear damage resulting from the Accident at the Tokyo Electric Power Company Fukushima and Daini Nuclear Power Plants of 5 August 2011 established that:[21]

> "The following damage suffered by Evacuees can be recognised as damage warranting compensation:
>
> i) Lost earnings, medical treatment expenses, pharmaceutical costs, mental anguish etc. arising as a result of suffering an injury, experiencing a deterioration in health to an extent that required medical treatment (including a psychological ailment; the same applies below), contracting a disease, or dying, because of evacuating etc. of necessity due to the accident.

17. See Section II.1 above.
18. See Section III below.
19. For more information see Suzuki, Y. et al (2015), "Psychological distress and the perception of radiation risks: the Fukushima health management survey", *Bulletin of the World Health Organization*, Vol. 93 (9), 598-605. World Health Organization, available at: http://dx.doi.org/10.2471/BLT.14.146498 (accessed 24 Apr. 2024).
20. Goto, A., Bromet, E.J., Fujimori, K. *et al.* (2015), "Immediate effects of the Fukushima nuclear power plant disaster on depressive symptoms among mothers with infants: a prefectural-wide cross-sectional study from the Fukushima Health Management Survey", *BMC Psychiatry* No. 15, Article No. 59, available at: http://bmcpsychiatry.biomedcentral.com/articles/10.1186/s12888-015-0443-8 (accessed 24 Apr. 2024).
21. NEA (2012), *Japan's Compensation System for Nuclear Damage – As Related to the TEPCO Fukushima Daiichi Nuclear Accident*, OECD Publishing, Paris, p. 133.

ii) For an individual who evacuated etc. of necessity due to the accident, increased medical diagnosis expenses, medical treatment expenses, pharmaceutical costs etc. incurred in order to prevent, for example, a deterioration in health to an extent that requires medical treatment due to that evacuation etc."

The guidelines established for the Fukushima Daiichi accident could be considered as a precedent for any potential future nuclear incident. It could be useful for such guidelines to be established in advance of any necessity to invoke them or at the latest upon the occurrence of the nuclear incident, taking thus into account the particularities of the event. It would help victims to obtain compensation efficiently and avoid to some extent litigations (even though guidelines would not be binding), as all the concerned actors could refer to them.

d. Methods of calculation of compensation

As of today, and apart from the example of Japan, there are no clear guidelines to establish the method of calculation for compensation for loss of life or personal injury. By elimination, national tort law will be applied to award compensation. It can vary from one country to another, however. For example, in Portugal the amount of compensation for a lost life is EUR 80 000, but that will be different in other countries.

Some countries associate personal injury claims with real costs incurred, like medical or rehabilitation bills and lost wages.

As another example, the injured person could also claim adequate compensation for pain and suffering if the injury was inflicted wilfully or by negligence during the treatment of that injury. For example, compensation could be paid in the form of reimbursement of the costs of a treatment as well as compensation for the pecuniary loss sustained by the deceased because of a loss or reduction of the earning capacity, an increase in needs or a handicap to the career of the deceased during his or her illness.

In addition, compensation could be claimed to cover the funeral costs. Moreover, in the event that the deceased had been under a legal obligation to provide maintenance to a third party, compensation could be paid to such third party to the extent of the maintenance which the deceased would have been obliged to pay during his or her life expectancy. Such liability could also exist if the third party had been conceived but not yet born at the time the injury was sustained.

Finally, as was the case for crashes of airlines containing passengers from several jurisdictions, it may be that the legal rules governing compensation would be set aside in favour of an extra judicial decision, for example to award a lump sum.

The example of the Fukushima Daiichi accident demonstrates that some benchmarks were set out in order to aid the process of compensation (see above) and that these benchmarks were useful when establishing which items should be compensated. It would be useful to use these benchmarks but it will depend on national policy to do so or not.

III. The concept of mental anguish

One of the lessons learned from the Chernobyl accident, recently proven by the Fukushima Daiichi accident, is that the psychosocial impact is one of the major consequences of nuclear incidents.

Mental anguish could mean a relatively high degree of mental pain and distress that is more than mere disappointment, anger, resentment or embarrassment, depression, anxiety; a mental sensation of pain resulting from such strong emotions as fright, grief, despair, severe disappointment, indignation, wounded pride, shame, public humiliation, etc… although it may include all of these; and is objectively manifested by the suffered parties in significant behavioural or emotional changes or physical symptoms.

Mental anguish means a highly unpleasant emotional reaction that may be a subject of an action for damages or incident, and which results from another's conduct or action. It is recognised as an element of non-economic damage in many jurisdictions. Victims may recover from mental anguish, but in some countries mental anguish cannot be sought on a standalone basis and must be linked to a personal injury case.

In relation to the Fukushima Daiichi accident, WHO assesses that mental anguish may be suffered as a result of, and is increased by, conditions such as evacuation, relocation, material and financial loss and fear and uncertainty related to radiation exposure and its potential consequences.[22] Moreover, mental anguish and other psychosocial effects of radiation accidents may extend far beyond the geographical area and present great challenges to the medical community and health authorities that still have to be addressed.

In the responses received to the Questionnaire, it appears that some countries provide for the compensation of mental anguish in the context of nuclear incidents, however the majority do not.[23] It is also noteworthy that one country may not provide for the compensation of mental anguish in the context of a nuclear incident, but envisage such compensation in the context of other industrial activities. This could mean that national courts would be inclined to compensate it in the event of a nuclear incident.

Some countries establish additional criteria for the compensation of mental anguish, for example that mental anguish should result from physical or bodily damage medically noted by a physician. The additional criteria may vary. For instance, in the case of the 1999 TokaiMura accident, mental anguish alone, without any personal injury, was not recognised as damage unless the claimants could irrefutably prove a causal link and the proportionality of the amount of compensation sought.[24] The "Urgent Recommendations – Interim Report" issued by the Investigation Committee for the Critical Accident at the Uranium Processing Plant described the social and economic effects of the accident rather broadly: "Residents living near the site were not only inconvenienced due to the evacuation and the recommendation to stay indoors, but they also were subjected to the mental and physical effects caused by rumours. At the same time, sufficient measures including psychological counselling are necessary. Following the accident, there are many adverse effects due to rumours from misunderstanding".

The criteria for compensating mental anguish could therefore stress the causal link between the damage and the accident, which could be analysed more stringently than with regard to physical injury.

As the prescription period has been extended to 30 years in certain modernised Conventions, there will be an increase in the length of time during which a person can develop a form of mental anguish suffering. This increase in prescription period could affect the definition of mental anguish as, for example, a fear that one will develop cancer during 30 years could in itself create stress, a form of mental anguish.

Finally, some legal systems may require establishing the causal link between the physical injury and the mental anguish, whilst in other systems the mere coexistence of physical injury with mental anguish may suffice.

22. See the 2013 WHO report, *supra* note 10.
23. See Section I.2 above.
24. On 30 September 1999, a Level 4 criticality accident occurred in a conversion test building of a nuclear fuel fabrication plant in Tokaimura, in the Ibaraki Prefecture, that was operated by JCO, a wholly-owned subsidiary of Sumitomo Metal Mining Co. (SMM) of Tokyo. A state of criticality continued on and off for approximately 20 hours following the initial criticality incident. About 50 households within 350 meters of the plant were evacuated and about 300 000 people living within a 10 km radius were recommended to remain indoors. As of 30 September 2000, 7 025 claims for compensation were filed. For more information, see NEA (2000), "Tokai-Mura Accident, Japan – Third Party Liability and Compensation Aspects", *Nuclear Law Bulletin,* No. 66, OECD Publishing, Paris, pp. 13-21, and NEA (2003), "2003 Judgment of the Mito District Court issuing penalties in respect of the Tokai-mura accident", *Nuclear Law Bulletin*, No. 71, OECD Publishing, Paris, p. 43.

IV. The concept of "indirect loss of life"

Indirect loss of life could be understood as loss of life that occurs as a result of the occurrence of a nuclear incident, although not directly. Examples of this could include fire, the impossibility of providing medicines on time and suicides.[25]

The Questionnaire results indicate that the majority of countries do not provide for compensation for "indirect" loss of life, such as suicide.[26]

In order to determine whether it should be compensated, national courts could consider developments in legislation and case law concerning environmental liability, in view of the links that can be drawn with nuclear liability. Several legal systems today enshrine the "probability theory", the appraisal of proof of the causal link based on criteria of likelihood and probability and not of certainty. The acceptance of probability-based criteria in similar civil liability models could facilitate the compensation of indirect loss of life and injuries.

In addition, the solutions implemented by governments and the courts could be considered as international precedents. It would be difficult to understand and to explain to the claimants that damages awarded in relation to past nuclear incidents will not be considered in future nuclear incidents. In the Fukushima Daiichi accident, compensation was awarded for indirect damage and indirect loss of life.

Economic models[27] explain suicide as a rational act in a dynamic situation characterised by uncertainty based on a choice between various alternatives depending upon associated benefits and costs. The suicide rate is correlated to cultural, social, economic and political forces, sex and age.[28] In high-income countries, the proportion of all deaths due to suicide (1.7%) is higher than the corresponding proportion in low- and middle-income countries (1.4%).[29] However, any cross-country comparisons of suicide rates are likely to be worthless because of the underreporting due to both cultural and social pressures.

The meaning of suicide is ambiguous as despair and hopelessness are culturally conditioned.[30] Some cultures do not stigmatize suicides, e.g. the sacrifice for the physical and/or economic survival of others.[31] Religion often plays a protective role against suicide. However, Eastern religions are more accepting of it than Western ones. A nation's level of individualism is a potent predictor of its suicide rate. Honour and reputational threat are another important sociocultural variable.

The forced evacuation after the Fukushima Daiichi accident was responsible for symptoms of depression which led to increased suicide rates immediately after the accident and then 1.5-2.5 years after the accident depending on sex and age.[32] The Fukushima District Court acknowledged some suicides were linked to "strong stress" caused by the evacuation and the

25. This Chapter does not deal with loss of life incurred as a direct result of evacuation.
26. See Section I.2 above.
27. Hamermesh, D.S. and N.M. Soss (1974), "An Economic Theory of Suicide", *The Journal of Political Economy*, Vol. 82, No. 1, pp. 83-93, The University of Chicago Press; Lester, D. (1987), *Suicide as a Learned Behavior*, Charles C. Thomas Publisher, Springfield, Illinois, United States.
28. Clay, Rebecca A. (2018), "The cultural distinctions in whether, when and how people engage in suicidal behavior", *Monitor on Psychology*, June 2018, Vol. 49, No. 6, p. 28.
29. WHO (2014), Preventing suicide. A global imperative, Word Health Organisation, Luxembourg, p. 22.
30. Colucci, E. and Lester D. (eds.) (2012), *Suicide and Culture: Understanding the Context*, Hogrefe Publishing, Cambridge, p. 69.
31. Institute of Medicine (2001), *Risk Factors for Suicide: Summary of a Workshop*, The National Academies Press, Washington, DC.
32. Orui, M. et al. (2018), "Suicide Rates in Evacuation Areas After the Fukushima Daiichi Nuclear Disaster. A 5-Year Follow-Up Study in Fukushima Prefecture", *Crisis*, 39(5), pp. 353-363, also available at www.ncbi.nlm.nih.gov/pmc/articles/PMC6263751 (accessed 24 Apr. 2024).

fear of becoming a burden. Consequently, it ordered the operator liable to compensate for suicide in 2014, 2015 and 2018.[33]

Links between nuclear incidents and suicide have not been thoroughly examined. A 2018 study published in The Journal of Crisis Intervention and Suicide Prevention[34] analysed suicide rates in evacuation areas after the nuclear incident in Fukushima based on statistics between March 2009 and December 2015. Suicide rates in areas in which evacuation orders had been issued, requiring across-the-board compulsory evacuation, were compared with the national average. Male suicide rates in evacuation areas increased significantly immediately after the disaster, and then began to increase again four years afterwards. Female suicide rates declined slightly during the first year and then increased significantly over the subsequent three-year period.

Indirect loss of life could be considered on a case-by-case basis by national courts, taking into account the national precedents in fields other than nuclear incidents.

V. The extended prescription period for personal injury (from 10 to 30 years)

1. The issues relating to personal injury

Under the Revised Paris Convention and the Revised Vienna Convention, the prescription period for personal injury goes beyond the original 10 years and is extended to 30 years. In some countries, there is no provision for prescription for personal injury.[35] However, claims are also time barred after two or three years (depending on the convention) from the date on which the person suffering nuclear damage had, or should have had, knowledge of the nuclear damage and of the operator liable for it.

In the case of a delayed personal injury, it may be difficult to establish whether the claimant was indeed exposed to radiation and, if so, the dose absorbed.[36] This may be caused by a number of factors, e.g. by the fact that the victim has moved within or has left the area; or because the amount of radioactivity in the food consumed cannot be properly calculated, among other reasons.

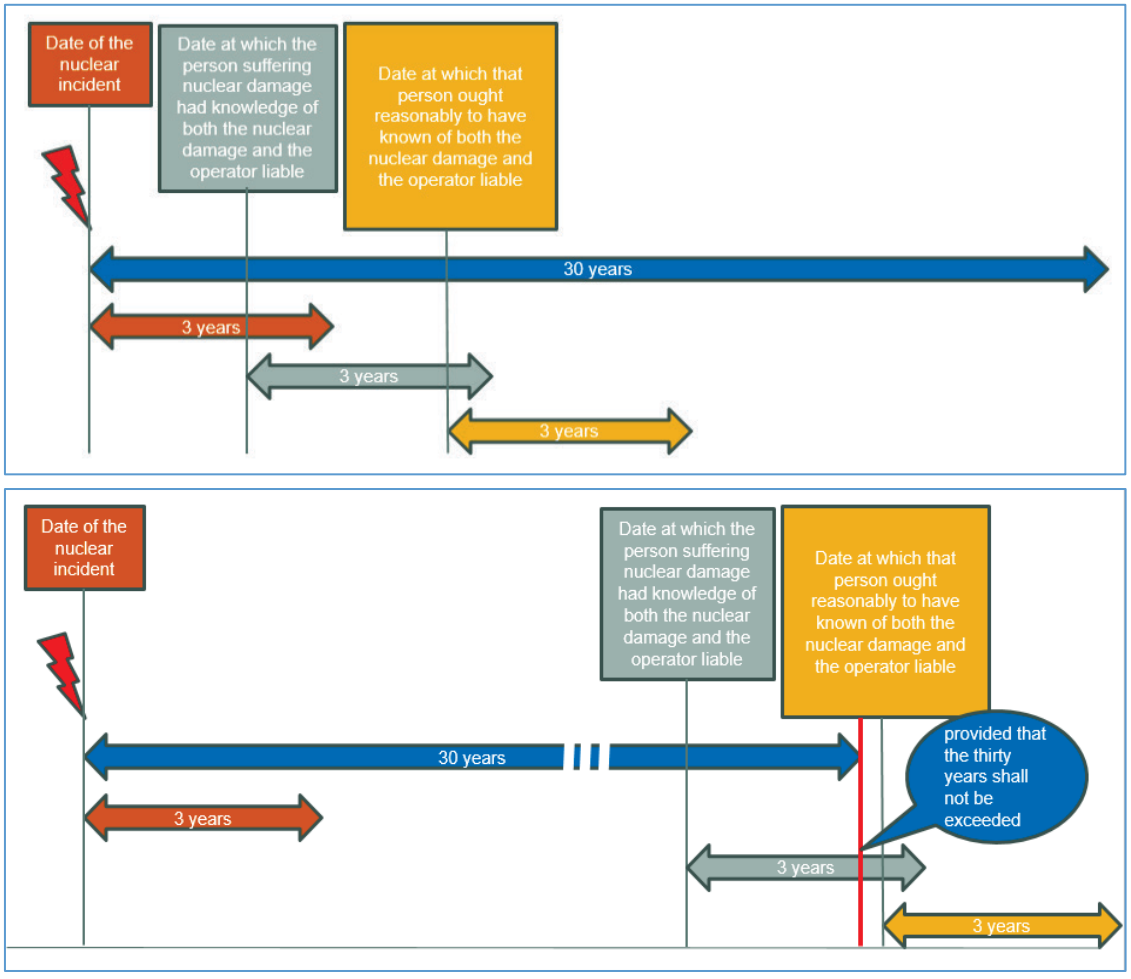
It is equally difficult to establish the effects of the dose absorbed on a living tissue. This remains true especially with regard to delayed injury, which is linked to the problem of determining stochastic effects of radiation as the exact mechanisms of cancer development are not fully known.[37] Even small doses of radiation can cause delayed injury. The effects may differ according to individual conditions (e.g. general health condition, family cancer history). In addition, diseases like leukaemia or other types of cancer can be triggered by various factors other than radioactivity. Therefore, the effects of ionising radiation and other risk factors are extremely difficult to dissociate especially when the dose absorbed was low.

Furthermore, delayed injury can manifest not only through cancer but through many different diseases with no particular features that could be easily linked to radiation exposure.

33. "Compensation awarded over 102-year-old's suicide amid Fukushima crisis", *The Japan Times*, 20.2.2018, available at: www.japantimes.co.jp/news/2018/02/20/national/crime-legal/compensation-awarded-102-year-olds-suicide-amid-fukushima-crisis/#.XRWv1iAzU2w (accessed 24 Apr. 2024).
34. No. 39(5), pp. 353-363.
35. See Section I.2 above.
36. In 2005, the Chernobyl Forum, which is made up of 8 United Nations agencies including the IAEA and WHO, released the report "Chernobyl's Legacy: Health, Environmental and Socio-Economic Impacts". The report found that up to 4 000 people "could eventually die of radiation exposure from the Chernobyl nuclear power plant (NPP) accident nearly 20 years ago", however "as of mid-2005, fewer than 50 deaths had been directly attributed to radiation from the disaster". For further reading, see www.iaea.org/sites/default/files/chernobyl.pdf (accessed 24 Apr. 2024).
37. See Section II.2.b.ii above.

Figure 1.3. **The difficulties arising from the extended prescription period**

30-year prescriptive period



Source: Quéré, A. (2019), "Impact of the prescription period", presented at the Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, Lisbon, October 2019.

2. The issues relating to insurance

The extended prescription period for bodily injury claims to 30 years is a challenge for the insurers for the following reasons:

- A major hurdle lies in the uncertainty surrounding the authorised releases and the overall effects at these low doses of radiation, which makes the risk an entrepreneurial risk rather than an insurable risk. There is no direct evidence of health effects in the "authorised radiation limits" range – consequently it is questionable whether an operator should be required to insure a non-existent risk.
- The causal link is also key for insurance. A cancer will manifest itself years after an exposure to radiation and diseases like leukaemia or other types of cancer can be triggered by various factors other than radioactivity. Current knowledge cannot distinguish potential radiation induced cancers from non-radiation induced cancers. Faced with this uncertainty, courts will have a difficult time in establishing the causal link.

- Another significant question is the impossibility of establishing whether the claimant has indeed been exposed to radiation, and establishing the dose.

In addition to the above qualitative difficulties, there are also quantitative difficulties. As nuclear reactors are regulated by the same rule of authorised release, all nuclear reactors in the world face the same risk of authorised releases causing personal injury in the future. It is difficult to identify the year when the authorised release caused the personal injury. Assuming that 9 reactors with a limit of the operator's nuclear liability of EUR 1.2 billion per nuclear incident caused personal injury after 20 consecutive years of operation, the total exposure will be EUR 1.2 billion x 9 x 20 = EUR 216 billion (under the assumption that there is an annual limit, which is the case in a number of countries). This amount vastly exceeds the total capacity of the insurance market.[38]

As it is known that the exposure to higher radiation may lead to the development of cancer, sometimes more than 10 years later, the extended prescription period for personal injury claims to 30 years makes sense from a victim's perspective. However, at the same time, it disconcerts the insurers because there will be almost no insurability in the authorised release once it is combined with the extension of the prescription period because both the above qualitative and quantitative issues will become more apparent than in the case of 10 years.

Making the extended prescription period for personal injury claims from 10 to 30 years insurable cannot be guaranteed without nuclear insurers consultation. One possibility could be to introduce a trigger and a lifetime limit applying to licence holders. This would cap the liability amount. The trigger would need to be a predefined level of emissions (above the authorised radiation limits), such as a defined level of radioactivity in the immediate surroundings of the plant or an INES level 4 event.[39] Any agreed threshold (or combination thereof) which can be measured without bias could be considered, the objective being to have a clearly defined event. Establishing such a trigger will require careful reflection, as once triggered, insurers would reserve the insured amount in full.

This would allow the insurers to build financial reserves to respond to potential claimants facing real claims in the future. This would also help the operator and the authorities to inform the population around the accident site, which in return would allow the victim to avoid missing deadlines relating to the period of discovery.

3. The issues relating to priority rules

The Revised Vienna Convention and some national legislations provide for priority rules that say that "priority in the distribution of the compensation shall be given to claims in respect of loss of life or personal injury".[40]

As explained above, it is difficult to establish delayed loss of life or personal injury, and more specifically to establish the causal link to the nuclear incident. It will therefore be challenging to evaluate the potential amounts of compensation that will be due in the future for delayed loss of life or personal injury, blocking funds that could be distributed to victims for other types of nuclear damage. This is more complex as the 30-year prescription period for loss of life or personal injury under the Revised Paris and the Revised Vienna Conventions will mean that the victims suffering other types of nuclear damage will lose their right to compensation as the prescription period that will apply to the other types of nuclear damage will be of 10 years under all the Conventions.

38. The mutuals, which were created by the operators, have a capacity to cover 30 years, as do some insurers.
39. See the International Nuclear and Radiological Event Scale (INES) at www.iaea.org/topics/emergency-preparedness-and-response-epr/international-nuclear-radiological-event-scale-ines (accessed 24 Apr. 2024).
40. Article VIII.2 of the Revised Vienna Convention.

VI. Conclusion

As of October 2019, the question regarding the extent to which loss of life or personal injury could be compensated in the event of a nuclear incident remains. The Conventions provide that national courts will be responsible for determining this and without any clear path, guidance or at least prior consideration and reflection, such a task will be complicated.

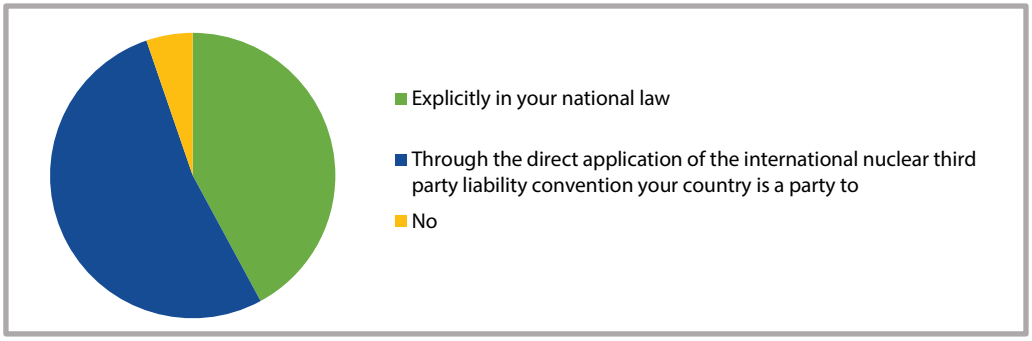
In addition, victims of a nuclear incident will be in need of swift compensation to be able to address the issues they face, no matter which head of damage they will be claiming compensation for. If no guidance is addressed in advance, national courts will face years of litigation before such compensation can be provided.

It is therefore suggested to encourage the dissemination of nuclear law through education and communication, enabling national courts to have a broad understanding of the challenges that will be faced in the event of a nuclear incident.

Annex 1.A1. **Compilation of responses to the Questionnaire**[1]

Question 2.a.

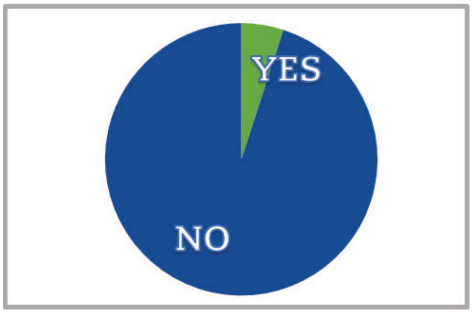
Do your national legislation, regulations and/or case law provide for this type of damage (i.e. loss of life or personal injury) in the context of a nuclear damage?



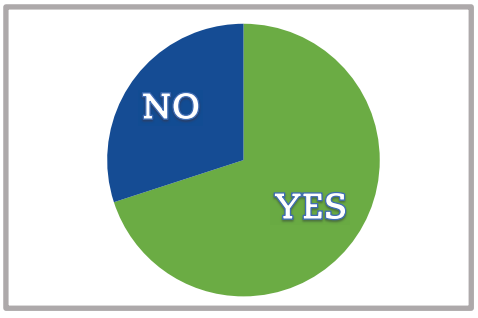
Question 2.b.

With regard to personal injury, do your national legislation, regulations and/or case law provide for:

(i) a specific definition and/or measures to determine what a "personal injury" is in the context of a nuclear damage?



(ii) a specific prescription period for "personal injury" in the context of a nuclear damage?

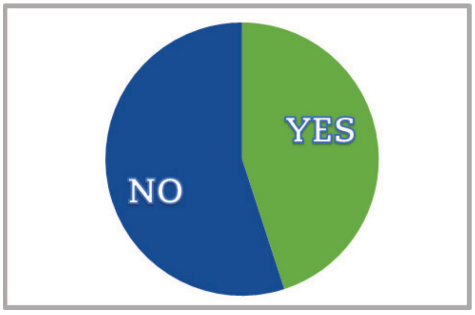


1. The charts included in the present Annex 1.A1 provide an overview of the answers to the questions relating to the Expert Group 1 topic "Loss of life or personal injury".

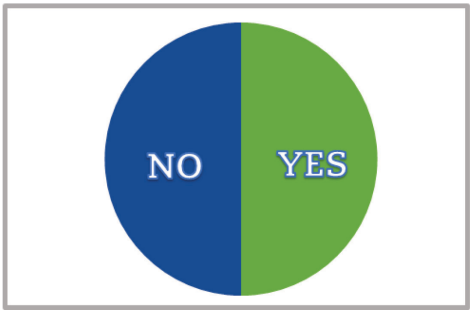
Question 2.c.

Do your national legislation, regulations and/or case law consider that mental anguish should be compensated:

(i) in the context of a nuclear incident?

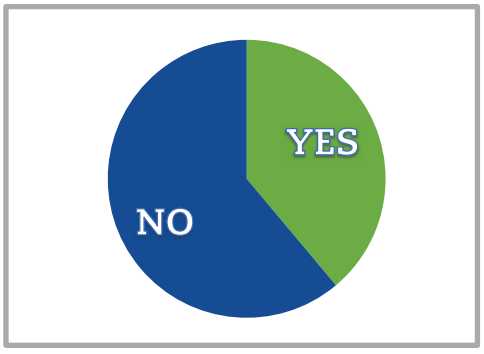


(ii) in the context of other industrial activities?



Question 2.d.

Do your national legislation, regulations and/or case law compensate for an "indirect" loss of life, such as suicides?



Chapter 2. **Loss of or damage to property**

Conclusions from the Workshop

- **Absence of definition of "loss of or damage to property"** in the Conventions and diversity of national legal approaches give competent courts full discretion leading to uncertainties as to the extent of compensation to be paid.
- **Exclusion of damage to the on-site property** from the scope of compensation under the nuclear liability conventions does not affect the right of the parties to commercial contracts to indemnify the owners of such property.
- **Potential overlapping of compensation** for property damage with other heads of damage might lead to the detriment of other victims' indemnification.
- **The Fukushima Daiichi lessons learnt**: a state with nuclear installations needs to be prepared by establishing a clear and comprehensive framework to determine the compensation due to the victims of property damage (e.g. guidelines).
- **Development of a specific definition of "damage to or loss of property"** at the national level or at least of mechanisms to speedily determine such damage upon the occurrence of a nuclear incident, along with the criteria needed to calculate compensation for such damage, can only be encouraged in order to ensure protection of victims of a nuclear incident by efficiently providing adequate and quick indemnification.

Introduction: the concept of "property" in the context of indemnification for nuclear damage

Even though the concept of "property" entirely depends on the legal system concerned (it provides a definition and the extent of the related rights and obligations), "property" is commonly understood as the right to possess, use, and enjoy a determinate thing (i.e. the right of ownership).[1] Therefore, property may be defined as anything that is owned by a person or an entity. As to the ownership of a thing, it can be described as the right of one or more persons to possess and use it to the exclusion of others, including the right to convey it to others. In addition, there may also be rights which are similar to ownership without, however, covering the same scope (e.g. lease, rent). In case of a nuclear incident, these rights may be taken into account in the process of indemnifying victims for nuclear damage (e.g. relocation costs of a tenant having possession of a house who was forced to leave it following an evacuation order).

There are various forms of property, and among them (a non-exhaustive list): *movable property* (i.e. property that can be moved or displaced, such as personal goods) and *immovable property* (i.e. property that cannot be moved); *real property* (i.e. land and anything growing on, attached to, or erected on it, excluding anything that may be served without injury to the land) and *personal property* (i.e. any movable or intangible thing that is subject to ownership and not classified as real property); *public property* (state- or community-owned property not restricted to any one individual's use or possession) and *private property* (i.e. property which is protected from public appropriation and over which the owner has exclusive and absolute rights); *tangible property* (i.e. property that has physical form and characteristics) and *intangible property* (i.e. property that lacks a physical existence, such as patents, goodwill, intellectual property or similar rights).

The issue of property rights can become particularly significant when dealing with nuclear damage to the environment because of its very wide definition (which could vary from one legal system to another) and common ownership (unless considered as private property, e.g. a lake or woods owned by a private person).[2] In case of a nuclear incident, the competent court will have to determine whether "environment" can be qualified as "property" nuclear damage to which may be subject to compensation as part of "loss of or damage to property" in accordance with the applicable law. This Chapter will not however elaborate on the potential delimitation, in the context of a nuclear incident, of "measures of reinstatement of impaired environment" and "loss of or damage to property" on one hand, and "loss of income deriving from an economic interest in any use or enjoyment of the environment" and "loss of or damage to property" on the other hand, as these issues will be addressed in detail by Chapters 4 and 3 respectively.

In case of a nuclear incident, the applicable law as interpreted by the competent court will provide a definition of "property", "ownership" and/or "similar rights" nuclear damage to which may be subject to compensation. In addition to proving the causal link between the "loss of or damage to property" and the nuclear incident, persons which may be entitled to such compensation according to the applicable law (i.e. "third parties" such as individuals, legal persons, self-employed individuals and corporation) will be required to demonstrate their legal ownership or rightful possession. In these circumstances, having a title to property would provide legal certainty to victims with regard to financial compensation to which they may be entitled (e.g. an owner of a house proving his/her ownership by a title would most probably be compensated for costs due to the loss of his/her house or a decrease in value of his/her property caused by a nuclear incident). However, title is generally affixed to property that has greater

1. Definitions and examples of "property" and "ownership" used in the Introduction are taken from the Black's Law Dictionary, available at: https://thelawdictionary.org (accessed 24 Apr. 2024).
2. See Principle 2(b) of the International Law Commission (ILC) Draft Principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities, 2006, available at http://legal.un.org/ilc/texts/instruments/english/commentaries/9_10_2006.pdf (accessed 24 Apr. 2024); and Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with Regard to the Prevention and Remedying of Environmental Damage, *Official Journal of the European Union* (OJ) L 143, 30 Apr. 2004 (EU Directive on Environmental Liability).

value (e.g. housing, buildings, land, vehicles), which may leave other property(ies) in a situation where, in the absence of title, its (their) ownership or rightful possession cannot be easily demonstrated (e.g. personal belongings). In these circumstances, any other evidences or documents that would show ownership or rightful possession (e.g. home and mortgage insurance; a company's insurance; a fire insurance; a company's balance sheet) would help victims to claim compensation. The applicable law may also entitle other persons than the owners of property to request compensation (e.g. usufructuaries, tenants or lessees).

In addition to the conditions to be fulfilled to prove ownership or rightful possession, criteria for evaluating the value of damaged property[3] and determining other costs that may be taken into account to calculate compensation for nuclear damage to property will have to be established.[4] These are only some challenges that will have to be dealt with while addressing the issue of indemnifying victims for "loss of or damage to property" caused by a nuclear incident.

I. "Loss of or damage to property" as provided under the international conventions

1. The nuclear third party liability conventions

i. Definition of "loss of or damage to property"

All nuclear third party liability conventions (i.e. the Paris Convention, the Revised Paris Convention, the Vienna Convention, the Revised Vienna Convention and the CSC) cover "loss of or damage to property" in their respective definitions of "nuclear damage".[5] They also provide that "loss of or damage to property" does not include damage or loss to the nuclear installation itself and any property on that same site which is used or to be used in connection with such

3. In this regard, a majority of property has some amount of monetary or potential value that may be identified while calculating compensation. Some intangible property may have paper documents to represent the property (such as stocks, bonds, or patents). Other types of intangible property, like a brand's reputation or goodwill, may not require a paper document. Much intangible property is considered intellectual property, which can include ideas, creative work, and design concepts. Though intangible, this type of property can be significantly valuable.
4. Depending on the applicable law, certain losses suffered by victims of a nuclear incident (e.g. "loss of profit", "loss of income") can be considered as being part of "loss of or damage to property", "economic loss" and/or "measures of reinstatement of impaired environment" (within the meaning of the nuclear third party liability conventions). In such a case, victims would be asked to demonstrate these losses and provide supportive evidences.
5. Article 3 of the Paris Convention expressly covers damage to or loss of any property in case of a nuclear incident as it provides that "The operator of a nuclear installation shall be liable, in accordance with this Convention, for […] damage to or loss of any property […]". Under the Revised Paris Convention, the definition of "nuclear damage" has been significantly expanded to include additional heads of damage, whilst "loss of or damage to property" remain covered by the Revised Paris Convention in the same manner as provided in the Paris Convention (see Article 1(a) of the Revised Paris Convention). The Vienna Convention provides in its Article I.1(k) that "nuclear damage" covers, among others, "any loss of, or damage to property." The definition of "nuclear damage" provided in the Revised Vienna Convention is almost identical to the definition of nuclear damage provided in the Revised Paris Convention. The "loss of or damage to property" are covered by the Revised Vienna Convention in the same way as they are covered by the Vienna Convention (see Article I.1(k) of the Revised Vienna Convention). Article I(f) of the CSC contains a definition of "nuclear damage" which is identical to the definition in the Revised Vienna Convention (see Article I(f) of the CSC).

installation.[6] The purpose of such exclusion is to avoid the financial security constituted by the operator from being used principally to compensate damage to the nuclear installation to the detriment of third parties. In this regard, the *Exposé des Motifs of the Revised Paris Convention*[7] clarifies that

> […] Owners of nuclear installations which are either operating or under construction are obliged to assume the risks of loss of or damage to their property since they are able to include the cost of this risk in the cost of operating or building the installation. Similarly, contractors whose property is on the site of a nuclear installation are obliged to assume the risks of loss or damage thereto, as they are able to include the cost of this risk in the price of their supply contract.

However, it is worth noting that this exclusion does not affect the personal property of any person employed on the site.[8] Moreover, such exclusion should not affect the rights of the parties to the commercial contracts to agree upon indemnification of damage to owners of such on-site property.

In order to be entitled to compensation for "loss of or damage to property" under the Conventions, loss or damage must be caused by a "nuclear incident"[9] arising out of or resulting from (a) the radioactive properties or a combination of radioactive properties with toxic, explosive or other hazardous properties of nuclear fuel or radioactive products or waste, or (b) from ionising radiation. As a consequence, there must be an emission of ionising radiation before damage can give rise to compensation under the Conventions; the only exception in this regard relates to preventive measures.[10]

6. See Article 3 of the Paris Convention, Article 3 of the Revised Paris Convention, Article IV.5(a) of the Vienna Convention, Article IV.5 of the Revised Vienna Convention and Article 3 of the CSC Annex. It is worth noting that the *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage* states the following: "[…] unlike the corresponding provision in the 1960 Paris Convention, Article IV.5(a) of the 1963 Vienna Convention makes no reference to other nuclear installations, including an installation under construction, which may be located on that same site, nor to property used in connection with such other installations. The 1997 Protocol amends the Vienna Convention in this respect, in order to bring it in line with the 1960 Paris Convention". For more information See IAEA (2020), *The 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage – Explanatory Texts*, IAEA International Law Series, No. 3 (Rev. 2), IAEA Doc. STI/PUB/1906, IAEA, Vienna (*Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*), p. 41.
7. NEA (2024), *Exposé des Motifs of the Paris Convention as amended by the Protocols of 1964, 1982 and 2004*, adopted by the Contracting Parties to the Paris Convention on 18 Nov. 2016, NEA Doc. NEA/NLC/DOC(2020)1/REV1/FINAL (*Exposé des Motifs of the Revised Paris Convention*).
8. For example, see NEA (1982), "Exposé des Motifs", revised text approved by the OECD Council on 16 Nov. 1982, OECD Doc. C/M(82)24(Final) (*Exposé des Motifs of the Paris Convention*), paragraphs 40 and 41; paragraph 55 of the *Exposé des Motifs of the Revised Paris Convention*, NEA (2024), *Exposé des Motifs of the Revised Paris Convention, supra* note 7; IAEA (2020), *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*, p. 41, *supra* note 6.
9. A "nuclear incident" is defined in Article 1(a)(i) of the Paris Convention. The Revised Paris Convention contains identical provisions. Provisions of the Vienna Convention [Article I.1(l)] are slightly different as, unlike the Paris Convention which covers damage due to ionising radiation emitted by "any source of radiation inside a nuclear installation", damage caused by "other ionizing radiation emitted by any other source of radiation inside a nuclear installation" is only covered by the Vienna Convention if the law of the installation state (i.e. the state on whose territory the nuclear installation is situated) so provides. The new definition of "nuclear damage" provided in Article I.1(k) of the Revised Vienna Convention brings it in line with the provisions of the Paris Convention and the Revised Paris Convention. For more information, see IAEA (2020), *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*, pp. 35-36, *supra* note 6.
10. See Article 1(a)(vii) of the Revised Paris Convention and Article I.1(k) of the Revised Vienna Convention. As far as the definition of "nuclear damage" is concerned, Article I(f) of the CSC provides a harmonised definition identical to the one adopted in the Revised Vienna Convention.

Finally, all Conventions contain no detailed provisions determining the kind of "loss of or damage to property" which will be compensated, but provide only that damage must be to property and related causally to a nuclear incident. What should be considered as damage to property, in view of the very wide divergence of legal principles and national laws, is left to be decided by the competent court in accordance with the national law applicable.[11] The wide discretion thus given to the national legislation of the contracting parties may give rise to uncertainties as to the extent of compensation to be paid in case of a nuclear incident.[12] Moreover, nuclear liability principles would be interpreted in light of general tort law (so will the definition of nuclear damage and of "loss of or damage to property"), as the scope of civil remedies is ultimately tied to the general legal concepts and traditions of each countries.[13]

ii. *Relations with other heads of nuclear damage*

The Revised Paris Convention, the Revised Vienna Convention and the CSC contain detailed definitions of "nuclear damage" which comprise different categories of injury, loss, costs or damage subject to compensation.[14] Apart from the two "traditional" categories of "loss of life or personal injury" and "loss of or damage to property", the above definition of "nuclear damage" encompasses certain types of economic loss, the costs of restoring an impaired environment and the costs of measures taken to prevent or minimise nuclear damage.[15]

However, such losses and costs constitute nuclear damage only to the extent determined by the relevant provisions of national law of the competent court. A contracting party is not free to exclude any of these categories of damage under its national law; rather, its body of national law and legislation must address all of those heads of damage, although it has discretion to determine the nature, form and extent of compensation to be granted under those heads.[16] Moreover, all these losses and costs (with the exception of the preventive measures applied

11. All the Conventions provide that the nature, form and extent of the compensation, within the limits of the Conventions, as well as the equitable distribution thereof, shall be governed by national law of the competent court [see Articles 11 and 14(b) of the Paris Convention, Articles 11 and 14(b) of the Revised Paris Convention, Article VIII of the Vienna Convention, Article VIII of the Revised Vienna Convention and Article 11 of the CSC Annex]. For more information, see NEA (1982), *Exposé des Motifs of the Paris Convention*, paragraph 39, *supra* note 8 and IAEA (2020), *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*, pp. 34-35, *supra* note 6.
12. According to the *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*, "[…] after the Chernobyl incident, it became clear that the various legal systems of the States in which damage was suffered were likely to provide different answers to the questions of whether, and to what extent, the wide range of pecuniary losses that may derive from a serious nuclear incident could qualify as property damage. It was pointed out, for example, that there is a difference, from the legal point of view, between the financial loss due to the seizure of contaminated vegetables and the financial loss due to a decline in turnover caused by changing attitudes of customers afraid of the possible dangers of nuclear contamination. […] [T]he law of the competent court will have to be referred to primarily in order to determine the precise meaning of nuclear damage to be compensated, especially in relation to the concept of property damage". For more information, see IAEA (2020), *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*, pp. 34-35, *supra* note 6.
13. NEA (1997), "Preliminary Study of Amendments to the Paris Convention on Third Party Liability in the Field of Nuclear Energy Resulting from the Revision of the 1963 Vienna Convention on Civil Liability for Nuclear Damage", OECD Doc. [NEA/LEG/DOC(97)/4/CORR1], p. 10.
14. See Article 1(a)(vii) of the Revised Paris Convention, Article I.1(k) of the Revised Vienna Convention and Article I(f) of the CSC.
15. The definition of "nuclear damage" in the Revised Paris Convention does not include a head of damage referred to in the Revised Vienna Convention and the CSC, and namely "any other economic loss, other than any caused by the impairment of the environment, if permitted by the general law on civil liability of the competent court". This head of damage is generally considered to be covered by other heads of damage already included in the definition provided in the Revised Paris Convention.
16. For more information see NEA (2024), *Exposé des Motifs of the Revised Paris Convention*, paragraph 54, *supra* note 7 and IAEA (2020), *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*, pp. 36-41, *supra* note 6.

outside of contaminated zones or in case of imminent threat),[17] are subject to compensation insofar as not already included in the concepts of loss of life, personal injury or loss of, or damage to, property under the law of the competent court.[18]

Finally, due to the significant variety of the applicable national laws, it may happen in practice that the same loss or damage is interpreted differently by a competent court and, as a consequence, compensated under two or more heads of damage at the same time (e.g. losses suffered by a farmer of a contaminated land, which may be qualified as part of "loss of or damage to property" or costs of "measures of reinstatement of impaired environment"). It may lead to a potential overlap in compensation for the same loss or damage to the detriment of other victims' indemnification.

2. Other international instruments providing definitions or establishing mechanisms to define "loss of or damage to property"

The definition of "nuclear damage" contained in the Revised Paris Convention (which is almost identical to the definition of "nuclear damage" provided in the Revised Vienna Convention and the CSC) has been inspired by similar definitions adopted under other international liability conventions, such as the definition of "pollution damage" in the 1992 Civil Liability Convention (formerly the International Convention on Civil Liability for Oil Pollution Damage)[19] and the definition of "damage" contained in the International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances (HNS).[20]

The Convention on Civil Lability for Damage Resulting from Activities Dangerous to the Environment[21] includes the definition of damage, which covers, among others, the loss of or damage to property other than to the installation itself or property held under the control of the operator, at the site of the dangerous activity. The Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and Their Disposal[22] defines damage as, among other, loss of or damage to property other than property held by the

17. Taking into account that the definition of "nuclear damage" provided in the Revised Paris Convention, the Revised Vienna Convention and the CSC seem to exclude the need for the "preventive measures" to be linked to the existence of ionising radiation, a question may arise as to whether the preventive measures applied inside contaminated zones could be covered by the head of "loss of or damage to property."
18. This Chapter does not cover in detail what is "economic loss", which is addressed by Chapter 3 and what are "costs of measures of reinstatement of impaired environment", which are addressed by Chapter 4. For more information on these heads of damage and their relations with "loss of or damage to property", see: a) Economic loss: NEA (2024), *Exposé des Motifs of the Revised Paris Convention*, paragraph 58, *supra* note 7 and IAEA (2020), *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*, p. 36, *supra* note 6; b) Costs of measures of reinstatement of impaired environment: IAEA (2020), *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*, pp. 38-39, *supra* note 6 and NEA (2024), *Exposé des Motifs of the Revised Paris Convention*, paragraph 59, *supra* note 7; c) Loss of income deriving from an economic interest in any use or enjoyment of the environment: IAEA (2020), *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*, pp. 36-37, *supra* note 6 and NEA (2024), *Exposé des Motifs of the Revised Paris Convention*, paragraph 60, *supra* note 7.
19. International Convention on Civil Liability for Oil Pollution Damage (1992), 1956 UNTS 255. For more information on this convention, see www.imo.org/en/About/Conventions/Pages/International-Convention-on-Civil-Liability-for-Oil-Pollution-Damage-(CLC).aspx (accessed 24 Apr. 2024).
20. International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (2010 HNS Convention). For more information on the HNS Convention, see www.hnsconvention.org/the-convention/ (accessed 24 Apr. 2024).
21. Council of Europe (1993), Convention on Civil Lability for Damage Resulting from Activities Dangerous to the Environment, European Treaty Series - No. 150. For more information on this convention, see https://rm.coe.int/168007c079 (accessed 24 Apr. 2024).
22. Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal (1999 Basel Protocol). For more information on this Protocol, see https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-3-b&chapter=27&clang=_en (accessed 24 Apr. 2024).

person liable in accordance with the Protocol. However, none of these conventions specifies the meaning of "loss of or damage to property".

At the EU level, the Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damage[23] lays down rules based on the polluter-pays principle, to prevent and remedy environmental damage. This directive, however, does not cover environmental damage or an imminent threat of such damage caused by an incident or activity in respect of which liability or compensation falls within the scope of any of the international instruments listed in Annex V of the Directive (i.e. the Paris Convention, the Revised Paris Convention, the Vienna Convention, the Revised Vienna Convention and the Joint Protocol).

II. Definitions of "loss of or damage to property" provided under national laws

1. Questionnaire

The replies provided to the Questionnaire give a certain overview of how different national laws qualify "loss of or damage to property" (See Annex 2.A1 to this Chapter).

National laws of most of the countries who replied to the Questionnaire cover "loss of or damage to property" in case of a nuclear incident, without providing however any specific definition of this head of damage. In some countries, the definition of "nuclear damage" provided by the respective Conventions directly applies in the national legal system). In other countries, there is a specific legal definition of "nuclear damage" which however mirrors the definition provided in the relevant Convention. Only few countries provide for a more detailed definition of "nuclear damage" than the one contained in the Convention to which they are party. But none of these countries have a specific legal definition of "loss of or damage to property" in case of a nuclear incident. As for the non-Convention states, general tort law would apply to define the scope of nuclear damage to be compensated and among this scope, "loss of or damage to property" or govern the extent of such compensation.

2. Examples of definition of "loss of or damage to property" provided in national laws[24]

Where national laws do not provide any specific definition of "loss of or damage to property" in case of a nuclear incident, provisions of general tort and/or the civil liability law of a competent court would most probably be referred to in order to determine the precise meaning of this category of damage to be compensated, taking into account that in any case the competent court will have the final say. The following examples may be provided:

i. Non-Convention states

- Austria

Compensation to property damage is regulated by the general provisions of Austrian tort law. According to Section 11(1) and (2) of the 1999 Federal Act on Civil Liability for Damage Caused by Radioactivity (AtomHG),[25] loss of or damage to property shall include decontamination costs and costs of measures of reinstatement of impaired environment. Moreover, if the damage to physical property also creates serious harm to the environment and if the person liable is unable or unwilling to restore it to its former condition, the person who suffered damage shall also be entitled to recover compensation for costs of reinstatement, even if such costs exceed the value of the property damaged.

23. *Supra* note 2.
24. All English translations provided in the report for laws issued in a language other than English are unofficial.
25. Federal Act on Civil Liability for Damage Caused by Radioactivity, as amended, 1998 (*BGBl.* I No. 170/1998) (AtomHG).

ii. Paris Convention states

- Germany

As regards the notion of "property", the German Atomic Energy Act (the "Atomgesetz")[26] provides no specific definition, and therefore the German Civil Code (Bürgerliches Gesetzbuch) applies.[27] It establishes the principle of full compensation which means that victims can claim full compensation for the cost of restoring their health or property; in case restoration is not possible or not sufficient, (additional) compensation in money can be claimed.[28] A consequential financial loss is also compensated. If a house is contaminated, the owner can claim compensation for the economic loss incurred by being deprived of the use of the house, e.g. the loss of income incurred for the time the owner could not rent the house to anyone or the cost incurred by renting another house for personal use during the time the house could not be inhabited. By contrast, a purely financial loss not resulting from damage to property is not compensated.

However, based on the statutory provisions provided in paragraph 31 of the Atomgesetz, liability for damage to property is limited to the amount of the fair market value of such damaged property and the costs of protection against the radiation hazards originating from such property.[29] Finally, the definition of damage to property not only benefits the person having legal ownership, but also extends to other persons holding comparable rights attributed to them, e.g. the right of a tenant to have possession of the house.

- Slovenia

In the Slovenian Act on Liability for Nuclear Damage[30] there is no definition of "loss of or damage to property." In the Protection Against Natural and Other Disasters Act,[31] the damage caused by a natural or other disaster shall comprise direct damage, the costs of interventions and measures to prevent the adverse consequences of the disaster being increased.

26. Atomic Energy Act, as amended, 1959 (*BGBl*. I 1959 S. 814).
27. As explained by Christian Raetzke, the German Civil Code "does not contain any provision specific to nuclear third party liability; but its chapter on tort law (sections 823 et seq.) helps define the notion of damage to life or property and its chapter on obligations contains the general principles of compensation applicable to any liability established by civil law (sections 249 to 253)." Moreover, "[c]oncerning the definition of "damage to or loss of property", this link is not entirely straightforward, for the term used for "property" in the official German wording of the [Paris Convention] – *Vermögenswerte* – does not figure within the terminology of the Bürgerliches Gesetzbuch. However, there is broad consensus among German experts that the term *Vermögenswerte* can be equated to the term *Eigentum oder ein sonstiges Recht* in section 823 Bürgerliches Gesetzbuch, which roughly translates as "ownership or another [similar] right."" For more information, see Raetzke, C. (2016), "Nuclear third party liability in Germany", *Nuclear Law Bulletin*, No. 97, OECD Publishing, Paris, pp. 9-33.
28. Section 249(1) of the German Civil Code reads: "A person who [owes compensation for] damage […] must restore the position that would exist if the circumstance obliging him to pay damages had not occurred."
29. Paragraph 31 of the Atomgesetz implements into the German national law provisions of Article 11 of the Paris Convention, which authorises the law of the competent court to determine the nature, form and extent of the damage to be compensated. This may lead to important consequences in the event of a nuclear damage to property (so-called "unjust financial losses"), such as loss of use of the damaged property. Consequently, together with the immediate property damage and the limitation of compensation for nuclear damage to the fair market value of such damaged property, it may result in a situation where a significant portion of the total damage caused by a nuclear incident to property may not be compensated. This also applies to a situation where a nuclear incident causes damage to a person's property and at the same time to his/her right of use of such property (e.g. an owner of a house damaged by a nuclear incident who is renting such house to a third person and cannot receive his/her rent due to the house's contamination): the total amount of compensation for nuclear damage would be limited to the fair market value of such property. For more information, see Fischerhof, AtG, No. 4 to paragraph 31 of the Atomgesetz.
30. Act on Liability for Nuclear Damage, 2010 (Official Gazette of the Republic of Slovenia – International Treaties, No. 77/10, 2010).
31. Official Gazette of the Republic of Slovenia, No. 51/06 – official consolidated text, 97/10 and 21/18 – ZNOrg.

Therefore, it is necessary to apply the general provisions of the tort law on damage and compensation. The Obligations Code[32] regulates material and non-material damage and the related compensation. Compensation for non-material damage can be monetary or non-monetary, while for material damage there is only monetary compensation. According to Article 132 of the Obligations Code, damage is the diminution of property (ordinary damage), the prevention of an increase in property (lost profits) and the fact of inflicting physical or mental pain or fear to another person and of curtailing the reputation of a legal entity (non-material damage).

iii. Vienna Convention states

- Hungary

According to Section 2(23) of the 1996 Hungarian Atomic Energy Act (the "Atomic Act"),[33] "nuclear damage" is defined as "non-material loss due to loss of human life, non-material loss due to damage to physical integrity and health of persons, all material damage, the costs of reasonable recovery of all environmental damage occurring together with these, the costs of reasonable and necessary measures actually implemented to mitigate or eliminate the non-material loss and the damage, if they are caused by an extraordinary event with nuclear fuel, radioactive product or waste in a nuclear facility, or nuclear material originating from, transported from or sent to a nuclear facility within the nuclear facility or during transport."[34]

According to Section 48/A of the Atomic Act, the extent, manner and applicability of compensation for nuclear damage to property shall be determined according to the relevant provisions of Act V of the 2013 Hungarian Civil Code on non-contractual liability for damages. Section 6:522 of the Civil Code provides that the tortfeasor shall compensate the aggrieved party for all his losses in full. In this regard, damage to property comprises, among others, any depreciation in value of the property of the aggrieved party; any pecuniary advantage lost (i.e. loss of profit); and the costs necessary for the mitigation or elimination of the financial losses sustained by the aggrieved party.

III. Types of losses related to "loss of or damage to property"

1. Losses that may be taken into account to compensate "loss of or damage to property" in the context of a nuclear incident

It is worth reminding that it is up to the competent court to decide, based on the applicable law, what are the losses associated with "loss of or damage to property" subject to compensation in case of a nuclear incident. Depending on the interpretation of "loss of or damage to property" given by the competent court (i.e. wide or restrictive interpretation), certain economic losses arising from "loss of or damage to property" (e.g. "loss of profit", "loss of earnings", "costs of measures of reinstatement of impaired environment", or "loss of income deriving from an economic interest in any use or enjoyment of the environment") and other types of losses (to the extent provided by the applicable law) may be included in the compensation as part of property damage.

32. Official Gazette of the Republic of Slovenia, No. 97/07 – official consolidated text, 64/16 and 20/18 – OROZ631.
33. Act CXVI of 1996 on Atomic Energy.
34. The Atomic Act covers all material damage (in Hungarian: "*minden anyagi kár*") instead of "any loss of or damage to property" (in Hungarian: "*a javak minden elvesztése, illetőleg minden vagyoni kár*") provided by the Vienna Convention to which Hungary is a party. The Atomic Act does not contain any definition of "all material damage". However, a competent court may interpret "all material damage" and "any loss of or damage to property" in the same way.

Taking the above into account, the following losses might be considered as being part of "loss of or damage to property" to be compensated in case of a nuclear incident:

- Costs due to the loss of the movable and/or immovable property itself (including the personal property of any person employed on the nuclear installation site);
- Costs related to the decrease in value of movable and/or immovable property;
- Decontamination costs;
- Costs of repair of the damaged property;
- Costs of measures taken to prevent or minimise the impact of nuclear damage on property (the preventive measures applied inside contaminated zones could be covered by the head of "loss of or damage to property");[35]
- Examination expenses to confirm that products or property are not contaminated[36] and other investigation costs;[37]

35. For example, the definition of nuclear damage provided by the Hungarian Atomic Act includes the costs of reasonable and necessary measures actually implemented to mitigate or eliminate the damage. Under the general liability rules of the Hungarian law, costs necessary to mitigate disadvantages caused by a damage could in principle be part of property damage, but it is subject to the competent court's interpretation.
36. For example, and with regard to the examination expenses, the Japanese Interim Guidelines (see *infra* note 57) mention that concerning "property, which includes goods that were located in an Affected Area, where it is recognised as necessary and reasonable to arrange for testing to ascertain the safety of the property, based on factors such as the nature of that property, examination expenses incurred by the property owner, etc. (including incidental costs, such as transportation costs incurred for the purpose of testing; the same applies below) can be recognised as damage warranting compensation, to the extent necessary and reasonable. […] [T]he value or price of property is greatly influenced by psychological and subjective factors such as the impressions, thoughts, and awareness of the individuals who buy and sell, etc. that property. […] Moreover, property testing often needs to be conducted, for example as a preventive measure to stop the other party from backing out of the transaction, asking for the transaction to be cancelled or asking for a price reduction, or to keep the escalation of business damage to a minimum. It follows that judging by the standard of the knowledge of the average, ordinary person and based on factors such as the type and nature of the property in question, where for example the owner, etc. of that property has deep concerns over the safety of the property and it is recognised as necessary and reasonable for that owner, etc. to arrange for testing to entirely dispel those concerns, it is reasonable to recognise those examination expenses incurred as damage. If examination expenses as a result of the accident are incurred prior to an evacuation instruction, it can be presumed that the testing was arranged based on a reasonable judgment due to the accident, and in the absence of reasonable grounds for disqualifying these examination expenses for compensation, these expenses can also be recognised as damage warranting compensation to the extent necessary and reasonable."
37. As mentioned by Christian Raetzke, according to Article 38 of the Atomgesetz, the German government shall provide compensation "to persons having suffered damage in Germany in the wake of a nuclear incident in specified cases where these victims cannot, under the rule of a foreign legislation, obtain the same amount of compensation they would be entitled to under German law." Based on these provisions, the German government paid around EUR 238 million for compensation to victims of the Chernobyl accident for damage suffered in Germany (see the statement of the Federal Government in Bundestagsdrucksache 17/2682 of 27 July 2010, p. 3). As further clarified by Christian Raetzke, "[t]his sum comprises not only compensation for damage awarded pursuant to section 38 of the *Atomgesetz* but also additional payments for specified economic losses based on two "equity guidelines" issued in 1986." For more information, see Raetzke, C. (2016), "Nuclear third party liability in Germany", *Nuclear Law Bulletin*, No. 97, OECD Publishing, Paris, pp. 30-31. In an official paper of the German government dated 2016, there is the following statement: "Federal compensatory payments between 1996 and 2015 were for contaminated venison, of which over 98 percent were wild boars. The compensation payments include a lump sum for incurred investigation costs." Investigation costs in general therefore were considered as part of the property loss, since there was as well venison and wild boar which are not contaminated and can be sold. The investigation costs shall be included in the lump sums, which are paid to the hunters. Consequently, the German government came to the conclusion that such investigation costs are part of the "loss of or damage to property" and therefore compensated. For more information on this subject, see Eich, W. (2003), "The Compensation of Damage in Germany Following the Chernobyl Accident", in NEA (ed.), *Indemnification of Damage in the Event of a Nuclear Accident – Workshop Proceedings*, Paris, France, 26-28 November 2001, OECD Publishing, Paris, pp. 89-92.

- Storage and disposal costs (e.g. waste storage and disposal costs for vegetables/food which could not be sold anymore due to contamination);
- Other economic loss arising from "loss of or damage to property" and which may be included in this category of damage (e.g. pecuniary loss related to the need to rent a temporary replacement until the damaged property becomes usable; loss of profit/loss of income related to the impossibility to rent the damaged property or to use it as a workplace);
- Costs of restoring an impaired environment (if considered by the competent court as included in the category "loss of or damage to property");
- Intellectual property related costs (e.g. loss of IT data being an intellectual property stored on a server destroyed by a nuclear incident).

In practice, assessing these losses and calculating compensation for damage may be a challenge. To determine compensation for immovable property situated in a longtime contaminated area (e.g. a house) should not be an issue as the fair market value of such property would be used as a basis. However, fair market value of some other types of property may be difficult to establish (e.g. jewellery, paintings) and therefore experts will have to be involved to determine an objective price.

With regard to the decrease in value of damaged property, some issues may arise where the overall conditions of the area where it is located deteriorate over time (e.g. bad economic situation or significant real estate price drops). It may not be easy to clearly distinguish the impact attributable to the nuclear incident itself from other factors which led to such a decrease in value.

The issue of causality may also complicate the evaluation of repair costs for damaged property. There may be a situation where the residents decide to come back, after several years of evacuation, to their houses left in the evacuated zone after a nuclear incident and find their property damaged by natural disasters (e.g. bad weather). This damage was not induced by the radiation itself but by the fact that the victims were not able to maintain their property, since they were not allowed to enter the restricted area. In some countries such costs will be compensated as part of nuclear damage. In other countries this would not be the case.

Another potential challenge would be to justify contamination examination expenses and other investigation costs in cases where it appears that goods or property were not in fact contaminated. In these circumstances, setting up certain areas where examination would be considered as justified regardless of its outcome (property being contaminated or not) would help resolving this issue.

In November 2011, the Hungarian Nuclear Insurance Pool carried out a theoretical exercise focusing on the assessment of certain loss of or damage to property (qualified as "material damage")[38] in case of a nuclear incident (see Annex 2.A3 to this Chapter). The theoretical scenario was a nuclear incident occurring at a land-based nuclear power plant located in Hungary with a significant release of radiation to the environment. The area taken into account for the purposes of the exercise covered a 30 km-zone corresponding to the Urgent Protective Actions Zone defined by the Hungarian Atomic Energy Authority (the "Area") with a mandatory evacuation in certain sectors (i.e. zones which are most exposed to contamination due to the main wind direction) and agriculture prohibitive measures applied to the whole Area. It is worth mentioning that the share of agricultural land corresponded to 88% of the Area (including specific high added value agricultural goods and products such as wine, watermelons, asparagus, and red pepper) with a relatively low level of industrial and tourism activities.

38. The choice of this head of damage was justified by the fact that, unlike other types of damage (e.g. loss of life or personal injury, costs of reinstatement of impaired environment, preventive measures) there was a significant amount of available, quantifiable and reliable public information regarding potential "material damage" in Hungary (source: Hungarian Central Statistical Office and Hungarian Nuclear Insurance Pool database).

For the purpose of the exercise, the following types of property were subject to monitoring while assessing the impact of a nuclear incident: companies; population (towns and/or villages); houses and/or flats; agriculture (land, vegetables, animals). The following losses were excluded from the exercise: i) in the Area: loss of or damage to property belonging to the state or municipalities; cars and other vehicles; any property of micro companies; higher added value agricultural products (wine, spices, etc.); private movable property located outside of buildings or flats (e.g. agricultural vehicles or machines belonging to private persons); loss of income or loss of profit; any damage to the environment; costs of preventive measures; ii) outside the Area: any claims for "material damage."

As an outcome of this exercise, it appeared that the total amount of "material damage" that was subject to consideration according to the proposed scenario (i.e. only certain types of "loss of or damage to property" located in a limited area) would be significantly higher than the limits of operators' liability provided in the Conventions as it would amount to approximately EUR 2.4 billion, with less than 5% of this amount (SDR 100 million or EUR 117 million, approximately) provided by the insurance market according to Hungarian law.[39] It also appeared that some types of claims could potentially be compensated either as "material damage" or as damage to the environment (e.g. damage to agriculture and forests) or economic losses (e.g. the loss of income or profit or a decrease in the value of movable or immovable property).

2. Concept of "consequential" or "indirect" damage in the context of "loss of or damage to property" in case of a nuclear incident

There is no single criterion regarding qualification of loss as "direct" and "indirect" or "consequential", as the same loss (e.g. "loss of profit") may be considered in some legal systems as a "direct loss", whilst according to the other legal systems it would be regarded as an "indirect" or "consequential".[40] Based on the replies provided to the Questionnaire, the national laws of the majority of the countries who replied to the Questionnaire provide compensation to victims of a nuclear incident for both "direct" and "indirect" loss. None of the countries provided any definition of "indirect" losses. Certain countries provide that only "direct" loss is subject to compensation.

With regard to the losses that may result from "loss of or damage to property" as provided in the Conventions (i.e. "economic loss" arising from "loss of damage to property",[41] "loss of income deriving from a direct economic interest in any use or enjoyment of the environment, incurred as a result of a significant impairment of that environment"[42] and "the costs of measures of reinstatement if impaired environment")[43] – it is a matter of law, and ultimately up to the judge who would interpret such law to determine whether such losses constitute "indirect" or "consequential damage", and whether such damage could be subject to compensation in case of a nuclear incident, and if so, under which category ("loss of or damage to property", "economic loss", etc.).[44]

39. According to the Hungarian Atomic Act, compensation for nuclear damage is limited to SDR 100 million per nuclear incident at a nuclear facility with a possibility for the Hungarian Government to provide additional compensation up to SDR 300 million.
40. According to the Black's Law Dictionary (*supra* note 1), "consequential damages" means losses that do not flow directly and immediately from an injurious act but that result indirectly from the act.
41. As an example: a factory owner's loss of income resulting from a production stoppage in that factory which is directly linked to the factory building having been damaged by a nuclear incident.
42. As an example: a fisherman suffering an economic loss because fish in the sea are contaminated by radiation and may no longer be sold in the market.
43. These are heads of nuclear damage subject to compensation as stand-alone heads of damage unless included in the categories of "loss of life or personal injury or "loss of or damage to property" (applicable to "economic loss), or in the category of "loss of or damage to property" only (for the remaining heads). For more information, see Section I.1(ii) of this Chapter.
44. For example, under the general liability rules of the Hungarian law, consequential damage (e.g. loss of revenue of a local business due to contamination) would be considered as part of property damage subject, however, to the competent court's interpretation. Important factors to consider by the court would be causality and the potential measures of the claimant to mitigate consequential damage.

Therefore, depending on the applicable law, "indirect" or "consequential damage" could be part of damage caused by the nuclear incident subject to compensation under the category "loss of or damage to property", without being directly connected to the radiation itself.[45] In many countries however, the concept of "consequential damage" does not exist and it would be therefore up to the judge to decide whether, based on the appreciation of the causal link and the remoteness, such damage may be compensated.[46]

3. Exclusions from insurance policies regarding "loss of or damage to property"

All conventional insurance policies provide for an exclusion regarding radioactive risks. This is due to the fact that nuclear damage is expected to be compensated under a specific nuclear liability regime and therefore covered by a specific nuclear insurance.

In this regard, and in addition to the classic cases of exoneration of an operator for nuclear liability provided in the Conventions (armed conflict, hostilities, civil war and insurrection, etc.)[47] or the cases where the compensation is excluded (i.e. damage to the nuclear installation itself or to any property on that same site which is used or to be used in connection with any such installation),[48] there may be additional exclusions provided in the nuclear insurance policies that would limit compensation of costs related to "loss of or damage to property" suffered by third parties.

As an example, compensation for damage caused by a nuclear incident triggered by a grave natural disaster of an exceptional character may not be covered by some nuclear insurers due to its very high level of risk.[49] Moreover, exclusion of claims for nuclear damage caused to certain categories of victims (e.g. employees of the operator liable) needs to be verified in each country taking into consideration, among others, all relevant laws, regulations and practice, as the insurance policies and related insurance covers available in a particular country may provide a cover whose scope differs from the scope of nuclear damage subject to compensation according to the applicable law.

Finally, in some legal systems (e.g. Hungary), only the legal entity designated as an "authorised operator" can be considered as an operator liable in a case of a nuclear incident. The property of such a legal entity will not be covered by a specific nuclear liability insurance

45. For example, in the case of contamination of a meadow that has been used by a farmer to graze cows, the decontamination costs would most probably be compensated since these are direct costs. Compensation of the cost of replacing cattle feed could also be argued for in many cases. According to the current practice of some nuclear insurance pools (e.g. Germany), the costs of decontamination would be considered as direct damage, whereas the replacement costs would be considered as indirect.
46. As an example, in tort liability law in Japan, there is originally neither the concept of "consequential damage" nor of "indirect damage." To determine whether the damage in question must be compensated, the conclusion is always drawn out by the existence of legally sufficient causality between the damage and the tort as mentioned above. In other words, the consequential or indirect nature of damage is not taken into consideration in deciding the compensation of damage. However, the Interim Guidelines refer to indirect damage (see *infra* note 57). According to it, "indirect damage" means damage suffered by third parties who are in certain economic relationships with individuals who suffered damage recognised as qualifying for compensation under "Damage relating to government instructions to evacuate" or "Rumour-related" damage as a result of the accident ("primary damage" and "primary victims"). However, in the guidelines, the concerned types of damage are not property damage but business damage and damage due to incapacity to work.
47. See Article 9 of the Paris Convention, Article 9 of the Revised Paris Convention, Article IV.3 of the Vienna Convention, Article IV.3 of the Revised Vienna Convention and Article 3.5 of the CSC Annex.
48. See Section I.1(i) of this Chapter.
49. It is worth noting that the Paris Convention (Article 9) and the Vienna Convention (Article IV.3) provide that the operator shall not be liable for damage caused by a nuclear incident directly due to a grave natural disaster of an exceptional character, taking however into account that the national legislation of the operator liable may provide that he is to be liable even in these circumstances. The Revised Paris Convention (Article 9) and the Revised Vienna Convention (Article IV.3) both removed this exoneration. The CSC does not exempt the operator for nuclear liability in case of a grave natural disaster (Article 3.5 of the CSC Annex).

as compensation is only due to "third parties". Consequently, nuclear damage caused to any off-site property of a subsidiary of the "authorised operator" could be treated as damage to "third parties" subject to compensation.

4. Practical methods of calculating costs of "loss of or damage to property"

According to insurance practice, there are different approaches to calculate compensation for property damage, and among them, reinstatement prices and "time value". The "time value" seems to be the most appropriate basis for compensation (otherwise, there may be situations where victims receive compensation which amount is higher than the value of their property before the accident, which would constitute a "benefit"). The most likely approaches to determine the "time value" is to find a fair market value (if possible) of the damaged property, or to take into account its depreciated value. Before compensating the value of the property, it should be verified whether the property could economically be decontaminated (that means decontamination is not extensively more expensive than the value of the property itself). However, some property could be difficult to "price" (e.g. great paintings) – it can be almost impossible to find a fair market value for special pieces of art. Therefore, the next economic base rate which could be considered is the "common value", the value of the used material (canvas, colours, etc.). However, such approach is not universal (based on this approach, a Rembrandt or Monet would be worth several hundred euros, which obviously would not be adequate).

IV. Potential criteria that may be used to define "loss of or damage to property" to be compensated in case of a nuclear incident

1. Criteria based on the use of a property

Since property would most likely be damaged by contamination rather than suffer a "physical damage" (e.g. destruction caused by an explosion) in case of a nuclear incident, one of the main concepts of determining the "loss of or damage to property" may be the "loss of use." In combination with the decontamination costs, the loss of use can determine the property loss in cases where the property is not irrevocably contaminated. In other cases, where the property for technical reasons cannot be decontaminated (e.g. food), the market value of the property may be used to determine the loss (e.g. compensation of hunters who are not able to sell their meat anymore after a nuclear incident).

Since the level of irradiation and radioactive decontamination is crucial for the ability to use a property without causing a threat to the health of the user, the definition of valid radiological criteria is a central task.

2. Radiological protection and other criteria

Radiological protection-related issues of "loss of or damage to property" (e.g. level of radioactive contamination, ambient dose rate) should be considered in conjunction with related psychological, social, and economic issues.

Regarding radiological protection, the IAEA provides a system of general criteria: those are mainly projected or received radiation dose expressed in mSv, derived for urgent actions (e.g. evacuation, food or drinking water ban) and for early protection actions (e.g. temporary relocation, food replacement). Operational criteria are derived from general criteria based on measurable quantities (such as operational intervention levels or emergency action levels, expressed for example in Bq per kg of foods).[50]

50. IAEA (2011), *Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency*, IAEA Safety Standards Series, No. GSG-2, IAEA, Vienna, p. 96.

Concerning agriculture, fishery or forestry activities and associated food products safety in Japan after the Fukushima Daiichi accident, the criteria used to protect the public from ingestion of food, milk and drinking water that may be contaminated were based on an annual permissible dose of 5 mSv per year as provisional criteria for the first year after the accident, and then decreased to 1 mSv per year. The criteria were based on the advice of the International Committee on Radiological Protection (ICRP) [51] and the Food and Agriculture Organization (FAO) Codex Alimentarius Commission's standards. [52] Those levels were converted into standard limits expressed in Bq of radioactive cesium per kg of food, separated into 5 categories, and by considering the major radionuclides. For example, the values for drinking water, milk, general foods and infant foods are 10, 50, 100 and 50 Bq/kg respectively. [53] Those limits have guided estimations of economic losses in agriculture, fishery and forestry for the purposes of compensation for nuclear damage, also taking into account the costs of remediation actions aimed to decrease the level of radioactive contaminations in such products.

Based on the example of agriculture/fishery or forestry activities and associated food products, any protection action is triggered, among other factors, by a limit value (generally expressed as the residual dose possibly converted into activity concentrations in a product or an environmental compartment – air, soil, water) which may evolve in time and space, according to the prevailing circumstances of the accident and the national or local situation. This evolution can serve as an objective quantified basis to help build consistently a fair and transparent system for compensation for loss of or damage to property (e.g. taking into account the evolution in time and space of the designation of areas regarding various restrictions for habitation, evacuation, business).

The potential points of importance in establishing a compensation system for nuclear damage regarding "loss of or damage to property" may be (in no specific order):

- loss of or damage to property highly depends on prevailing circumstances characterising the nuclear incident; whether it is only due to a radiological or nuclear event or to a combination with other industrial or natural hazards will make the characterisation of the damage as a whole more complex in terms of expertise needed to quantify (or score) it;
- loss of or damage to property will be always unique for each person or group of persons (in case of collective property);
- national and local approaches may guide the characterisation process of radiological damages by defining in advance "simple" categories: the property is radiologically damaged at a level triggering permanent protective actions regarding public health (e.g. for public health reasons, the level of radioactive contamination restricts or interferes negatively with the current individual or collective usage of the property or part of it; or the property is located within an evacuation area), or temporary (e.g. the level of contamination of the property and the local circumstances are compatible with decontamination);
- national and local approaches should be flexible enough to integrate affected people's concerns; they should consider adopting a framework based on a whole-of-society and all-hazards approaches; in case of transboundary issues, these approaches need harmonisation and consistency among countries;
- individuals will need to have a good understanding of the damage characterisation process to enhance the acceptance of the situation. Radiological protection culture for people has to be developed and maintained. This is a must for them to understand the underlying reasoning of radiological benchmark values used or set by authorities to trigger actions. This also helps to recover mental or psycho-social well-being. The situations of affected persons are generally very complex, especially in the case of large-scale nuclear incidents;

51. For more information on the ICRP, see www.icrp.org/ (accessed 24 Apr. 2024).
52. For more information, see www.fao.org/fao-who-codexalimentarius/fr (accessed 24 Apr. 2024).
53. Ministry of the Environment, Government of Japan (2019), "Booklet to provide basic information regarding health effects of radiation", Vol. 2, 152 pp. plus annexes.

- according to the criteria adopted for compensation, the Fukushima Daiichi accident demonstrated that the impact of implementing the system of compensation could be perceived in a negative manner. For instance, without a transparent and understandable communication with the affected persons, dealing differently in zones where protection actions were different may trigger jealousy or misunderstanding among beneficiaries and non-beneficiaries regarding the compensation for loss of or damage to their individual property;
- therefore, post-accident zoning is a tricky and difficult exercise where all types of actions need to be consistently scaled in space and time: lifting of the evacuation order, if any, home return, the decontamination/remediation plan, rehabilitation actions for coming back to "normal" life (e.g. reconstruction, road infrastructures, any kind of economic support) as well as implementation of the compensation system;
- based on the lessons learnt from the Fukushima Daiichi accident regarding evacuees, compensation for loss of or damage to their individual property is only one aspect of helping them. Measures to revitalise family and social bonds, cultural links respectful of traditions, and social, environmental and economic linkages between "sub-communities" (e.g. those that may suffer from "stigmatisation", or those that were artificially created by the zoning actions after the disaster) are also crucial.

It is also worth mentioning that the existence, at the national level, of priority rules in compensating nuclear damage in general (i.e. personal injury taking priority over other types of claims), and "loss of or damage to property" specifically (e.g. a priority given to individual/physical persons over companies), as well as rules or national practices regarding pro-rata compensation and/or standardised compensation payments, would affect the process of compensating victims for "loss of or damage to property."

V. Lessons learnt: how Japan dealt with the concept of "nuclear damage" regarding compensation for "loss of or damage to property" in the context of the Fukushima Daiichi accident[54]

1. Legal framework governing compensation for property damage

The Act on Compensation for Nuclear Damage (the "Compensation Act") and the Act on Indemnity Agreements for Compensation of Nuclear Damage (the "Indemnity Agreements Act")[55] form the basis of the Japanese nuclear liability regime. Neither of these acts specify the heads of nuclear damage subject to compensation in case of a nuclear incident. Therefore, the extent of compensation is to be established by the courts on a case-by-case basis pursuant to the adequate (or reasonable) causation principle (i.e. a legally sufficient causality between the damage and the accident).

After the Fukushima Daiichi accident, the Dispute Reconciliation Committee for Nuclear Damage Compensation (DRC) was established. In August 2011, the DRC published the first "Interim Guidelines on Determination of the Scope of Nuclear Damage resulting from the Accident at the Tokyo Electric Power Company Fukushima Daiichi Nuclear Power Plants."[56] The Interim Guidelines provide that, from the standpoint of the theory of adequate causation, the

54. For more information on this topic, see Annex 2.A2 to this Chapter.
55. For more information on both Acts, see NEA (2012), *Japan's Compensation System for Nuclear Damage as related to the TEPCO Fukushima Daiichi nuclear accident*, OECD Publishing, Paris.
56. The DRC has been publishing amended editions of the guidelines to determine the scope of the nuclear damage to allow promotion of voluntary out-of-court settlement of disputes (the Guidelines). Therefore, any reference to the "Interim Guidelines" or "Guidelines" in this Chapter shall mean all editions of the DRC guidelines published as of October 20219, unless it is otherwise understood by the context of the concerned paragraph. It is worth noting that the Guidelines have no legally binding force. For more information, see pp. 15-27 of NEA (2012), *Japan's Compensation System for Nuclear Damage as related to the TEPCO Fukushima Daiichi nuclear accident, supra* note 55.

scope of damages shall be "those damages that are causally related to the incident in question, i.e., the scope of damages considered to have reasonably occurred as a result of the incident, given social conventions."

In the Guidelines, damage to property is considered part of the more global type of damage, entitled "damages related to government instructions for evacuation", and is defined as "loss or reduction, etc. of property value" (the term "property" should be understood as including both personal and real property). The following types of damage to property are considered to require compensation:[57]

i. In case of impossibility to manage property in the Affected Area[58]

Where it is recognised that a property in an Affected Area has lost some or all of its value because of an inability to manage the property as a consequence of an evacuation, i.e. following an evacuation instruction, the value of the property was actually lost or reduced and additional costs were incurred due to that loss or reduction (such as the costs of disposing of or repairing the property). The loss or reduction in value, as well as the additional costs to the extent necessary and reasonable, can be recognised as damage warranting compensation.

ii. In case of exposure of property to radioactive material in the Affected Area

a. Property that is exposed to radioactive substances at levels that resulted in the loss or reduction of its value; or

b. Property that does not fall under (a), but where it is recognised that, based on factors such as the property's type and nature and the mode of the transaction, and judging by the standard of the knowledge of the average ordinary person, the property has lost some or all of its value as a result of a nuclear incident, the extent to which the value was actually lost or reduced, and to the extent necessary and reasonable, additional costs such as the costs of decontamination, can be recognised as damage warranting compensation.

iii. In case of expenditure borne by the owner of property

Expenses incurred by an owner, etc. to prevent the complete loss of or reduction in the value of a property in an Affected Area due to an inability to manage that property or to its exposure to radioactive material can be recognised as damage warranting compensation, to the extent necessary and reasonable.

Based on the Guidelines, the operator of the Fukushima Daiichi nuclear power plant, TEPCO, elaborated criteria for compensation of nuclear damage which further specify "loss or reduction, etc. of property value" and used them to compensate victims on a case-by-case basis.

In March 2012, the Affected Areas were redefined, which resulted, among other things, in the introduction to the Guidelines of the following provisions regarding "loss of or reduction, etc., of the value of real estate", damage to property:

1. For real estate in an "area in which homecoming is difficult", the reduction in value is presumed to be 100% (total loss);

57. Source: the Interim Guidelines on Determination of the Scope of Nuclear Damage resulting from the Accident at the Tokyo Electric Power Company Fukushima Daiichi and Daini Nuclear Power Plants of 5 August 2011 (the Interim Guidelines of 5 August 2011), available in NEA (2012), *Japan's Compensation System for Nuclear Damage as related to the TEPCO Fukushima Daiichi nuclear accident, supra* note 55.
58. According to the Guidelines, the Affected Areas are defined as the areas to which the Japanese government instructions for evacuation apply (Part 3 "Damages related to government instructions to evacuate." of the Interim Guidelines of 5 August 2011).

2. For real estate in an "area subject to living restrictions" and an "area preparing for lifting of evacuation instructions", it is presumed that there has been some reduction in value, taking into consideration the period until the lifting of evacuation instructions, etc.[59]

The Fourth Supplement to the Interim Guidelines[60] provided for additional damages subject to compensation and specified that in order to acquire a new home in the case of relocation, or to extensively repair or rebuild a previous home in the case of returning, the necessary and reasonable expenses exceeding the pre-accident property price (being compensated by TEPCO) shall be compensated.

2. Case law on loss of or damage to property

i. Settlement mediation cases by the Nuclear Damage Compensation Dispute Resolution Centre (ADR Centre)[61]

There is no general "trend" that may be identified in the mediation of "loss of or damage to property" cases settled by the ADR Centre. In each case the ADR Centre proposed a flexible solution taking into account individual circumstances of the claimant(s) in accordance with the standards set forth in the Guidelines.

For example:

a. In an October 2012 case after admitting that a claimant's real estate may not be considered in an "Area in which homecoming is difficult", the ADR Centre concluded that "humans are social beings of action" and "when considering the decrease in value or price of real estate, it is not enough to consider a single location of the target real estate; instead, we must think in terms of the extent that people would be allowed to carry out social and economic activities there." Taking into account that the area surrounding the claimant's property had several key facilities (such as train stations, government offices, hospitals, and schools) with some of them considered being in an "Area in which homecoming is difficult", it was decided that damage to the claimant's property constitutes a "total loss."[62]

b. In an August 2014 case, property owned by the claimants (e.g. real estate, household goods and farm equipment) and located in the "Area in which homecoming is difficult", the "Area subject to living restrictions" and the "Area preparing for lifting of evacuation instructions" was evaluated as a "total loss" because it could not be used for a period of six years after the Fukushima Daiichi accident. The ADR Centre commented that: "Even if the evacuation instructions were lifted in April 2016, the complainants were restricted from entering their properties for at least five years after the accident and thus were not able to use their properties."[63]

59. For more information, see the Second Supplement to Interim Guidelines of 16 March 2012, available in NEA (2012), *Japan's Compensation System for Nuclear Damage as related to the TEPCO Fukushima Daiichi nuclear accident, supra* note 55.
60. For more information, see the Fourth Supplement to Interim Guidelines of 26 December 2013, *Nuclear Law Bulletin*, No. 94, OECD Publishing, pp. 149-157.
61. The ADR Centre was established under the DRC to resolve disputes concerning damage compensation claims and started operating on 1 September 2011. The settlement mediation track record is that out of 25 037 applications received as of 5 July 2019, settlement mediation has been achieved in 23 894 cases with 19 254 settlements completed [Source: Ministry of Education, Culture, Sports, Science and Technology (MEXT), www.mext.go.jp/a_menu/genshi_baisho/jiko_baisho/detail/1329118.htm (available in Japanese only) (accessed 24 Apr. 2024)].
62. Source: settlement proposal n° 13, available in Japanese only at www.mext.go.jp/component/a_menu/science/detail/__icsFiles/afieldfile/2018/03/05/1329134_015.pdf (accessed 24 Apr. 2024).
63. Source: settlement proposal n° 30 , available in Japanese only at www.mext.go.jp/component/a_menu/science/detail/__icsFiles/afieldfile/2018/03/05/1329134_032.pdf (accessed 24 Apr. 2024).

c. In a March 2015 case, the ADR Centre determined that the value of the property (homes, buildings, and household belongings) owned by a claimant who had resided in the former "Evacuation-Prepared Area in Case of Emergency" and had not been assigned to "Evacuation Recommendation Spots", decreased. TEPCO argued that "since it was not 'Evacuation Recommendation Spots', the evacuation of the family was based simply on their own judgment […]." In response, the ADR Centre stated that: "Several specific sites recommended for evacuation were established in the area surrounding the claimant with four children and a pregnant wife, with households diagonally opposite and on adjoining land also established as "Evacuation Recommendation Spots". Furthermore, given the fact that radiation levels for both areas of households were almost the same as the real estate in question, the evacuation was continued, and if the living conditions of the family, their real estate, and the surrounding conditions are all taken into account, there should, in fact, be no fundamental difference with the evacuation conducted in the neighbouring households and those diagonally opposite it, and thus there would not seem to be any particular circumstances calling for differences in compensation."[64]

ii. *Decisions of Japanese Civil Courts*[65]

In the same manner as for the property damage cases settled by the ADR Centre, the Japanese courts applied no uniform approach regarding "loss of or damage to property" caused by the Fukushima Daiichi accident. It is, however, worth mentioning that regarding calculation of damages, and although the courts are not bound by the Guidelines, they have a tendency to follow the concept of damage to property provided in the Interim Guidelines.

a. In the Chiba District Court decision of 22 September 2017, claimants who were forced to evacuate requested compensation for property damage. The Court stated that:

> "If the property becomes unmanageable due to the accident or the accompanying evacuation instructions, or if all or part of the property value is lost due to exposure to radioactive materials, damages will be in the form of loss or reduction of the property value. In addition, the property value that serves as the basis for calculating the amount of damages is the market value of the property at the time of the accident […] However, with regard to residential real estate in areas subject to evacuation instructions where the evacuation instructions were lifted less than six years after the accident […] when various circumstances are comprehensively examined, and it is recognized that there is a period of time that exceeds the period for which the evacuation instructions are in effect during which the residential property cannot be used, it should be recognized that the value of the property has been completely lost or reduced for this period of time."[66]

b. In the Kyoto District Court decision of 15 March 2018, claimants had evacuated from Fukushima and neighbouring prefectures (they alleged that it became too difficult to continue living in their residences) and requested compensation for property damages. With regard to property that was not in the area subject to evacuation instructions, the plaintiffs alleged damages caused by sale or disposal of property as a result of the evacuation, as well as decreases in, or total loss of, value as a result of contamination by radioactive substances, with this damage being causally related to the accident. The Court, however, rejected the plaintiff's claims, stating that

64. Settlement proposal n° 36, available in Japanese only at www.mext.go.jp/component/a_menu/science/detail/__icsFiles/afieldfile/2018/03/05/1329134_038_2.pdf (accessed 24 Apr. 2024).
65. As a consequence of numerous lawsuits filed to claim compensation for nuclear damage caused by the Fukushima Daiichi accident, TEPCO paid JPY 9 078.4 billion of compensation based on the Interim Guidelines and settlement mediation provided by the ADR Centre (as of August 2019). Meanwhile, the number of claims filed climbed to 484, and as of the end of December 2018, 175 cases were pending.
66. For more information on this court decision, see Annex 2.A2 to this Chapter.

> "Unlike real estate and movable property in the area subject to evacuation instructions, economic activity continues in the area where the plaintiff lived before the accident, while with regard to real estate, persons who have left their homes due to evacuation instructions move to 'Areas subject to voluntary evacuation, etc.', and thus, real estate transactions are recognized as having been established in the area. For moveable property, unlike evacuation due to evacuation instructions, it is not the case that there is any restriction placed on removing these items […]. Damages to real estate and movable property in areas not covered by the evacuation instructions are thus not considered to be causally related to the accident."[67]

c. In the Tokyo District Court decision of 16 March 2018, in response to the plaintiffs who were forced to evacuate from Fukushima Prefecture and claimed that real estate in the former "Evacuation-Prepared Area in Case of Emergency" should be considered as a "total loss", the Court stated that:

> "The plaintiffs claim total loss on real estate due to physical damage resulting from an inability to take care of it due to continued evacuation. First, with regard to housings […] it is recognized that there is a considerable causal relationship between the accident and the evacuation that continued until August 2012 and that, during this period, it became difficult to take care of residences and the like, with it also suggested that residences and other property suffered certain damage (i.e. decrease in value), with this decrease in value recognized as being causally related to the accident […]. With regard to land, […] it is recognized that at least some of this land was used to grow crops prior to the accident, and it is suggested that certain damage (i.e. decrease in value) was the result of management difficulties associated with this evacuation causally related to the accident as well as the fact that the land was covered in sand as a result of the decontamination efforts of the local government, with this decrease in value recognized as having a considerable causal relationship with the accident. It is also our understanding that the plaintiff alleges that the property was a complete loss due to the inability to farm at the location following the accident. However, even though the change in living conditions of the plaintiff that followed this accident is an element to be considered in calculating damages for mental suffering, given such changes in living conditions (use conditions), we cannot help but think that it is difficult to base the loss of property value on this. Thus, we cannot accept the plaintiff's claim."[68]

Conclusion

All Conventions cover "loss of or damage to property" in their respective definitions of "nuclear damage" without however providing any details as to what should be considered as "loss of or damage to property". The Conventions only specify that "loss of or damage to property" does not include damage or loss to the nuclear installation itself and any property on that same site which is used or to be used in connection with such installation (personal property of any person employed on the site is not concerned by the exclusion). Although excluded by the Conventions, damage to on-site property may be indemnified if expressly agreed by contract (subject to its enforceability).

What should be considered as damage to property is left to be decided by the competent court in accordance with the national law applicable. In this regard, no common pattern may be identified among the definitions of "loss of or damage to property" in case of a nuclear incident provided in the national legislations. In the absence of a specific and uniform definition of "loss of or damage to property", a great variety of legal approaches based on the applicable

67. *Ibid.*
68. *Ibid.*

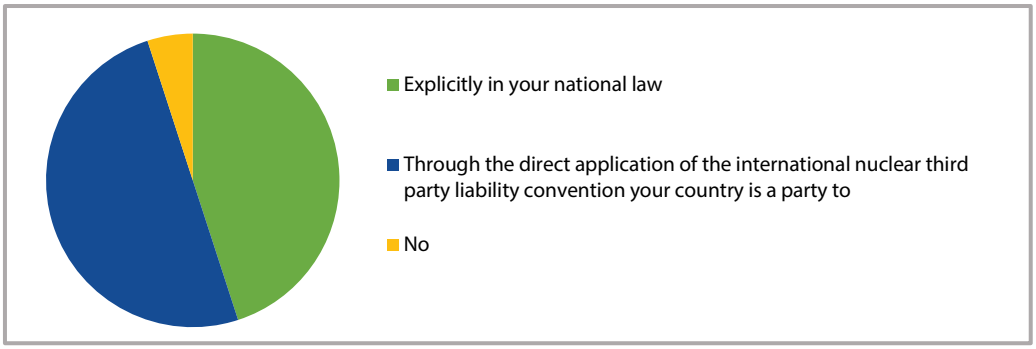
provisions of general tort and/or civil liability laws leaves a significant margin of discretion to the court competent in case of a nuclear incident to adopt a final decision on the scope and the extent of damage to be compensated.

Diversity of national legal approaches may also create practical difficulties where the same loss or damage could be interpreted differently by a competent court and potentially compensated twice, creating an overlap in indemnification for property damage with other heads of damage, to the detriment of other victims' compensation. The Fukushima Daiichi accident demonstrated that a state with nuclear installations needs to be prepared by establishing a clear and comprehensive legal framework to deal with the compensation due to the victims of a nuclear incident. In this regard, development of a specific definition of "damage to or loss of property" at the national level or of mechanisms to speedily determine such damage upon the occurrence of a nuclear incident, along with the criteria needed to calculate compensation for such damage, can only be encouraged to ensure the main purpose of any nuclear liability regime, namely the protection of victims of a nuclear incident by providing adequate and quick indemnification.

Annex 2.A1. **Compilation of responses to the Questionnaire**[1]

Question 3.a.

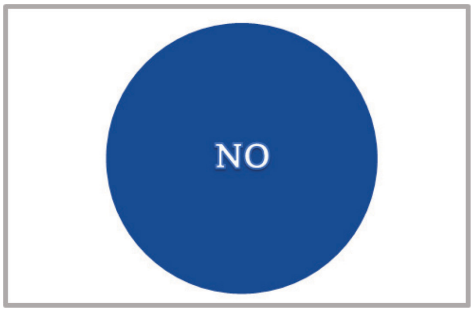
Do your national legislation, regulations and/or case law provide for this type of damage (i.e. loss of or damage to property) in the context of a nuclear damage?



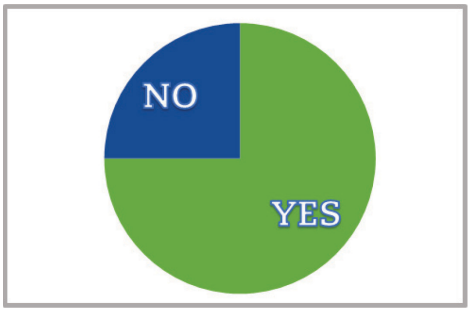
Question 3.b.

With regard to loss of or damage to property, do your national legislation, regulations and/or case law provide for:

(i) a specific definition and/or measures to determine what a "loss of or damage to property" is in the context of a nuclear damage (e.g. does it include expenses related to the examination of goods and properties, loss or decrease of movable and immovable property value…)?



(ii) a prescription period for "loss of or damage to property" in the context of a nuclear damage?



1 The charts included in the present Annex 2.A1 provide an overview of the answers to the questions relating to the Expert Group 2 topic "Loss of or damage to property".

Annex 2.A2. **Damage to property in Japan's nuclear damage compensation regime**

by Toyohiro Nomura[1]

I. Introduction

On March 11, 2011 a strong earthquake struck the northeastern part of Japan, followed by a huge tsunami. At the Fukushima Daiichi Nuclear Power Plant operated by Tokyo Electric Power Company (TEPCO), these events led to the loss of electrical power and the shutdown of cooling systems of reactors, which induced a partial melting of the cores of three reactors and large radioactive releases. This accident resulted in serious damage to large areas, and the compensation of the damage became an important social issue.

At the time of the Fukushima Daiichi accident, Japan was not party to any international convention on nuclear third party liability but had already enacted the Act on Compensation for Nuclear Damage (the "Compensation Act")[2] and the nuclear compensation regime was based on the principles similar to those provided by international nuclear third party liability conventions.[3] However, the Fukushima Daiichi accident exceeded all expectations. The Japanese government was therefore obliged to adopt several measures to realise prompt and sufficient compensation by TEPCO. In my personal observation, among these measures, three are very important and effective: first, the Guidelines on the scope of nuclear damage which should be compensated; second, the special mediation procedure out of judicial court; and third, the financing system for compensation by TEPCO. In this paper, I will discuss only the first and second measures, the Guidelines and mediations on the scope of damage. In addition, I will point out the judicial decision on this matter.

In early April 2011, the Japanese government established the Dispute Reconciliation Committee for Compensation of Nuclear Damage (DRC) in accordance with the Compensation Act.[4] Since then, the Committee has vigorously discussed the extent of damages which should be compensated. The first guideline was published on 28 April 2011, the second on 31 May 2011, and a supplement to the second guideline on 20 June 2011. All these Guidelines are incorporated into the "Interim Guidelines" issued on 5 August 2011. Four supplements were issued on 6 December 2011, on 16 March 2012, on 31 January 2013 and on 26 December 2013. In this way, the Committee clarified the general idea of the extent of damage that should be compensated by TEPCO. I think that these Guidelines are in principle respected not only by TEPCO but also by the victims.

1. Emeritus professor of Gakushuin University and President of Japan Energy Law Institute.
2. This Act was enacted in 1961 and revised about every ten years. The framework of the act has not been changed but the amount of financial security has been raised.
3. For example, according to the Compensation Act, the operator assumes unlimited liability without fault and the amount of financial security is JPY 120 billion.
4. Until 2009, the DRC had two tasks. The main task was to mediate between and reconcile victims of a nuclear accident and the nuclear operator in case of any conflict on the compensation of damages. The DRC was also asked to establish Guidelines to determine the extent of damages which should be compensated. The reform of 2009 gave the DRC a new task (based on the lessons learnt from the JCO accident in 1999): to investigate the nuclear damage.

1. Overview of nuclear damage compensation in Japanese law

(1) Legal instruments on nuclear damage compensation

Nuclear liability is qualified substantially as tortious liability. Concerning tortious liability in general, Article 709 of the Civil Code stipulates clearly the principle of liability based on fault. That is to say, one person who causes damage to another person with his/her fault must compensate the damage. If he/she does not commit a fault, he/she is not liable for damage which he/she caused. This rule is applicable to all types of torts without distinction.

But with regard to the compensation of nuclear damage, as I mentioned above, the special rules are provided by the special law, namely the Compensation Act.

In 1961, the Compensation Act and the Act on Indemnity Agreements for Compensation of Nuclear Damage (the "Indemnity Agreements Act") were enacted. The nuclear liability system in Japan is based mainly on these two acts. Article 3, section 1 of the Compensation Act provides: "Where nuclear damage is caused as a result of reactor operation etc. during such operation, the nuclear operator who is engaged in the reactor operation etc. on this occasion shall be liable for the damage, except in the case where the damage is caused by a grave natural disaster of an exceptional character or by an insurrection."

According to this system, the nuclear operator is liable for nuclear damage it caused even if it did not commit a fault. Since then, the basic structure of these acts has remained unchanged. Nevertheless, the Compensation Act was revised approximately every ten years mainly to increase the amount of financial security for compensation. In 2009, this amount was increased to JPY 120 billion. It should be noted that the 2009 reform has also added the task of establishing a Guideline on the extent of nuclear damage which should be compensated by the nuclear operator that causes damages, taking into account the process of compensation made during the JCO (Tokaimura) accident of 1999.[5]

It has to be noted that this Compensation Act applies not only to the operation of nuclear reactors, but also to the transport of nuclear material (including nuclear fuel and nuclear waste). Article 3, section 2 of the Act provides that: "Where nuclear damage is covered by the preceding paragraph and if the damage is caused as a result of the transport of nuclear fuel etc. between nuclear operators, the nuclear operator who is the consignor of the nuclear fuel etc. shall be liable for the damage unless there is a special agreement in writing between the nuclear operators."

(2) The Compensation Act and the Civil Code

The Civil Code and the Compensation Act seem to relate in the same way as general law and special law. In this case, the special law prevails over the general law. And if there is no suitable provision in the special law, the general law covers the gap. But in the field of tort, the special law generally provides a strict liability which is more advantageous to victims. Therefore, it is unlikely that a victim would demand compensation for suffered damage through the Civil Code, which has harder conditions, instead of taking the easier route of the special law. But according to commonly accepted legal theory in Japan, a victim can choose not only the special law but also the general law as the basis of liability when the special law does not expressly exclude the application of the general law.

At first glance, regarding the legal basis for the liability of a nuclear operator, both the Compensation Act and the Civil Code seem apply. Of course, the Civil Code provides general rules on tort and the Compensation Act covers only nuclear liability. The Compensation Act does not expressly exclude the application of the Civil Code.[6] But the system of the special

5. In January 2015, Japan signed the CSC. For this signing, Japan made some amendments to the Compensation Act. But these amendments are not so important, because the Japanese law was already in conformity with international principles concerning nuclear liability.
6. The Compensation Act expressly excludes application of the 1994 Act on the Product Liability (Article 4, Paragraph 3). But the Civil Code is not expressly excluded.

Compensation Act implicitly means that the provisions of the Civil Code do not apply at least on the basis of the liability of a nuclear operator.

Two points underpin this view. First, the responsibility of persons other than the nuclear operator is excluded by the Compensation Act (Article 4, paragraph 1). Article 4, paragraph 1 is obviously inconsistent with Article 709 of the Civil Code, because under Article 709 of the Civil Code, several persons may be liable for one damage if each of them caused the damage. Second, the Compensation Act limits the recourse of a nuclear operator against the third person who is responsible for the nuclear incident, after the operator has compensated victims for damage caused by such accident (Article 5).

But if there are no rules in the Compensation Act, the Civil Code applies. For example, the extent of damages which should be compensated is determined by the Civil Code. In Japan's Civil Code there is no article on this matter in the field of tort liability. Therefore, the commonly accepted doctrine determines the extent of damages, based on an analogy with Article 416 of the Civil Code on contractual liability.[7] This is the so-called theory of the adequate causation established by the doctrine and the case law that applies to nuclear damage caused by a nuclear incident. And the amount of compensation may be reduced by taking into account the victim's fault (Article 722, Paragraph 2 of the Civil Code).[8] But this reduction due to the victim's fault is no more than theory and in the practice of compensation after the Fukushima Daiichi accident, there seems to be no case where compensation is reduced because of the victim's fault by applying Article 722, Paragraph 2 of the Civil Code.[9]

In any case, we can say that no third person other than the nuclear operator is responsible for the nuclear incident, because Article 4 of the Compensation Act applies and Article 709 of the Civil Code is excluded. In some cases, victims still demanded compensation of nuclear damage by proving the fault of TEPCO according to Article 709 of the Civil Code. The lawyers of the victims emphasised this argument for the purpose of condemning strongly the unethical conduct of TEPCO. But tribunals did not admit the application of Article 709 of the Civil Code as the basis for the compensation of nuclear damage.[10] These decisions were of the first instance and were

7. Article 416 of the Civil Code provides that: "(1) The purpose of the demand for the damages for failure to perform an obligation shall be to demand the compensation for damages which would ordinarily arise from such failure. (2) The obligee may also demand the compensation for damages which arise from any special circumstances if the party did foresee, or should have foreseen, such circumstances." (Translation by Ministry of Justice).
8. Article 722 (2) of the Civil Code provides that: "If a victim is negligent, the court determines the amount of compensation by taking that factor into consideration." (Translation by Ministry of Justice).
9. However, Kyoto District court, on 18 February 2016 (Hanreijiho, no. 2337, p. 49) reduced the amount of damage by taking into consideration personal circumstances by analogy with Article 722, Paragraph 2 of the Civil Code.
10. For example, Maebashi District Court, 17 March 2017 (Hanreijiho, no. 2339, p. 4), Kyoto District Court, 15 March 2018 (Hanreijiho, no. 2375/2376, p. 14), Iwaki Subdivision of Fukushima District Court, 26 June 2019 (D1-Law.com). The decision of Iwaki Subdivision says:
    "If we admit that the right to claim damages under the Nuclear Damage Compensation Act and the right to claim damages under the Civil Code coexist, or we allow that the liable operator use freely the right of recourse to a third party with negligence, the liability will be dispersed and the individuals who are likely liable shall be separately insured. As a result, the compensation for nuclear damage planned by the above-mentioned Nuclear Damage Compensation Act is completely lacking in substance and the operator cannot receive the above-mentioned government assistance and the victims cannot be compensated because of the insufficiency of financial resources for compensation. This may lead to results against the spirit of the Nuclear Damage Compensation Act, that is to say the sound development of the nuclear power business. After all, Article 3, Paragraph 1 of the Nuclear Damage Compensation Act makes special provisions regarding liability for damages under the Civil Code and the provisions of tort liability of the Civil Code cannot be applied to the torts of operator when nuclear damage is permitted due to the concentration of liability (channelling) under the Nuclear Damage Compensation Act. Similarly, Article 4, Paragraph 1 of the same Act states that no person other than the nuclear operator is liable even if he is negligent about the occurrence of damage as a consequence of the channelling of the Nuclear Damage Compensation Act."

    Already in the case of the JCO accident in 1999, Mito District Court on 27 February 2008 (Hanreijiho, no. 2003, p. 67) decided that the contractual or tortious liability based on the Civil Code is excluded by the Compensation Act.

appealed to a higher court. There will be a final appeal to the Supreme Court. Accordingly, no one knows, for the time being, the final judgement of the Supreme Court on this matter.

(3) The scope of damage to be compensated

As mentioned above, the Compensation Act does not specify the scope of damage which should be compensated. The scope of damage is determined by the so-called theory of adequate causation which is established in the general law of torts. Accordingly, there is no exact notion of loss or damage to property defined by law. Instead, we can only analyse the legal practice of compensation and abstract the notion of loss or damage to property from this analysis. I would like to do this in this paper and present the concept of loss or damage to property by analysing the guidelines of the DRC, mediation by ADR Centre[11] and decisions by judicial courts.

2. Damage to Property

As you understand from the situation above explained, in Japanese civil law there is no obvious definition of "loss or damage to property" and we can only deduct the concept by analysing the judicial practice. Accordingly, I will only provide you the analysis as follows.

II. Damage to Property in the Guidelines Established by the Dispute Reconciliation Committee

Just after the Fukushima Daiichi accident, Japanese government established the DRC composed of ten members – specialist in various fields. And this Committee elaborated Guidelines on the scope of nuclear damage. Here I would like to present details of damage to property.

1. General Survey of the Guidelines

(1) The issuance of the Guidelines

Article 18, Paragraph 1 of the Compensation Act states that, "In order to allow the Ministry of Education, Culture, Sports, Science, and Technology to conduct affairs related to settlement mediation in the event of disputes regarding compensation for nuclear damages and the development of general guidelines that contribute to the voluntary resolution of the dispute by the parties, the DRC is to be established according to Cabinet Order provisions." The DRC was established in accordance with the "Decree on the Establishment of the DRC" declared on 11 April 2011. Article 18, Paragraph 2 of the Compensation Act stipulates that the DRC is responsible for: "1) Settlement mediation of disputes related to compensation for nuclear damage, 2) stipulating guidelines for determining the scope of nuclear damage with regard to disputes related to compensation for nuclear damage and other general guidelines contributing to voluntary dispute resolution by the parties, and 3) investigating and evaluating nuclear damage as required by the activities noted in 2) above."

Forced to evacuate and facing business problems due to shipping restrictions, residents and businesses found themselves in desperate trouble following the accident. As such, the DRC presented Guidelines for nuclear damage, with most-likely-to-occur events covered first. The first guideline was formulated in April 2011 and the second in May 2011, with the second guideline supplemented in June of the same year. Thereafter, in August 2011, "Interim Guidelines" were formulated that included previous Guidelines and subsequent considerations.

11. After the Fukushima Daiichi accident, the Nuclear Damage Compensation Resolution Centre (ADR Centre) was established under the DRC in September 2011. Since then, more than 20 000 cases have been resolved by mediation.

The Interim Guidelines stipulate that, from the standpoint of the theory of adequate causation, the scope of damages shall be "those damages that are causally related to the incident in question, i.e. the scope of damages considered to have reasonably occurred as a result of the incident, given social conventions"[12] meant to provide a complete picture of the urgency related to nuclear damage caused by the accident. In addition, anything not covered by the Interim Guidelines is not directly subject to compensation, with what may be recognised as reasonable causal damage dependent on specific circumstances. The Interim Guidelines have been studied repeatedly thereafter as well and have been updated with the "Fourth Interim Guidelines Supplement."

(2) The legal nature of the Guidelines

The Guidelines established by the DRC consist of: (1) specific guidelines that address the content of previous legal norms and the rationale behind them in light of the accident, (2) guidelines indicating new interpretations when no previous legal norms exist, and (3) guidelines that seemingly change prior interpretations of law. Of these, item (1) is considered to have the same legal binding power as prior legal norms by which the courts and parties are bound. On the other hand, items (2) and (3) are considered to not have legal binding power in the sense of being illegal or invalid if they are not followed or if they change the rights or obligations between parties.[13]

Regarding the positioning of the Interim Guidelines, notable comments in several cases have included: "In calculating damage for which compensation is to be offered, although it is possible to reference the content of the Interim Guidelines, etc., the court is not bound by the damages and compensation stipulated by the Interim Guidelines, and it can be considered appropriate to determine the content and amount of damages subject to compensation according to the individual circumstances of the plaintiffs themselves" (Maebashi District Court, 17 March 2017); "[…] the standard compensation of JPY 100 000 per month established by the Interim Guidelines, etc., should be interpreted as the bare minimum, and depending on the individual circumstances of the plaintiffs, there may naturally be cases where a larger amount should be allowed" (Chiba District Court, 22 September 2017); and "[…] it goes without saying that the contents [of the guidelines] do not bind the court, so the court can and should judge whether or not the plaintiff's request can be made without feeling bound by the Interim Guidelines" (Tokyo District Court, 7 February 2018). While all of these courts have referred to the Interim Guidelines as standards, they have also suggested that actual judgments might differ from the Interim Guidelines in accordance with the plaintiff's circumstances.

On the other hand, even with the court allowing damages beyond those outlined in the Guidelines, there has been no significant increase in the amount of compensation recognised by the Guidelines. Because many people have already received compensation in accordance with the Guidelines and their disputes have been settled, some have pointed out that judges may feel it unfair to allow plaintiffs compensation beyond that provided for in the Guidelines, and thus, the Guidelines tend to have a significant effect on judges.[14]

2. Damage to property in the Guidelines

In the Interim Guidelines, damage to property is specified as follows in the article dealing with "Loss or reduction, etc. of property value":

> The following actual damage to property can be recognised as damage warranting compensation. ("Property" here includes both personal and real property).

12. Takase, M. (2015) "Current Status and Issues Surrounding Nuclear ADR" in Takehisa Awaji et al. "Research on Compensation Related to the Fukushima Nuclear Accident", Nihonhyoronsya, p. 262.
13. Toyonaga, S. (2014) "Act on Compensation for Nuclear Damage", Shinzan-sha, pp. 426-431.
14. Yoshimura, R. "The Theory of Damage in Compensation for the Fukushima Nuclear Accident", *Horitsujiho*, Vol. 90, No. 8, pp. 66-67.

I. Where it is recognised that a property in an Affected Area has lost some or all of its value because of an inability to manage the property as a consequence of an evacuation etc., of necessity, due to an evacuation instruction, the extent to which the value was actually lost or reduced, and to the extent necessary and reasonable, additional costs due to that loss or reduction (such as the costs of disposing of or repairing the property), can be recognised as damage warranting compensation.

II. In addition to Guideline I), property in an Affected Area:

   (1) that is exposed to radioactive substances at levels that resulted in the loss or reduction of its value; or

   (2) that does not fall under (1), but where it is recognised that, based on factors such as the property's type and nature and the mode of the transaction, and judging by the standard of the knowledge of the average ordinary person, the property has lost some or all of its value as a result of the accident, the extent to which the value was actually lost or reduced, and to the extent necessary and reasonable, additional costs such as the costs of decontamination, can be recognised as damage warranting compensation.

III. Expenses incurred by an owner, etc. to prevent the complete loss of or reduction in the value of a property in an Affected Area due to an inability to manage that property or to its exposure to radioactive material can be recognised as damage warranting compensation, to the extent necessary and reasonable.

Moreover, from the beginning of April 2012, existing evacuation areas were reconsidered. They comprise 1) an Area preparing for lifting of evacuation instructions (area in which it has been definitively confirmed that annual accumulated exposure dose is 20 mSv or less), 2) an Area subject to living restrictions (area in which annual accumulated exposure dose could exceed 20 mSv, where continued evacuation is required in order to reduce the level of radiation dose of residents), and 3) an Area in which homecoming is difficult (an area currently with annual accumulated exposure dose exceeding 50 mSv, where it is feared that annual accumulated radiation may not fall below 20 mSv even over a long period, specifically after five years). The following provisions were added regarding "Loss or reduction, etc. of property value", formulated in March 2012:

I. Concerning the property value of real estate in an area in which homecoming is difficult, it can be presumed that taking the value immediately prior to occurrence of the accident as the basis, there has been a 100% reduction in value as a result of the accident (total loss);

II. Concerning the property value of real estate in an area subject to living restrictions and an area preparing for lifting of evacuation instructions, it can be presumed that taking the value immediately prior to occurrence of the accident as the basis, there has been some reduction in value as a result of the accident, taking into consideration the period until the lifting of evacuation instructions, etc.

The fourth supplement to the Interim Guidelines dictates that residents should be restricted from returning to a part of an "area in which homecoming is difficult" because, with access to the area restricted and full-scale decontamination and restoration of public facilities having not been carried out at this stage, there is no prospect of the evacuation instructions being rescinded. Thus, assuming that the purchase price of the land/building where an area resident is to be relocated is within the scope of compensation for damages to a certain extent beyond the acquisition cost of the land and buildings that were inhabited at the time of the accident, these were added as new damages related to reacquiring housing.

III. Damage to property in mediation by the ADR Centre under the DRC

Procedures for victims to request compensation for damages suffered in the Fukushima Daiichi accident consist of three types: direct claims to TEPCO, petition for settlement mediation by the Nuclear Damages Dispute Resolution Center (ADR Centre), and civil lawsuits. Of these, I will now turn my attention to settlement mediation by the ADR Centre.

1. Overview of mediations by the ADR Centre

Article 18 of the Compensation Act stipulates that the DRC mediate the settlement of nuclear damage compensation disputes. However, because this accident involved a large number of disputes, the ADR Centre, which is an internal organisation of the DRC, actually handles settlements. Consisting of a general committee, a panel, and a settlement mediation office, the ADR Centre was established on 1 September 2011, in response to the accident. The General Committee comprises a chair and two members nominated by the DRC; it nominates committee members on a per-case basis, reviews services provided by mediation committee members, and adopts and revises standards necessary for settlement mediation procedures. Mediation committee members make up a panel, as appointed by the General Committee, that conducts interviews and makes phone calls, written inquiries, and the like for each case, after which it presents a settlement proposal from a neutral and fair position. The Settlement Mediation Office is within the Ministry of Education, Culture, Sports, Science and Technology and takes care of general affairs related to settlement mediation.

The ADR Centre does not charge a fee for settlement mediation, and even though it takes longer than direct claims made to TEPCO, unlike civil cases, strict proof procedures are not needed, there is no application of the principle of disposal or argument, and there are no procedural restrictions such as additional claims or changes to lawsuits. Moreover, both parties are guaranteed freedom of consent for the settlement proposal presented by the ADR Centre. For this reason, even though there is an institutional limit to the effect that disputes will not be resolved unless both parties agree to the proposed settlement, as of 5 July 2019, 25 037 cases had been filed for settlement mediation procedures, with 23 894 of these cases already settled, and 19 254 settlements completed.[15] This can be thought of as reducing the burden on the court while responding to certain claims of the victims.

2. Damage to property in the mediation

The ADR Centre publishes the status of its activities every year, listing the number of claims filed for settlement mediation and the number of claims settled. According to this report, the number of claims filed for settlement mediation with the ADR Centre and the number of settlements is as follows:

15. Source: Ministry of Education, Culture, Sports, Science and Technology.

Table 2.1. **Number of claims filed for settlement mediation and claims settled**

Number of claims filed for settlement mediation							
Number of claims	2011*	2012	2013	2014	2015	2016	2017
Total number of cases	521	4 542	4 091	5 217	4 239	2 794	1 811
Property damage	149	793	703	845	604	320	285
Real estate-related		485	427	540	418	204	194
Number of claims settled							
Number of claims settled	2011*	2012	2013	2014	2015	2016	2017
Total number of cases	2	1 204	3 926	4 438	3 644	2 755	1 581
Property damage		124	682	777	506	402	267
Real estate-related		26	170	395	279	286	183

Notes: * Results from September to December 2011.

There were relatively few claims filed for settlement mediation in 2011 because victims initially tended to file claims directly with TEPCO, and the sparse number was attributed to the fact that the ADR Centre was not yet a known entity. Since 2012, the ADR Centre has become better recognised, and while the number of responses from TEPCO to direct claims has increased since the end of 2011, the number of claims for settlement mediation to the ADR Centre has also increased because many victims are dissatisfied with TEPCO's response. From 2011 to 2012, TEPCO tended to have few settlements involving property damage to real estate, where direct claims had not yet been started. We can see that both the number of cases filed, and the number of settlements peaked in 2014 and have been trending downward ever since.

The ADR Centre also publishes some of the settlement mediation cases on its website. Below, I introduce some of the published cases related to property damage.

In an October 2012 settlement mediation case, after admitting that according to the radiation exposure monitoring map released by the Ministry of Education, Culture, Sports, Science, and Technology, the real estate may not be designated as being in an "Area in which homecoming is difficult" (the air exposure rate at the closest measurement point to the target property was 3.8 mSv/hour or more but less than 9.5 mSv /hour), the mediation committee members determined that "humans are social beings of action" and "when considering the decrease in value or price of real estate, it is not enough to consider a single location of the target real estate; instead, we must think in terms of the extent that people would be allowed to carry out social and economic activities there." One place in the north or northeast part of the property had a measurement of more than 19 mSv /hour, and the surrounding area had many important facilities such as train stations, government offices, hospitals, and schools, and there were places less than 2 to 3 km to the southwest that had levels of more than 19 mSv /hour, so it was clear that these places would be designated as "Area in which homecoming is difficult". In addition, the value or price of a property is greatly influenced by psychological and subjective factors such as the impression, consciousness, and awareness of the persons buying and selling the property. As such, with the Fukushima Daiichi Nuclear Power Plant only 3 to 4 km away from the property, it was judged a total loss.[16]

In an August 2014 settlement mediation case, property such as real estate, household goods, and farm equipment in an "Area in which homecoming is difficult", "Area subject to living restrictions" and "Area preparing for lifting of evacuation instructions" owned by the petitioners

16. Settlement proposal #13, available in Japanese only at www.mext.go.jp/component/a_menu/science/detail/__icsFiles/afieldfile/2018/03/05/1329134_015.pdf (accessed 24 Apr. 2024).

who lived in Katsurao village, was evaluated as a total loss because it could not be used for a period of six years after the accident. As mentioned above, according to the second supplement of the Interim Guidelines, it can be inferred that the property value of real estate in an "Area in which homecoming is difficult" was a total loss due to the accident based on the value immediately before the accident occurred. Regarding property values for real estate in an "Area subject to living restrictions" and an "Area preparing for lifting of evacuation instructions", taking into account the period until the evacuation instructions was rescinded, it can be assumed that values have decreased to some extent compared to the values immediately preceding the accident. Regarding this, a mediation committee member commented, "Even if the evacuation instructions were lifted in April 2016, the complainants were restricted from entering their properties for at least five years after the accident and thus were not able to use their properties." Moreover, there were concerns that the cancellation of evacuation instructions may be pushed back due to delays in decontamination and infrastructure development and that even if the evacuation instructions were rescinded in April 2016, it would take more time for complainants' lifestyles – such as conventional eating habits and living environments – to get back to normal. Furthermore, as many residents of Katsurao village have not indicated a willingness to return, it can be thought of as natural that some would hesitate to return even after the evacuation instructions are rescinded. When determining the property value of real estate owned by the complainants, the fact that the claimants owned property exposed to radioactive material from the accident that had been in an "Area subject to Evacuation Instructions" for at least five years could not be dismissed even after the evacuation instructions had been rescinded. It should also be noted that there is no decontamination plan for the surrounding forests. Based on the above, it is appropriate to evaluate the property owned by the complainants as having been completely damaged by the accident and to cover the entire value of the property at its value immediately before the accident.[17]

In a March 2015 settlement mediation case, the mediation committee members determined that there had been a decrease in the value of the property in the form of homes, buildings, and household belongings of the claimant who had resided in the former "Evacuation-Prepared Area in Case of Emergency" and had not been assigned to "Evacuation Recommendation Spots". In this case, TEPCO asserted: "Since it was not 'Evacuation Recommendation Spots', the evacuation of the family was based simply on their own judgment. It is clear that we cannot say it was impossible for them to manage their land, buildings, and household goods." In response, the mediation committee member said:

> Several specific sites recommended for evacuation were established in the area surrounding the claimant with four children and a pregnant wife, with households diagonally opposite and on adjoining land also established as 'Evacuation Recommendation Spots'. Furthermore, given the fact that radiation levels for both areas of households were almost the same as the real estate in question, the evacuation was continued, and if the living conditions of the family, their real estate, and the surrounding conditions are all taken into account, there should, in fact, be no fundamental difference with the evacuation conducted in the neighboring households and those diagonally opposite it, and thus there would not seem to be any particular circumstances calling for differences in compensation.

It was deemed appropriate that for real estate such as homes and land, the market value equivalent decreased 20%, and for household goods the value fell by the equivalent of at least half of TEPCO's standard amount of compensation for "Area subject to living restrictions".[18]

In all of these cases, I think that the mediation committee members presented a flexible settlement proposal that took into account the individual circumstances of the claimant in accordance with the standards set forth in the guidelines established by the DRC.

17. Settlement proposal #30, available in Japanese only at www.mext.go.jp/component/a_menu/science/detail/__icsFiles/afieldfile/2018/03/05/1329134_032.pdf (accessed 24 Apr. 2024).
18. Settlement proposal #36, available in Japanese only at www.mext.go.jp/component/a_menu/science/detail/__icsFiles/afieldfile/2018/03/05/1329134_038_2.pdf (accessed 24 Apr. 2024).

IV. Damage to property in the judicial decisions by civil courts

Several lawsuits have been filed seeking compensation for damages resulting from the accident. Here, I highlight the general trends in the lawsuits and some court cases seeking compensation for property damage in Japan.

1. Overview of judicial decisions

Many lawsuits have now been filed seeking compensation for damages caused by the accident. As of August 2019, TEPCO had provided JPY 9 074.8 billion in compensation based on the Interim Guidelines established by the DRC and settlement mediation provided by the ADR Centre.[19] Meanwhile, the number of complaints filed climbed to 484, and as of the end of December 2018, 175 cases[20] were pending. Some of these cases involve the joint lawsuits which have been filed by residents evacuated from around the Fukushima Daiichi Nuclear Power Plant.

Under the generally accepted legal principles in Japan, when there are multiple legal grounds for a claim, these grounds may all be pursued. As for lawsuits actually filed, there are several in which the main claim was based on Article 709 of the Civil Code, which stipulates general tort liability, with the preliminary claim based on Article 3 of the Compensation Act, which provides for the liability without fault of the nuclear operator. Thus, it is thought that the reason plaintiffs choose to bear the burden of verifying TEPCO's negligence is to clarify, through the trial process, TEPCO's deficiencies when it came to measures against tsunamis and severe accidents, as well as its inappropriate responses. However, in the actual judgment of the court, assuming that responsibility under Article 709 of the Civil Code can coexist with liability under the Compensation Act, compensation paid by nuclear operators for claims based on general torts can be reimbursed to third parties for minor negligence and the like. As such, there is the risk of losing sight of the intent of the Compensation Act, and thus, this law is interpreted as excluding the application of general tort liability provisions for nuclear damage.

In addition to claiming damages against TEPCO, which was responsible for the nuclear incident, claims have been filed all over Japan against the national government based on the State Redress Act for reasons such as the non-exercise of timely and appropriate national regulatory supervision authority. According to Article 4 of the Compensation Act, only the nuclear operator in charge of the nuclear facility that caused the accident can bear liability for damages, so there may be a question as to whether a claim for damages against the government is even possible. On this point, looking at the legislative process of the Compensation Act, it is understood that the provisions of Article 4 do not exclude national liability, and indeed, in actual trials, several cases have affirmed the government's responsibility.[21] Moreover, even a trial that does not recognise the responsibility of the state is premised on claiming damages against the state based on the State Redress Act.

2. Damage to property in judicial decisions

The general trend of litigation relating to the accident is as described above, but there are few cases where damage to property is at issue. I introduce the court's view on damage to property in the form of: 1) a Chiba District Court decision of 22 September 2017, 2) a Kyoto District Court decision of 15 March 2018, and 3) a Tokyo District Court decision of 16 March 2018. In all of these cases, there were claims for damages other than property damage, including damages caused

19. TEPCO Holdings Co., Ltd. "Status of Compensation Payments," available in Japanese only at www.tepco.co.jp/fukushima_hq/compensation/results/index-j.html (accessed 24 Apr. 2024).
20. Minutes of the Dispute Reconciliation Committee for Nuclear Damage Compensation (49th) available in Japanese only at www.mext.go.jp/b_menu/shingi/chousa/kaihatu/016/gijiroku/1413173.htm (accessed 24 Apr. 2024).
21. Because the Fukushima Daiichi accident occurred before Japan joined the CSC, consistency with the CSC is not an issue regarding the legal channelling of liability. Whether a claim for compensation against the national government, based on Japan's Nuclear Damage Compensation Act, will be allowed in the event of a nuclear accident after joining the CSC is an issue for future consideration.

by evacuation and damages for mental suffering associated with evacuation, but here I only discuss damage to property.

(1) Chiba District Court decision of 22 September 2017[22]

Claiming that they were forced to evacuate the Fukushima Prefecture and move to Chiba Prefecture, the claimants in this case requested damages against TEPCO as a defendant, based on Article 709 of the Civil Code and Article 3, Paragraph 1 of the Compensation Act, and against the national government as a defendant, based on Article 1, Paragraph 1 of the State Redress Act.

In this trial, the basic idea of damage to property was framed as follows: "If the property becomes unmanageable due to the accident or the accompanying evacuation instructions, or if all or part of the property value is lost due to exposure to radioactive materials, damages will be in the form of loss or reduction of the property value. In addition, the property value that serves as the basis for calculating the amount of damages is the market value of the property at the time of the accident." Furthermore, regarding compensation for residential real estate:

> The objective value of residential real estate after the accident is supposed to be verified by real estate evaluations, but the concept of second supplement to the Interim Guidelines and compensation standards[23] can, in view of the peculiarities of the accident, be thought of as a reasonable evaluation method for the complete loss or reduction of market value. With regard to the amount that defendant TEPCO accepts without dispute, according to the above evaluation method, the court will also recognize this same amount as compensation for damages to residential real estate. However, with regard to residential real estate in areas subject to evacuation instructions where the evacuation instructions were lifted less than six years after the accident […] when various circumstances are comprehensively examined, and it is recognized that there is a period of time that exceeds the period for which the evacuation instructions are in effect during which the residential property cannot be used, it should be recognized that the value of the property has been completely lost or reduced for this period of time.

With regard to household possessions:

> […] from the viewpoint of prompt compensation, the concept of compensation standards is based on the assumption that household goods and tools in areas subject to evacuation instructions cannot be used for a long period of time and that there are differences in areas subject to evacuation instructions, such as difficulty in gaining temporary entry, so that the amount of compensation for household goods is determined according to areas subject to evacuation instructions and household composition […]. These amounts reflect differences in areas subject to evacuation instructions, while also referencing household goods valuations used in the fire insurance industry and can thus be thought of as reasonable. However, these amounts are determined without assessing what household tools the evacuees possessed in detail; should a household article or tool have a value in excess of this, and the owner be able to prove the loss of this value, they would be compensated in excess of the amount.

Thus, the plaintiff's allegations claiming damages to household goods and tools based on statistics showing reacquisition costs of residential real estate and the ownership status of household goods in each household were not accepted.

22. Source: websites of the respective Courts in Japan.
23. According to the Ministry of Economy, Trade and Industry's "Concept of Compensation Standards that Accompany the Review of the Evacuation Areas," released on 20 July 2012, in an "Area in which homecoming is difficult", compensation for full value prior to the accident will be provided, while in an "Area subject to living restriction" and an "Area preparing for lifting of evacuation instructions" full compensation is provided six years after the accident, with this compensation being in proportion to the period until the lifting of the evacuation instructions.

(2) Kyoto District Court decision of 15 March 2018[24]

In this trial, claimants, along with their families, had been evacuated to Kyoto and other locales from Fukushima Prefecture, as well as from Miyagi, Tochigi, Ibaraki, or Chiba Prefectures because it became too difficult to continue living in their residences. The claimants requested damages against TEPCO as a defendant, based on Article 709 of the Civil Code and Article 3, Paragraph 1 of the Compensation Act, and against the national government as a defendant, based on Article 1, Paragraph 1 of the State Redress Act.

With regard to property that was not in the area targeted for evacuation instructions, the plaintiffs alleged damages caused by sale or disposal of property as a result of the evacuation, as well as decreases in, or total loss of, value as a result of contamination by radioactive substances, with this damage being causally related to the accident. The court, however, rejected the plaintiff's claims, stating:

> Unlike real estate and movable property in the area targeted for evacuation instructions, economic activity continues in the area where the plaintiff lived before the accident, while with regard to real estate, persons who have left their homes due to evacuation instructions move to 'Areas subject to voluntary evacuation, etc.', and thus, real estate transactions are recognized as having been established in the area. For moveable property, unlike evacuation due to evacuation instructions, it is not the case that there is any restriction placed on removing these items […]. Damages to real estate and movable property in areas not covered by the evacuation instructions are thus not considered to be causally related to the accident.

(3) Tokyo District Court decision of 16 March 2018

In this case, plaintiffs who were forced to evacuate from Fukushima Prefecture due to the accident requested damages against TEPCO as a defendant, based on Article 709 of the Civil Code and Article 3, Paragraph 1 of the Compensation Act, and against the national government as a defendant, based on Article 1, Paragraph 1 of the State Redress Act.

In responding to the plaintiff, who claimed that real estate in the former "Evacuation-Prepared Area in Case of Emergency" should be assessed at a total loss, the court stated:

> The plaintiff claims total loss on real estate due to physical damage resulting from an inability to take care of it due to continued evacuation. First, with regard to housings, […] it is recognized that there is a considerable causal relationship between the accident and the evacuation that continued until August 2012 and that, during this period, it became difficult to take care of residences and the like, with it also suggested that residences and other property suffered certain damage (decrease in value), with this decrease in value recognized as being causally related to the accident […]. With regard to land, […] it is recognized that at least some of this land was used to grow crops prior to the accident, and it is suggested that certain damage (decrease in value) was the result of management difficulties associated with this evacuation causally related to the accident as well as the fact that the land was covered in sand as a result of the decontamination efforts of the local government, with this decrease in value recognized as having a considerable causal relationship with the accident. It is also our understanding that the plaintiff alleges that the property was a complete loss due to the inability to farm at the location following the accident. However, even though the change in living conditions of the plaintiff that followed this accident is an element to be considered in calculating damages for mental suffering, given such changes in living conditions (use conditions), we cannot help but think that it is difficult to base the loss of property value on this. Thus, we cannot accept the plaintiff's claim.

24. Source: Hanreijiho, no. 2375/2376, p. 14.

In each of these cases, regarding calculating damages, while the courts state that they are not bound by the Interim Guidelines, with regard to judgment concerning actual damage to property, no difference with the concept of damage to property in the Interim Guidelines could be found.

V. Conclusion

The nuclear damage compensation system in Japan provides for compensation for damage with a considerable causal relationship with a nuclear incident based on the Compensation Act and the Civil Code. And damages are not categorised in the Compensation Act unlike in the nuclear third party liability conventions such as the CSC. As to the property which belongs to other persons than the operator under a contract between them, the operator is in principle liable to compensate when the operator caused the accident and the property was damaged. This liability is based on the theory of adequate causation in the law of torts. On the other hand, the operator can be exonerated regarding the liability for compensation. If the contract exempts the operator of liability, it is not liable to compensate the loss or damage to property mentioned in the contract, even if the owner of the property demands the compensation on the basis of tortious liability under the Compensation Act or the Civil Code. In such cases, it seems that the contract relation is prior to the tortious relation between the operator and the contracting party who accept the risk of loss or damage to property by contract.

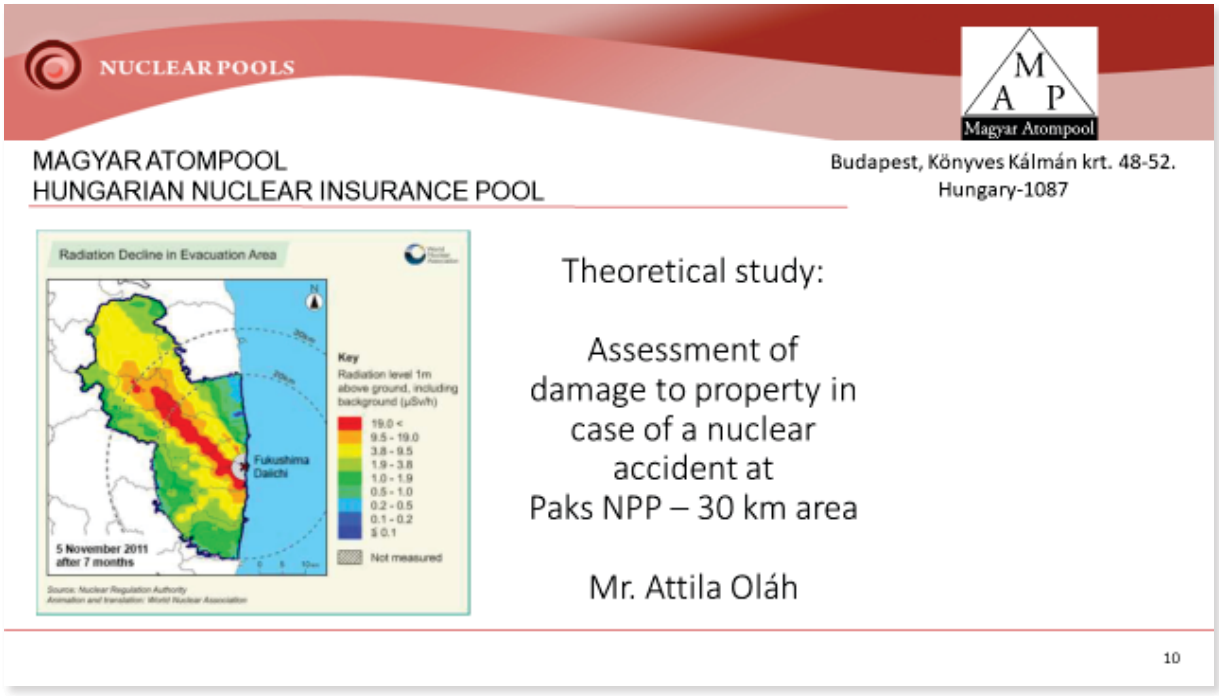
That is why the Interim Guidelines established by the DRC categorise damages possibly caused by the accident and play an important role in providing compensation to victims. Moreover, there have been a great number of mediations of settlement and trials to date, and these judgments will provide important hints for how the nuclear damage system will be handled in the future.

However, the damage compensation practice related to Fukushima Daiichi accident reflects the peculiarities of the Japanese nuclear damage compensation regime (including countermeasures after the Fukushima Daiichi accident). That is to say TEPCO has unlimited liability, and Japanese government has established the Nuclear Damage Compensation Facilitation Corporation and has provided financial support to TEPCO so that compensation can be made without going bankrupt. For this reason there is no need to consider priorities to damages to be compensated.

The experience of Japan cannot therefore be generalised, but other countries could learn many lessons from it.

Annex 2.A3. **Theoretical study: Assessment of damage to property in case of a nuclear accident at the Paks nuclear power plant – 30 km area**[1]

by the Hungarian Nuclear Insurance Pool



1. The slides included in the present Annex 2.A3 are an abstract of the presentation on "Costs related to 'loss of or damage to property'" provided during Session 2 of the Lisbon Workshop.

NUCLEAR POOLS

FOCUS OF THE STUDY

- The 30 km area, but only "material damage" type of claims and its values
- Why only material damage?
  - There are lots of available, quantifiable, reliable public information *
  - Injury/death: can not be estimated due to evacuation, non-pecuniary harm has to be a consequence of injury
  - Reinstatement of environment: there is no available estimation on reinstatement costs, it very much depends on the quantity of the released contamination and the affected area
  - Preventive measures: what kind of costs would be covered? Would the state decrease the limit available for all claimants with its own evacuation and other preventive costs?

** Sources of information: Hungarian Central Statistical Office and company databases*

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NUCLEAR POOLS

FURTHER ISSUES

- Hungarian Atomic Law, Section 56. 2)-3):

  (2) If there is reasonable cause to suggest that the nuclear damage resulting from the nuclear accident will exceed the amount described in Section 52, *on the basis of the Government's decision, until further action, only a specified portion* of the amount of compensation for nuclear damage *may be used* to satisfy the parties entitled to compensation for nuclear damage.

  (3) *If the amount* available for compensation for nuclear damages *is insufficient* to satisfy all parties entitled to compensation for nuclear damage in full, the amount of *compensation* due to all of them for nuclear damages *shall be proportionately reduced*.

- On the basis of the above Section, claim settlement depends on very much Government decisions. Some questions: how much is the "specified portion", will Government define priorities, will there be fixed compensations for certain type of claims, how long insurers should wait for claims to define proportionate reduction, etc.
- Availability of State / authority databases

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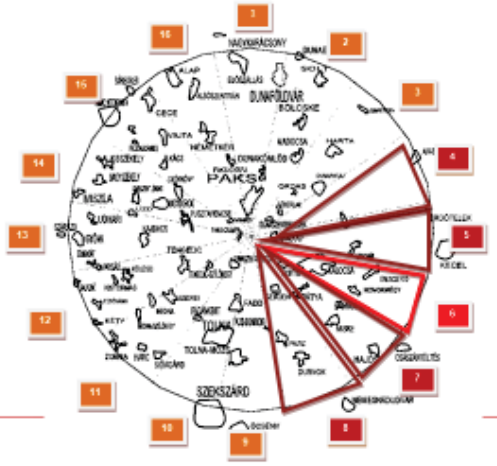
NUCLEAR POOLS

MAP OF 30 KM AREA & MAIN WIND DIRECTION (5 MOST ESPOSED SECTORS)



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NUCLEAR POOLS

MONITORED AREAS

- Enterprises
- Population
- Houses, flats
- Agriculture
  - value of land
  - plant culture
  - stock raising
- 16 sectors vs. 5 most exposed sectors
- Comments / conclusion

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NUCLEAR POOLS

COMPANIES

- There are 4.890 registered companies (mainly small, medium) on these locations (2013) – w/o micro companies (Paks NPP and Atomix Kft. is not included)
  - turnover of companies: HUF 618 bn (EUR 2 bn)
  - tangible assets: HUF 261 bn (EUR 0.85 bn)
  - retained earnings: HUF 38 bn (0.12 bn)
  - number of employees: 30,559
  - number of company cars: 3,732
- Micro companies:
  - in agriculture and certain services quite significant
  - there is no reliable information on their activity

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NUCLEAR POOLS

POPULATION

- 72 towns and/or villages (in 3 counties)
- Population: 210,199 inhabitants, (including 2 towns just outside 30 km, but in the main wind direction)
- Slowly decreasing
- Approx. half of the population lives in below 7 towns

Town	Distance from NPP	Number of inhabitants				
		1970	1980	1990	2001	2011
Paks	5 km - N	13 585	19 509	20 274	20 859	19 032
Tolna	17 km - S	11 586	12 291	12 080	12 116	11 073
Szekszárd	28 km - SW	24 896	34 648	36 857	36 233	32 669
Dunaföldvár	26 km - N	10 118	9 347	8 551	9 149	8 623
Kalocsa	11 km - E	16 129	18 668	18 350	18 793	16 316
Kecel*	31 km - E	10 094	9 535	9 080	9 166	8 596
Kiskőrös*	31 km - E	14 042	15 616	14 911	15 393	13 972
Total		**100 450**	**119 614**	**120 103**	**121 709**	**110 281**

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NUCLEAR POOLS

HOUSES, FLATS

- Number of houses / flats / summer houses (2011): 94.832
- Average size of houses / flats in Hungary (2003): 78 m2
- Real value of houses / flats different county by county
- Personal goods value is around 22% of house / flat value
- The below values are real and not new replacement values

(new replacement value is approximately double of figures given the table)

County	Number of houses, flats	Real value of houses/flats (HUF/m2)	Average size of houses/flats (m2)	Real value of houses/flats	Real value of personal goods
Bács-Kiskun	38 410	132 330		396 458 033 400	87 220 767 348
Fejér	4 531	126 970	78	44 873 483 460	9 872 166 361
Tolna	51 891	123 310		499 096 978 380	109 801 335 244
Total in HUF	**94 832**	**127 537**	**78**	**940 428 495 240**	**206 894 268 953**
Total in EUR	**94 832**	**425**	**78**	**3 134 761 651**	**689 647 563**

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NUCLEAR POOLS

AGRICULTURE – VALUE OF LANDS

- Exact land sizes per town / village per different usage (2010)
- Price is differentiated by type of land and location

(price information: OTP Bank - 2013)

Type of land	Size of land (ha)	Average price of land (HUF/ha)	Value of land
Arable	161 888	813 333	130 294 760 000
Orchard	2 856	1 080 000	3 084 480 000
Grape	8 768	1 310 000	11 486 080 000
Grass	20 125	332 000	6 681 500 000
Forest	10 087	575 000	5 800 025 000
Total in HUF	**203 724**	**-**	**157 346 845 000**
Total in EUR	**203 724**	**-**	**524 489 483**

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NUCLEAR POOLS

AGRICULTURE – GRAINS, FRUITS, GRAPE

- Grains: average values, using the available data for the size of grain lands and harvested quantity on county level, but calculating only with 5 main grains prices (2013)
- Fruits: average values, based on town/village fruit land and distribution of main fruits on country level
- Grape: part of 4 traditional wine regions touches 30 km area. The real value is not the grape, but the wine

Plant	Land size (ha)	Value in HUF	Value in EUR
Grain	161 888	40 589 000 000	135 296 667
Fruit	2 856	1 669 000 000	5 563 333
Grape	8 768	4 240 000 000	14 133 333
Total	**173 512**	**46 498 000 000**	**154 993 333**

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NUCLEAR POOLS

AGRICULTURE – ANIMALS

- Figures available on town/village level (2013)
- Prices as per 2013

Animal	Live-stock	Weight (kg) / unit	Price / kg or unit	Value bn HUF	Value mn EUR
neat	18 047	550	431	4,28	14,26
cow	7 948	1 unit	300 000	2,38	7,95
pig	79 951	120	400	3,84	12,79
sow	5 206	1 unit	120 000	0,62	2,08
sheep	58 870	40	756	1,78	5,93
horse	2 395	1 unit	600 000	1,44	4,79
chicken	854 957	2	126	0,22	0,72
goose	30 233	6	590	0,11	0,36
duck	63 535	3	364	0,07	0,23
turkey	48 027	9	392	0,17	0,56
Total				**14,90**	**49,68**

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NUCLEAR POOLS

30KM AREA AND 5 MOST EXPOSED SECTORS

- Sector 5-6-7 are most exposed due to main wind direction
- Sector 4 and 8 neighboring, same measures
- Almost only Bács – Kiskun county

Assumption:

1. Serious radioactive contamination release to the environment on a controlled way
2. Wind according to main direction
3. Evacuation only in sector 4 – 8, final evacuation, total loss
4. Agriculture prohibitive measures in the whole 30 km area

(3-4. is realistic based on personal discussions)

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NUCLEAR POOLS

30KM AREA AND 5 MOST EXPOSED SECTORS

- Potential claim value:
  - private assets (houses/flats + personal goods) in sector 4–8
  - tangible assets of companies in sector 4–8
  - total agriculture activity in the 30 km area

Values	Total 30km area	4 - 8 zones	Potential
houses/flats	940 428 495 240	316 370 580 240	316 370 580 240
personal goods	206 894 268 953	69 601 527 653	69 601 527 653
tangible assets of companies	261 562 987 979	118 632 734 064	118 632 734 064
agriculture land (incl. forest)	157 346 941 060	44 828 327 390	157 346 941 060
wheat, corn, barley, sunflower, rapes.	40 587 886 761	9 199 329 304	40 587 886 761
fruits	1 669 401 003	1 040 742 306	1 669 401 003
grape	4 238 002 027	2 607 778 479	4 238 002 027
animals	14 903 064 801	4 738 641 952	14 903 064 801
Total in bn HUF	**1 627 631 047 824**	**567 019 661 388**	**723 350 137 609**
Total in mn EUR	**5 425 436 826**	**1 890 065 538**	**2 411 167 125**
Limit in EUR (ROE SDR/EUR = 1,25)		**Insurer + State**	**375 000 000**

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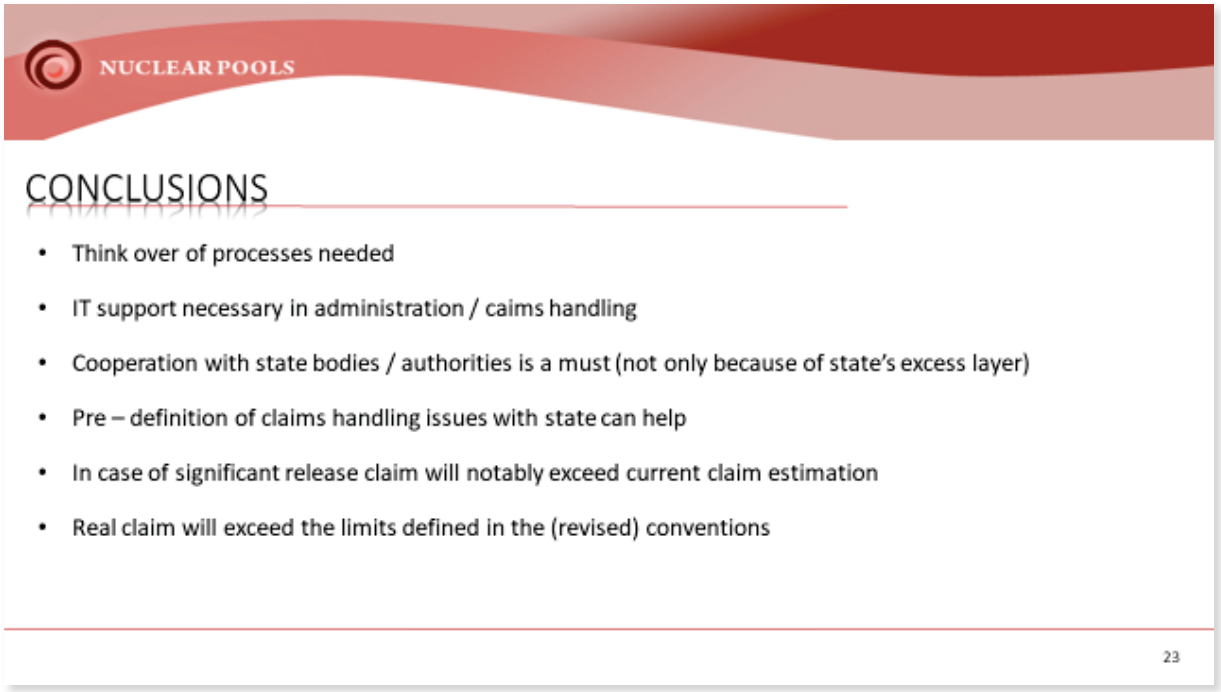
NUCLEAR POOLS
CONCLUSIONS
• Think over of processes needed
• IT support necessary in administration / caims handling
• Cooperation with state bodies / authorities is a must (not only because of state's excess layer)
• Pre – definition of claims handling issues with state can help
• In case of significant release claim will notably exceed current claim estimation
• Real claim will exceed the limits defined in the (revised) conventions
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Chapter 3. **Economic loss**

"One would think that 'economic loss' is when something can be monetised, but it is not as simple as it seems."
-Ben McRae, Chair of Group 3

Conclusions from the Workshop

- **Evolution of the definition**: with the entry into force of the Revised Paris Convention on 1 January 2022, only the original Vienna Convention does not explicitly provide for "economic loss", but it still covers it under the residual category.
- **Consequential economic loss, loss caused by preventive measures or damage to the environment**: the risk of overlap with other heads of damage poses a real challenge to avoid double compensation; the Revised Paris Convention explicitly requires loss caused by damage to the environment to be "direct", a requirement that will certainly be considered by all courts (i.e. even from non-Paris Convention states).
- **Pure economic loss**: the "catch-all clause" provided in the Vienna Conventions and the CSC covers economic loss suffered by persons who did not also suffer bodily or property damage, and, for the Revised Vienna Convention and the CSC, which is not related to an economic interest in the use or enjoyment of the environment; claimants must still establish the causal link with the nuclear incident.
- **Timing concerns**: gathering supporting evidence may take time; economic loss victims may need to receive provisional payments.
- **Need of clear guidance on what "economic loss" covers to draw lines**: courts may look to concepts such as "duty of care", "remoteness" and "foreseeability"; even though the Conventions provide some guidance to frame covered losses, clear instructions are still needed (e.g. the guidelines established to compensate the victims of the Fukushima Daiichi accident); courts will try to compensate a very broad range of economic loss, especially in case of major nuclear incidents, but they will be constrained by the amount of funds available, even when government intervenes, as was the case for the Fukushima Daiichi accident.

I. "Economic loss" under the international nuclear liability conventions

I.1 The original conventions

The original Conventions, i.e. the Paris Convention and the Vienna Convention, considered "nuclear damage" as:

- loss of life or personal injury; and
- loss of or damage to property (except on-site property and, for the Vienna Convention, damage to the means of transport)

to the extent that they were caused by a "nuclear incident"[1] arising out of or resulting from (a) the radioactive properties or a combination of radioactive properties with toxic, explosive or other hazardous properties of nuclear fuel or radioactive products or waste in, or of nuclear material coming from, originating in, or sent to, a nuclear installation, or (b) from ionising radiations emitted by any other source of radiation.[2]

The Vienna Convention provided for an additional "nuclear damage", which has been considered as a catch-all clause:

- any other loss or damage so arising or resulting if and to the extent that the law of the competent court so provides.

According to the IAEA Secretariat's commentary to the draft Vienna Convention presented to the 1963 conference, this catch-all clause "concerns principally such items as moral damages and indirect damage or loss of profits".

As explained in the *Exposé des Motifs of the Paris Convention*,[3] the competent court (in principle, the courts of the state in whose territory the nuclear incident occurred) must apply the provisions of the convention and for all matters, both substantive and procedural, not governed by the convention, the national law or legislation, including rules of private international law, which are not affected by the convention. This also applies to the Vienna Convention. Therefore, the competent court may interpret these heads of damage (i.e. "loss of life or personal injury" and "loss of or damage to property") in either a restrictive or broad way as allowed under its national law. It could therefore potentially compensate other types of loss, such as "economic loss", under such heads as long as its general tort law recognises such a form of damage to be included within the concept of "loss of life or personal injury" or "loss of or damage to property".

Accordingly,

- under the Paris Convention, economic loss would be compensated only to the extent that the law of the competent court included such loss within either of the first two heads of damage, and
- under the Vienna Convention, economic loss would be compensated only to the extent that the law of the competent court included such loss within the first two heads of damage ("loss of life or personal injury" and "loss of or damage to property") or covered such loss pursuant to the catch-all clause ("any other loss or damage so arising or resulting").

1. "Nuclear incident" is defined under both conventions in a similar manner. The definition under the Vienna Convention is as follows: "any occurrence or series of occurrences having the same origin which causes nuclear damage".
2. The Vienna Convention only covers damage caused by any other source of radiation inside a nuclear installation if the law of the installation state so provides.
3. NEA (1982), "Exposé des Motifs", revised text approved by the OECD Council on 16 Nov. 1982, OECD Doc. C/M(82)24(Final) (*Exposé des Motifs of the Paris Convention*).

Not all victims of nuclear incidents will be treated equally, not only because of the differences between the Conventions, but because of the extent of the damage to be compensated under the national nuclear liability regimes, which depends on the interpretation that the competent courts would have on the definition of "nuclear damage". There may be significant differences among the different national laws.

I.2 The post-Chernobyl conventions

The 1986 Chernobyl accident, due to its magnitude,[4] served as a wakeup call to the international community, who decided to improve the international nuclear liability conventions taking into consideration the impact of this accident. One of the issues addressed was the type of damage that nuclear incidents could cause: this accident demonstrated that damage could go well beyond the scope of damage encompassed by a strict interpretation of loss of life, personal injury and loss of or damage to property. The world witnessed that significant damage could also be caused to the environment and that the economies could be affected.

In fact, the 1979 Three-Mile-Island accident,[5] which caused no off-site contamination, had already provided for a precedent in this respect as the insurance pools settled a class-action suit for economic loss filed on behalf of residents in a 25-mile radius around the nuclear power plant.[6]

The first instruments to explicitly provide for "economic loss" were the Revised Vienna Convention and the CSC. During the negotiations of these conventions, a compromise was reached to extend the definition of "nuclear damage" to explicitly include "economic loss" to compel each contracting party to ensure that, if its courts had jurisdiction, they would address

4. The Chernobyl accident occurred on 26 April 1986 at the Chernobyl nuclear power plant, located in the Kiev region in the North of Ukraine. An accidental explosion during a safety test destroyed the core of a unit and started a significant fire that lasted several days. A massive amount of radioactivity was released and a radioactive plume dispersed that contaminated some 150 000 km^2 of what is today Belarus, Russia and Ukraine. Radioactive fallout was scattered over much of the northern hemisphere via wind and storm patterns, but the amounts dispersed were in many instances insignificant (IAEA, Frequently Asked Chernobyl Questions). It is important to note that the Union of Soviet Socialist Republics (USSR) was not a party to either the Paris or the Vienna Conventions. Therefore, victims were compensated based on their respective national laws.
5. The Three Mile Island Unit 2 reactor, in Pennsylvania, United States, partially melted down on 28 March 1979. However, there were no consequences outside the nuclear power plant site. A recommendation for all preschool children and pregnant women living within five miles (and subsequently 32 km radius) of the plant was issued, targeting 5 000 persons, but eventually over 140 000 persons fled the area. About 98% of the evacuees returned to their homes within three weeks.
6. During the accident at the Three Mile Island nuclear power plant, the Price-Anderson Nuclear Industries Indemnity Act ("Price-Anderson Act") provided liability insurance to the public. Coverage was available to those in need by the time Pennsylvania's governor recommended the evacuation of pregnant women and families with young children who lived near the plant. At the time of the accident, private insurers had USD 140 million of coverage available in the first tier pools. Insurance adjusters advanced money to evacuated families to cover their living expenses, requesting that unused funds be returned; recipients sent back several thousand dollars. The insurance pools also reimbursed more than 600 individuals and families for wages lost as a result of the accident. These on the spot, non-judicial payments totalled approximately USD 1.5 million. The insurance pools were later used to settle a class-action suit for economic loss filed on behalf of residents who lived near Three Mile Island. In 1981, USD 20 million for economic harm and USD 5 million for the establishment of a Public Health Fund were paid in partial settlement; in 1983, USD 2.35 million was paid in evacuation loss claims and wage loss claims to 10 993 claimants; in 1984; USD 485 000 was paid to local governments: and in 1985, USD 14.25 million was paid to settle bodily injury and emotional distress claims for 280 people. The Price-Anderson Act covered court fees of USD 29 million as well. Altogether, the insurance pools paid approximately USD 71 million in claims and litigation costs associated with the Three Mile Island accident. Sources: NRC Factsheet (www.nrc.gov/reading-rm/doc-collections/fact-sheets/nuclear-insurance.html) (accessed 24 Apr. 2024); The Price-Anderson Act and the Three Mile Island Accident, Tyson Smith, (www.oecd-nea.org/ndd/workshops/nuclearcomp/presentations/documents/1.TysonR.Smith-Price-AndersonOECD-NEALiability Workshop-December2013.pdf) (accessed 24 Apr. 2024). National Association of Insurance Commissioners, Nuclear Liability Insurance (Price-Anderson Act) (https://naic.soutronglobal.net/Portal/Public/en-US/RecordView/Index/19814) (accessed 24 Apr. 2024).

claims for such damage (the courts only deciding the extent to which particular types of economic damage came within the identified heads of damage), while trying to define the new heads of damage with sufficient precision to avoid compensating every remote economic loss as the limited amounts of compensation available[7] need to be distributed among all the victims equitably.

The Revised Vienna Convention and the CSC have identical definitions of nuclear damage, which read as follows:

> "Nuclear damage" means,
>
> (i) loss of life or personal injury;
>
> (ii) loss of or damage to property;
>
> and each of the following, to the extent determined by the law of the competent court:
>
> (iii) economic loss arising from loss or damage referred to in sub-paragraph (i) or (ii), insofar as not included in those sub-paragraphs, if incurred by a person entitled to claim in respect of such loss or damage;
>
> (iv) the costs of measures of reinstatement of impaired environment, unless such impairment is insignificant, if such measures are actually taken or to be taken, and insofar as not included in sub-paragraph (ii);
>
> (v) loss of income deriving from an economic interest in any use or enjoyment of the environment, incurred as a result of a significant impairment of that environment, and insofar as not included in sub-paragraph (ii);
>
> (vi) the costs of preventive measures, and further loss or damage caused by such measures;
>
> (vii) any other economic loss, other than any caused by the impairment of the environment, if permitted by the general law on civil liability of the competent court,
>
> in the case of sub-paragraphs (i) to (v) and (vii) above, to the extent that the loss or damage arises out of or results from ionizing radiation emitted by any source of radiation inside a nuclear installation, or emitted from nuclear fuel or radioactive products or waste in, or of nuclear material coming from, originating in, or sent to, a nuclear installation, whether so arising from the radioactive properties of such matter, or from a combination of radioactive properties with toxic, explosive or other hazardous properties of such matter.

If the Revised Vienna Convention does not exclude anymore the damage to the means of transport under the concept of "loss of or damage to property", the CSC still does.

The Revised Paris Convention provides for a similar definition with two exceptions:[8]

7. Even if a country provides for unlimited liability of an operator, or for the joint and several liability of various entities, the amounts that the liable operator may provide on its own to compensate the victims will be limited de facto to its assets. This does not take into account the additional amounts that may be provided at the national and international level to compensate victims, such as, but not limited to, the operators pooling systems or the international funds available under the regime established by the CSC, as well as by the Paris Convention and the Brussels Supplementary Convention.
8. See NEA (2004), Explanatory Report by the Representatives of the Contracting Parties on the Revision of the Paris Convention and the Brussels Supplementary Convention, Annex IV to the Final Act of the Conference on the Revision of the Paris Convention and of the Brussels Supplementary Convention, 12 February 2004, paragraph 12; and IAEA (2020), *The 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage – Explanatory Texts*, IAEA International Law Series, No. 3 (Rev. 2), IAEA Doc. STI/PUB/1906, IAEA, Vienna (*Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*), footnotes 126 and 129.

- it required that the loss of income derived from an economic interest in any use or enjoyment of the environment be from a direct economic interest, and
- it did not provide for the residual category of economic loss (i.e. "any other economic loss, other than any caused by the impairment of the environment, if permitted by the general law on civil liability of the competent court"), as the drafters considered that it was already covered by the other heads of damage.

The Revised Paris and Vienna Conventions, as well as the CSC provide that the new heads of damage will only entitle to compensation "to the extent determined by the law of the competent court". The drafters used on purpose the term "to the extent" instead of "if" (in which case it would have been an option) to stress the fact that either the law of the competent court needs to provide for such head of damage, or the competent court must interpret its national law as including this head of damage. The objective was to harmonise the heads of damage that would be compensated under the different legal systems (whether they were more restrictive or not). This also flows from the Conventions' principle pursuant to which "the nature, form, extent and equitable distribution of compensation for nuclear damage caused by a nuclear incident shall be governed by the law of the competent court."[9] It is important to note that while having the states parties to the Conventions adopt implementing laws that would include the heads of damage that cover economic loss, a common law country may comply with the Conventions if such heads of damage are covered by its general tort law developed through case law.

The modernised Conventions were therefore able to harmonise the treatment of nuclear damage by requiring coverage of the categories of economic loss, while allowing flexibility in their interpretation in order to take into account the differences of national legal systems.

II. The categories of "economic loss"

Since the adoption of the modernised Conventions, experts have distinguished between:

- "*consequential economic loss*": economic loss suffered by a person which arises from the personal injury, death, loss of or damage to property of that same person, and which is not already covered by or compensated under such categories of nuclear damage, i.e. loss of life or personal injury and loss of or damage to property;
- "*pure economic loss*": this category is not related to any property damage suffered by the person entitled to claim compensation. It encompasses the catch-all clause provided under the Vienna Conventions and the CSC (i.e. "any other economic loss, other than any caused by the impairment of the environment, if permitted by the general law on civil liability of the competent court"), and the economic loss caused by the preventive measures;
- "*loss of income deriving from an economic interest in any use or enjoyment of the environment*": this head of damage will only be compensated "insofar as not included in [loss of or damage to property]"; and
- "*residual category of economic loss*": the catch-all clause that is provided under the Vienna Conventions and the CSC.

This chapter will cover each of the actual heads of damage provided in the modernised Conventions (the Revised Paris and Vienna Conventions and the CSC) that include economic loss, and will not follow the above categorisation, as such categories do not have, according to some experts, a uniform meaning or application among the various jurisdictions.

9. Article 11 of the Revised Paris Convention, Article VIII(1) of the Revised Vienna Convention and Article 11 of the CSC Annex.

II.1 Economic loss resulting from "loss of life or personal injury", or "loss or damage to property"

This is the economic loss which arises from loss of life, personal injury, loss or damage to property, and which is not already covered by or compensated under those original categories of nuclear damage.[10]

In general, economic loss is a broad concept that can cover a wide range of adverse financial consequences. By stating "economic loss arising from [loss of life or personal injury/loss of or damage to property] insofar as not included in [those heads of damage], if incurred by a person entitled to claim in respect of such loss or damage", the modernised Conventions have sought to limit the extent of economic loss covered by this head of damage by giving guidance to the courts that will have to interpret it. Specifically, all of the following requirements need to be met:

a) there must be "economic loss";

b) the damage must arise from "loss of life or personal injury" and "loss of or damage to property"; and

c) the damage must be incurred by "a person entitled to claim in respect of such loss or damage".

The modernised Conventions do not provide more explanation on the above requirements. Therefore, it is up to the law of the competent court to determine how such requirements should be interpreted.

Economic loss

In some jurisdictions, economic loss is considered part of personal injury or property damage and thus covered to some extent by the original Conventions. In other jurisdictions, however, economic loss is considered a separate head of damage and not covered by the original Conventions. The inclusion in the modernised Conventions of the concept of "economic loss" as a separate head of damage ensures that such damage will be considered in all jurisdictions that adhere to these Conventions. For example, in Switzerland, the economic loss in relation with loss of life, personal injury, loss of or damage to property is qualified as part of the damage to person or to property.

As noted, economic loss is a broad term. In most legal systems, it includes but is not limited to "loss of profit", "loss of earnings" or "loss of income" that results from a person's own property being temporarily or permanently unavailable. However, economic loss might also include economic loss due to the loss or damage of a third party's property, such as: (i) lost wages resulting from damage to a workplace in which the workers have no property interest, and (ii) reduced revenue of businesses that either are suppliers to or customers of a factory damaged by a nuclear incident.

The boundaries of economic loss vary from jurisdiction to jurisdiction. In drawing lines as to what is covered or not covered, courts often look to concepts such as "proximate cause", "remoteness" and "foreseeability". Some legislations have opted to only compensate "direct" economic loss (this is the case for France).[11] Many jurisdictions also draw a line between "consequential economic loss" (loss suffered by person with a legal interest in injured person or property) and "pure economic loss" (loss suffered by person with no legal interest in injured person or property). Although often cited, this line is the subject of many exceptions.

10. This Chapter will not cover what is "loss of life or personal injury", which is addressed by Chapter 1, or what is "loss of or damage to property", which is addressed by Chapter 2.
11. The French Supreme Court (Cour de cassation) clarified in 1892 that under the French law, a direct damage must flow directly from the generating event (fait générateur). Damage that may have occurred obliquely is therefore excluded from compensation and only direct immaterial damage is compensated under the French law as long as a causal link is established between the generating event and the damage (Court of Cassation, Civil Chamber 14 March 1892 and Articles 1240 and following of the French Civil Code).

Link to "loss of life or personal injury" and "loss of or damage to property"

This linkage is especially important in jurisdictions that consider "loss of or damage to property" and "loss of life or personal injury" to be distinct heads of damage with regard to economic loss.

Proving a link to "loss of life or personal injury" should be relatively straightforward with regard to loss of earnings or loss of income as long as the causal link between the loss of life or personal injury and the nuclear incident is established: it should suffice to demonstrate that the deceased or injured victim was earning a certain salary/income/revenue before the accident and that this salary either no longer exists (if deceased) or has been decreased commensurately with the extent of the injuries suffered.

The link to "loss of or damage to property" may prove more challenging. Even though the causal link between such loss or damage and the nuclear incident may be established, the economic loss may be challenged if it is considered that the damage is temporary or may be prevented or minimised by taking certain actions. For example, the owner of a factory in the contaminated zone may be required to cease production for a certain period of time following an accident; however, the courts may consider that following a reasonable period of time it would be incumbent upon the factory owner to relocate production to a more suitable site outside the contamination zone (if said zone remains contaminated and may remain so for some time pending decontamination measures). One could anticipate that there may be differences of opinion as to what constitutes a "reasonable period of time" in this regard.

Furthermore, the case of self-employed persons may prove discussion-worthy where their place of business (which may coincide with their residence) is located within the contaminated zone. If they are in the habit of welcoming their clientele at that place of business, they may be also entitled to relocation costs, again depending on the time period during which their place of business is impracticable.

Under certain legislations, the link between "loss of or damage to property" and "loss of life or personal injury" with "economic loss" is established. This is the case of Canada, where Section 16 of the Nuclear Liability and Compensation Act (NLCA) provides that "Economic loss that is incurred by a person as a result of their bodily injury or damage to their property and that is caused by a nuclear incident, or psychological trauma that results from that bodily injury, is compensable."[12]

Person entitled to claim

The requirement that the economic loss be incurred by "a person entitled to claim in respect of such loss or damage" appears to be an attempt to restrict the extent of the damage to be compensated and to exclude pure economic loss. However, this language, which is not used in other heads of damage, leaves to the courts' discretion to determine who is entitled to bring a claim with respect to such damage since it does specify the basis on which a court can rely to permit a person to bring a claim based on damage to a person or property.

With respect to loss of life or personal injury, the injured person can certainly bring a claim. Most jurisdictions also permit certain family members to bring claims for economic loss resulting from the death or injury of another family member. Some jurisdictions also permit a person to bring a claim for economic loss resulting from the death or injury of another person if the person deceased or injured was considered an "economic asset" and the "economic interest" is proved (e.g. death of an artist or the injury of an internationally renowned athlete).

For example, in Japan, the Supreme Court ruled on 15 November 1968 in a case where the president of a company was injured in a traffic accident that his company should only be compensated if the president was no longer able to perform his duties at the company.[13] In Finland, the nuclear damage provided in the Nuclear Liability Act[14] shall be interpreted in

12. Nuclear Liability and Compensation Act, 2015 (SC 2015, c. 4, s. 120) (NLCA).
13. P. 2614, No. 12, Vol.22, Supreme Court Civil Case Digest.
14. Finnish Nuclear Liability Act (No. 484/1972), as amended.

light of the Tort Liability Act,[15] which specifies the person entitled to claim loss of income (e.g. the person who was maintained by or received child support from the person who died or suffered injury; and the parents, children and spouse of the person who died, as well as any other comparable person who was especially close to that person) may be compensated for loss of income.

With respect to loss of or damage to property, the owner of the damaged property can certainly bring a claim. Most jurisdictions also permit persons with lesser property or other legal interests in the damage property to bring a claim (e.g. an usufructuary); although the type of interests covered varies from jurisdiction to jurisdiction. Finally, some jurisdictions permit persons with only a third-party beneficiary type interest in the damaged property to a bring a claim (e.g. the tenant or lessee).

II.2 Loss of income deriving from an economic interest in any use or enjoyment of the environment

By stating "loss of income deriving from an economic interest in any use or enjoyment of the environment, incurred as a result of a significant impairment of that environment, and insofar as not included in [the loss of or damage to property]", the modernised Conventions have provided for a set of requirements to recover certain economic loss resulting from damage to the environment, giving thus guidance to the courts that will have to interpret it. Specifically,

a) only "loss of income" can be recovered;

b) there must be an "economic interest", and such economic interest must be "direct" under the Revised Paris Convention;

c) the victim must have "[used] or [enjoyed] the environment";

d) there must be a "significant impairment of [the] environment";[16]

e) the damage should not be considered as a "loss of or damage to property".

Loss of income

Here the term "economic loss" used for other heads of damage has been replaced by "loss of income" in order to stress the fact that this head of damage only permits recovery of the loss or decrease in financial benefits that a person derived from the environment. Therefore, an individual who "use[d] and enjoy[ed]" the environment for personal benefit should not be entitled to claim compensation.

Loss of income would include lost profits and lost wages, but in some jurisdictions, it might be read broadly to include less conventional forms of financial benefits. For example, some jurisdictions might include the value of fish that would have been caught by subsistence fishermen to feed their village. On the other hand, it would not cover the value of the lost enjoyment of sport fishermen, although it might well cover the lost revenue of the owner of the boat that these sport fishermen would have chartered.

Economic interest

An economic interest is a very broad concept, which can encompass any benefit that is traceable to the use or enjoyment of the environment and that is capable of being described in financial/monetary terms.

15. Finnish Tort Liability Act (412/1974).
16. Chapter 4 addresses the "Cost of Measures of Reinstatement of Impaired Environment" and therefore considers what is a "significant impairment of [the] environment".

Under the Revised Paris Convention, the use of the term "direct" economic interest is intended to ensure that compensation will not be awarded for nuclear damage that is too remote. By adding this qualifier, the Revised Paris Convention requires the court to examine if the persons suffering loss of income have a clear nexus or link to the use or enjoyment of the impaired environment that is sufficient to warrant compensation for their economic loss.

Even though the Vienna Conventions and the CSC do not specify whether the economic interest needs to be direct, one would presume that a court applying these conventions will also need to consider the remoteness of the damage.

It is interesting to note that Canada, a CSC country requires that the loss of income under this head of damage derives exclusively from a direct economic interest in any use of enjoyment of the environment.

It would be interesting to discuss what the Paris Convention countries wanted to exclude by clearly providing for a "direct" economic interest, which may therefore be covered under the Vienna Conventions and the CSC. They might have wanted to preserve the limited amounts of compensation available by excluding the payment of compensation to those whose economic activity is not directly affected by the impairment of the environment and to those who do not depend entirely for their income on commercial exploitation of the environment. It appears that this was a persistent concern during the negotiations of the modernised Conventions.

Use or enjoyment of the environment

The claim for compensation must be based on an economic loss caused by the temporary or permanent impossibility to use or enjoy the environment. This requirement may be interpreted narrowly to include only recognised legal rights in any use of the environment (e.g. activities that would require a license), or extensively to all claims where a certain form of economic interest may be established.

The most common economic activities that "use or enjoy the environment" are agriculture, fisheries and tourism, but one should not neglect other industries, such as but not limited to the food or cosmetic industries and the energy sector (e.g. there is no possibility to access a field of windmills or a coal mine because the environment through which one should go through has been contaminated).

If not included in "loss or damage to property"

Under the modernised Conventions, it is expressly stated that loss of income from an economic interest in any use or enjoyment of the environment is to be compensated only in so far as it is not already included under "loss or damage to property", under the applicable substantive law. Chapters 2 and 4 address the difference between "property" and "environment". The distinction between those two concepts may vary from one jurisdiction to another. "Property" clearly means moveable assets and real estate, but there are parts of the environment that can be the property of a legal person given the very broad definition that "environment" can have, which could potentially also include privately owned property (e.g. forests owned by a private person).[17] Therefore, in order to know whether a person will be entitled to compensation for loss of income deriving from an economic interest in any use or enjoyment of the environment, it would be important to clarify whether the damage would not be already covered as "loss or damage to property" under the law of the competent court.

17. See Principle 2(b) of the International Law Commission (ILC) Draft Principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities, 2006, available at: http://legal.un.org/ilc/texts/instruments/english/commentaries/9_10_2006.pdf (accessed 24 Apr. 2024); and Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with Regard to the Prevention and Remedying of Environmental Damage, *Official Journal of the European Union* (OJ) L 143, 30 Apr. 2004 (EU Directive on Environmental Liability).

II.3 Further loss caused by preventive measures

Chapter 5 addresses preventive measures. However, this head of damage also includes "*further loss or damage caused by such measures*" which includes economic loss. The difference with other heads of damage is that this one does not provide for any limits or restrictions. The only requirement is that the loss must be caused by the preventive measures; a causal link must therefore be established.

Economic loss caused by preventive measures may arise as the result of two very different situations:

- there has been a release of radiation;
- there is a "grave and imminent threat" that radiation will be released.

The inclusion of the grave and imminent threat situation creates a difference with the other heads of damage that only permit recovery if there is a release of radiation (see Section I).

II.4 Other economic loss permitted by the general law on civil liability of the competent court

This residual head of damage is only provided under the Vienna Conventions and the CSC with slight differences:

- the Vienna Convention: "any other loss or damage so arising or resulting if and to the extent that the law of the competent court so provides"
- the Revised Vienna Convention and the CSC "any other economic loss, other than any caused by the impairment of the environment, if permitted by the general law on civil liability of the competent court".

First, while the original Vienna Convention covered "any other loss or damage so arising or resulting", the new residual head of damage clearly provides for "any other economic loss", which is more restrictive and is in line with the discussions that were held during the revision regarding the necessity of delimiting the scope of compensation taking into account the limited amount of compensation available. While economic loss is a very broad term, it most likely would not include damage of an intangible nature such as diminution of the aesthetic value of a beach that could not be quantified in monetary terms.

Second, under the Revised Vienna Convention this residual head of damage must be permitted by the substantive law of the state with jurisdiction ("if permitted by the general law on civil liability of the competent court"). If the wording under the original Vienna Convention is different ("if and to the extent that the law of the competent court so provides"), both intend to delimitate the scope of compensation. The "law of the competent court" is defined under Article I (e) of the Vienna Convention as "the law of the court having jurisdiction under [the] Convention, including any rules of such law relating to conflict of laws", i.e. it includes the rules of private international law of the court. The "general law on civil liability of the competent court" is not defined under the Revised Vienna Convention, but as it strictly refers to the substantive tort law of the competent court, it clearly excludes any conflict of laws rules.

The court will have total discretion to decide what residual category of economic loss will be compensated under its own general law on civil liability. Thus, this residual head of damage appears to provide a means to compensate pure economic loss that is generally compensated in a jurisdiction but not under one of the specific heads of damage in the Conventions. During the discussions prior to adoption of the modernised Conventions, some examples were provided to explain this residual head, such as:

- loss of wages of employees laid-off by a factory whose site has been contaminated, and
- businesses that have been affected by rumour only.

It is also interesting to point out that the revised residual head of damage excludes "economic loss" caused by the impairment of the environment. Economic loss is already excluded by the restrictive "loss of income deriving from an economic interest…." (see Section II.2 above). The combination of both heads of damage clearly excludes any possibility of compensation under the modernised Conventions for economic loss (other than loss of income) that may derive from the contamination of the environment.

The Revised Paris Convention does not contain this residual head of damage because the contacting parties considered that this head of damage was already covered by the other heads of damage included in the definition (see Section I.2).

III. What may constitute "economic loss" in practice?

Economic loss is usually not defined in national legislations. It will be up to the competent court to determine what may constitute economic loss. To do so, the judges may rely on general tort law, as well as other areas of law and accounting principles.

For individuals, "economic loss" could cover:

- loss of wages,
- loss of income received from the use and enjoyment of property (i.e. rental of an apartment situated in the contaminated area),
- loss caused by the evacuation, i.e. rental of a new home, increased cost of living,
- increase cost of goods delivered from nuclear influence-free area as a result of nuclear incident,
- loss of any other income as a result of nuclear incident (e.g. loss of breadwinner).

For businesses (e.g. self-employed individuals and corporations), "economic loss" could cover:

- loss of profit,
- loss of sales,
- loss caused by the evacuation, i.e. rental of new offices, increased cost for operation.

In order to demonstrate the loss, the claimant will need to prove the difference between the current revenue, profit or income, and the ones earned before the accident during a reasonable period of time.[18] It is essential to clearly determine the period that will be considered to calculate the economic loss: how long after the accident will the person (either an individual or a corporation) be considered affected by the nuclear incident? Some concern may also exist with regard to the past period to be taken into account as the "reference basis" to calculate the economic loss may be an exceptionally bad period.

In addition, the problem will be to provide supporting evidence if the claimant has lost access to the required information, such as original invoices, accounting data (e.g. because his/her house or offices are in the restricted area). There are however other means, such as when the information has been provided to governmental authorities or third parties that still have the information, such as the tax authorities or the auditors.

18. See International Oil Pollution Compensation Funds (2019), *Guidelines for presenting claims in the tourism sector*, IOPC Funds, London, https://iopcfunds.org/wp-content/uploads/2018/08/2019-Tourism_e.pdf (accessed 24 Apr. 2024) and IOPC Funds (2019) *Claims Manual*, available at https://iopcfunds.org/wp-content/uploads/2018/12/2019-Claims-Manual_e-2.pdf (accessed 24 Apr. 2024). The guidelines explain on page 16 how the industry could claim economic loss by proving such loss through a formula that would take into account loss of revenue, variable costs, additional costs incurred and potential additional income. This is very similar to the approach taken in the Interim Guidelines adopted following the Fukushima Daiichi accident. See NEA (2012), *Japan's Compensation System for Nuclear Damage as related to the TEPCO Fukushima Daiichi nuclear accident*, OECD Publishing, Paris, pp. 138-139.

Given the circumstances, there might be an arbitrary settlement, as the evaluation of the economic loss tends to be carried out in a friendly manner between the operator or insurer and the claimant.

The loss of profit or revenue may also be caused by rumours. "Rumour-related damage" is not usually taken into consideration, except for Japan (see Section IV.1), Finland and France. However, given the psychological effect of a nuclear incident on customers, the causal link between the loss of profits caused by the rumour-related damage and the nuclear incident should be established, even though the concept of "remoteness" should have excluded it.

III.1 Lack of insurance to mitigate nuclear-related "economic loss"

Usually individuals and businesses would cover risks by buying insurance, but there is an exclusion in all insurance policies with regard to radioactive risks[19] in order to avoid duplication as nuclear damage is expected to be compensated by the operator under the nuclear liability regime. This was also one of the arguments to specify in the modersnised Conventions that "economic loss" will need to be compensated under the nuclear liability regimes.

IV. Practical approaches to determine "economic loss"

IV.1 Two nuclear examples: the Tokaimura and the Fukushima Daiichi accidents

1999 Tokaimura accident[20]

On 26 May 2000, a Nuclear Damage Investigation Study Group finalised a report establishing guidelines to determine the nuclear damage to be compensated under the Act on Compensation for Nuclear Damage ("Compensation Act").[21] Such guidelines were based on judicial precedents, examples in other countries and information obtained from on-site investigation. Under such guidelines, the following may be considered "economic loss":

- Loss of income: anyone whose residence or place of work was in the area subject to the recommendations, and who was unable to work as a result of the administrative action (e.g. evacuation orders), is eligible for compensation in respect of his/her lost or reduced income; and
- Business damage (both due to physical effects and to rumour): to be qualified as damage, there must be a consequential relationship between the accident and the economic loss; to determine causality, the time at which such loss or damage was caused, and the distance from the accident site are the most important factors: economic loss suffered between the time of the accident and 30 November 1999, within a 10 km radius of the accident site, and caused by loss of customers which is estimated to be reasonable given the circumstances of the accident, leading to an actual decrease in income, is considered to satisfy the causality criteria and is deemed eligible for compensation.

19. Example of exclusion clause: […] excludes any loss, liability, cost or expense, of any kind or description, or any other amount incurred by or accruing to the insured, directly or indirectly and regardless of any other cause contributing concurrently or in any sequence, originating from, caused by, arising out of, contributed to by, resulting from, or otherwise in connection with (i) any nuclear risk or (ii) irradiation or contamination by nuclear material (or substances).
20. For more information, see NEA (2000), "Tokai-Mura Accident, Japan – Third Party Liability and Compensation Aspects", *Nuclear Law Bulletin,* No. 66, OECD Publishing, Paris, p. 13, and NEA (2003), "2003 Judgment of the Mito District Court issuing penalties in respect of the Tokai-mura accident", *Nuclear Law Bulletin*, No. 71, OECD Publishing, Paris, p. 43.
21. For more information on the Compensation Act, see NEA (2012), *Japan's Compensation System for Nuclear Damage as related to the TEPCO Fukushima Daiichi nuclear accident*, *supra* note 18.

- Examination expenses (property): if the property was in Ibaraki Prefecture at the time the accident occurred, expenses incurred in respect of the examination of the said property (before 30 November 1999) can be recognised as damage.

The majority of claims concerned economic loss caused by consumers' behaviour based on rumour.

2011 Fukushima Daiichi accident[22]

For the 2011 Fukushima Daiichi accident, the Dispute Reconciliation Committee for Nuclear Damage Compensation (DRC) was promptly set up pursuant to Section 18.1 of the Compensation Act. The DRC is not permanent, but is only set up in case disputes occur regarding compensation of nuclear damage due to a nuclear incident. The first time that it was set up was for the Tokaimura nuclear incident. The DRC consists of up to ten committee members, who are appointed by the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) among experts of high moral standing and who are highly experienced or have academic standing relating to law, medicine, nuclear engineering or other nuclear-related technologies.[23] One of the roles of the DRC is to issue non-binding guidelines that determine the nuclear damage that may be compensated and provide alternatives to determine the amount of compensation payable for such nuclear damage.[24] This role was added to the Compensation Act in 2009, based on the lessons learnt from the 1999 Tokaimura accident.

The DRC provided very detailed guidelines to determine the nuclear damage to be compensated following the Fukushima Daiichi accident. However, it was not the DRC's view that specific forms of damage not explicitly provided in the guidelines would not be compensated. That would be left to the civil courts to decide. These guidelines, even though non-binding, were challenged very exceptionally by certain victims before the alternative dispute resolution centre or the courts.[25] They determined the nuclear damage in a very clear and detailed manner in order to avoid any doubt or misinterpretation, greatly contributing to the compensation process. They specified:

- the nature, form and extent of the nuclear damage to be compensated,
- the geographical situation of the victims, distinguishing between
  - those forced to leave the affected area due to an evacuation order
  - those who voluntarily evacuated (in the absence of an evacuation order)
  - those who were outside the area at the time of the accident and who had their main home within the affected area
  - those forced to take shelter indoors in the affected area
  - those whose businesses were conducted in the affected area
- the period during which the damage was suffered
- the eligible businesses, if relevant

The type of costs that may be compensated and considered as "economic loss" are as follows:

- examination expenses concerning persons, property and goods

22. For more information, see NEA (2012), *Japan's Compensation System for Nuclear Damage as Related to the TEPCO Fukushima Daiichi Nuclear Accident*, *supra* note 18.
23. Cabinet Order on the Organisation etc. of a Dispute Reconciliation Committee for Nuclear Damage Compensation, Article 1.
24. See Compensation Act, Section 18.2.
25. As of 2 August 2019, 25 123 cases were submitted to the Nuclear Damage Compensation Dispute Resolution Centre (ADR Centre) by victims that did not agree with the compensation received. From those cases, mutual agreement was reached for 19 337 cases, 2 643 were withdrawn, 2 041 were stopped during the process and two were not accepted.

- evacuation expenses
  - accommodation related expenses
  - increase in living expenses
- business damage (reduction in income/additional expenses incurred)
- damage arising from incapacity to work for an employer (loss of income)
- loss or decrease of movable and immovable property value
- temporary access expenses
- homecoming expenses

Rumour-related damage

Among the different types of damage addressed by the guidelines, rumour-related damage is one of the most interesting because it seems difficult to define.

The general criteria for rumour-related damage are defined in Part 7 of the *Interim Guidelines on Determination of the Scope of Nuclear Damage resulting from the Fukushima Daiichi accident* issued on 5 August 2011 ("Interim Guidelines") as follows:

> I) Although there is no established definition of so-called rumour damage, in these guidelines "rumour-related" damage refers to concern about the risk of contamination with radioactive material in relation to products or services, due to facts that are widely known through media reports, leading consumers or trading partners to refrain from purchasing the product or service, or stop trading in the service or product, resulting in damage.
>
> II) "Rumour-related" damage is eligible for compensation if there is a sufficient causal relationship to the accident. The general criteria for this is as follows: when a consumer or trading partner is concerned about the risk of contamination with radioactive material resulting from the accident in relation to a product or service, and their psychological state of wanting to avoid the product or service is reasonable from the perspective of an average ordinary person.
>
> III) In terms of what specific kind of "rumour-related" damage will be recognised as damage with a sufficient causal relationship with the accident, [the DRC's] view is as follows, based on the special characteristics of each industry etc. and divided by type according to factors like sales, the nature of the item, the region, and items of damage.
>
> (1) In terms of the types of "rumour-related" damage that is to a certain extent indicated for every industry, damage due to reluctance to purchase etc. that actually arose at the time of the accident onwards (meaning damage corresponding to that in Guideline IV; the same applies below) will, in principle, be recognised as qualifying for compensation as damage in a sufficient causal relationship with the accident.
>
> (2) In terms of types other than those in (1), instances of damage due to reluctance to purchase etc. that actually arose at the time of the accident onwards will be individually evaluated in light of the general criteria in Guideline II to determine whether there is a sufficient causal relationship with the accident.
>
> IV) The types of damage will be the following items arising due to consumers or trading partners being reluctant to purchase or suspending transactions for goods or services:
>
> (1) Business damage

A fall in revenue and, to the extent necessary and reasonable, additional costs, due to a reduction in trading volume or a drop in trading prices (including the costs of returns, disposal and decontamination of goods).

(2) Damage due to incapacity to work

If, due to the business damage in (1), operating conditions worsen for operators so that workers who worked in those businesses experience an incapacity to work, of necessity, the reduction in wages etc., and to the extent necessary and reasonable, the additional costs.

(3) Examination costs (property)

The cost of examination carried out, of necessity, due to demands etc. from trading partners.

These Interim Guidelines further specified the products that would allow for compensation under the category of rumour-related damage, if such products came from delimited geographical areas, as shown below.

Figure 3.1. **Geographical areas and categories of products to be compensated as part of rumour-related damage according to the Interim Guidelines**

Item	Area
Agriculture or forest products for food	Fukushima and other 5 prefectures
Tea	Fukushima and other 7 prefectures
Livestock products for food	Fukushima, Tochigi and Ibaraki
Fishery products for food or feed	Fukushima and other 4 prefectures
Flower	Fukushima, Tochigi and Ibaraki
Other agriculture or forest products	Fukushima
Beef	Fukushima and other 16 prefectures
Processed food used the above mainly	Not specified

Source: Ichiki, T. (2019), "Rumour related damage", presented at the Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, Lisbon, October 2019.

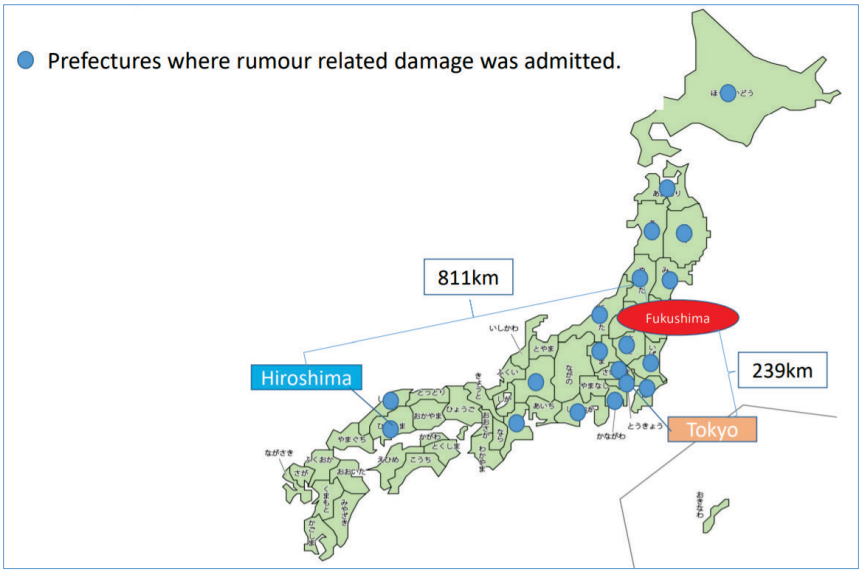
For example, the price of the Fukushima rice went down drastically even though it is a high quality rice that complied with the standards of the Food Sanitation Law (100 Bq/kg). From 2012 to 2018, more than 10 million bags were checked each year and they were below 25 Bq/kg, but customers were too scared to buy it. Therefore, the famers producing rice were compensated for the impact caused by the rumour surrounding their product.

It is important to note that the rumour-related damage will be established if there is a sufficient causal link to the accident and if the concern about the risk of contamination by radioactive material resulting from the accident is reasonable from the perspective of an average ordinary person. The actual contamination of the goods is not required.

The Third Supplement to the Interim Guidelines on the Determination of the Scope of Nuclear Damage resulting from the Accident at the Tokyo Electric Power Company Fukushima Daiichi and Daini Nuclear Power Plants (concerning Damages relating to Rumour-Related Damage in the Agriculture, Forestry, Fishery and Food Industries), issued on 30 January 2013, added additional products.[26]

26. The Third Supplement to the Interim Guidelines is published in *Nuclear Law Bulletin*, No. 92, OECD Publishing, Paris, p. 197.

Figure 3.2. **Prefectures admitting rumour related damage**



Source: Ichiki, T. (2019), "Rumour related damage", presented at the Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, Lisbon, October 2019.

Indirect damage

The guidelines also determined what was "indirect damage":

> I) "indirect damage" means damage suffered by third parties who are in certain economic relationships with individuals who suffered damage recognised as qualifying for compensation […] as a result of the accident ("primary damage" and "primary victims").
>
> II) Where the business transactions between the individuals who suffered indirect damage (the "indirect victims") and the primary victims are irreplaceable due to the nature of the indirect victims' business, the indirect damage can be recognised as being in a sufficient causal relationship with the accident. Specific examples of this type of indirect damage include the following:
>
> Damage that is suffered by business operators whose customers are constrained, due to the nature of the business, by the evacuation or suspension of their business operations in the affected region.
>
> (1) Damage that is suffered by business operators whose suppliers are limited due to the nature of the business which necessarily arises due to the evacuation or suspension of business operations, etc. of the primary victims who are the operators' suppliers.
>
> (2) Damage that is suffered by business operators whose suppliers are regionally limited due to the nature of the raw materials or service which necessarily arises due to the evacuation or suspension of business operations, etc. of the primary victims who are the operators' suppliers.
>
> III) The items of damage are as follows:
>
> (1) Business damage.
>
> Fall in revenue suffered and, to the extent necessary and reasonable, additional costs incurred by indirect victims as a result of the primary damage.

(2) Damage due to incapacity to work.

Reductions in income suffered and, to the extent necessary and reasonable, additional costs incurred by employees where, due to the business damage under (1) above, operating conditions worsen for the indirect victims, who are business operators and the employers of the employees, so that the employees, of necessity, experience an incapacity to work.

The guidelines that have been issued by the DRC are a precedent that should be consulted when determining what may be considered nuclear damage in case a nuclear incident occurs, taking into account that such determination may be different from one jurisdiction to another. It is acknowledged that such guidelines allowed all the persons concerned, whether the operator, the victims, the claims handling staff, or the government, to have a clear framework to compensate the damage caused by the Fukushima Daiichi nuclear incident and to help avoid disputes and going to the ADR Centre or the civil courts, which delays the payment of compensation to the victims.

TEPCO received, as of 31 January 2020, almost 3 million applications for compensation, and paid approximatively JPY 9 323 billion.[27]

IV.2 A non-nuclear example: the approach of the International Oil Pollution Compensation Funds (IOPC Funds)

The Civil Liability Framework for Oil Pollution is a specific regime adopted in 1969 to provide compensation to the victims in the event of oil spills caused by oil tankers as a response to the 1967 Torrey Canyon accident, which occurred close to the Scilly isles on 18 March 1967. The current international compensation regime is based on two conventions: the 1992 Civil Liability Convention (CLC) and the 1992 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (Fund Convention), together with the Protocol of 2003 to the Fund Convention (Supplementary Fund Protocol). The great majority of maritime states are parties to these conventions. Compensation is paid by the relevant funds when the damage exceeds the ship owner's liability under the CLC, the ship owner is exempt from liability under the CLC or it is financially incapable of meeting his obligations in full and the insurance is insufficient to pay valid compensation claims.

The main principles of this regime are similar to the ones provided under the nuclear liability regime: strict liability of the registered ship owner, limitation of liability that is calculated according to the tonnage of the ship, mandatory private insurance mechanism, and limited exonerations and provisions regarding the competent jurisdiction. Individuals, businesses, local authorities and states may claim compensation under this regime if they have suffered pollution damage caused by oil transported by a tanker and such pollution damage resulted in an actual and quantifiable economic loss, which must be proved by the claimant. An oil pollution incident can generally give rise to claims for five types of pollution damage: property damage, costs of clean-up operations at sea and on shore, economic losses by fishermen or those engaged in mariculture, economic losses in the tourism sector, and costs for reinstatement of the environment.

Under certain circumstances compensation is also payable for loss of earnings caused by oil pollution suffered by persons whose property has not been polluted (pure economic loss). For example, a fisherman whose nets have not been contaminated may nevertheless be prevented from fishing because the area of the sea where he normally fishes is polluted and he cannot fish elsewhere. Similarly, an owner of a hotel or a restaurant located close to a contaminated public beach may suffer losses because the number of guests falls during the period of the pollution.

27. Source: Records of Applications and Payouts for compensation of Nuclear Damage, posted on TEPCO's website. Latest status available at: www.tepco.co.jp/en/hd/responsibility/revitalization/pdf/comp_result-e.pdf (accessed 24 Apr. 2024).

The IOPC Funds have issued a series of publications to ensure that prompt and equitable payment of compensation to victims of oil pollution damage can be achieved, such as a Claims Manual, Fisheries Guidelines, Tourism Guidelines, and Guidance for Member States.[28]

According to the Claims Manual,

- Consequential loss: compensation is payable for loss of earnings suffered by the owners of property contaminated by oil as a result of a spill (consequential loss). One example of consequential loss is loss of income by fishermen as a result of their nets becoming oiled, which prevents them from fishing until their nets are either cleaned or replaced.
- Pure economic loss: compensation is payable, under certain circumstances, for loss of earnings caused by oil pollution suffered by persons whose property has not been polluted (pure economic loss). For example, a fisherman whose nets have not been contaminated may nevertheless be prevented from fishing because the area of the sea where he normally fishes is polluted and he cannot fish elsewhere. Similarly, an owner of a hotel or a restaurant located close to a contaminated public beach may suffer losses because the number of guests falls during the period of the pollution. Compensation may also be payable for the costs of reasonable measures, such as marketing campaigns, which are intended to prevent or reduce economic losses by countering the negative effects which can result from a major pollution incident.

The IOPC Funds also compensate for "costs of measures to prevent pure economic loss", but under the nuclear liability conventions, this would be covered under the head of damage "preventive measures", which is addressed in Chapter 5.

IV.3 A national example: the US legal system

In the United States, many courts have not allowed "pure economic loss" to be recovered, as it requires that the claimant be also entitled to claim for loss of life or personal injury and/or loss of or damage to property (which in other legal systems may be considered "consequential loss"). One of the most famous cases putting forward this principle is *Robins Dry Dock & Repair Co. v. Flint*.[29]

However, there are many exceptions to this rule, such as *People Express Airlines, Inc. v. Consolidated Rail Corp*.[30] pursuant to which an airline company was entitled to be compensated

28. For more information, see https://iopcfunds.org/ (accessed 24 Apr. 2024).
29. Robins Dry Dock & Repair Co. v. Flint, 275 U.S. 303 (1927): The owners of a vessel that chartered the vessel to the plaintiffs docked her with the defendant under a provision that required that the vessel be docked every six months. The defendant damaged the vessel by negligence, causing delay, repaired her, settled with the owners and received a release of all their claims. The defendant had no notice until the delay had begun. The court considered that the plaintiffs had no cause of action against the defendant for the loss of use of the vessel caused by the negligence, since (i) the docking contract between the owners and the defendant was not for the plaintiffs' direct benefit; (ii) no right of recovery could be based upon the ground that the plaintiffs had a property interest in or right in rem against the ship; (iii) a tort to the person or property of one man does not make the tortfeasor liable to another merely because the injured person was under a contract with that other, unknown to the doer of the wrong; (iv) the plaintiffs, having no claim against the defendant in contract or in tort, could gain no standing on the theory that the owners, in addition to their own damages, might have recovered those of the plaintiffs, on the analogy of bailees, who, if allowed to recover full value, are also chargeable.
30. People Express Airlines, Inc. v. Consolidated Rail Corp., 495 A.2d 107 (N.J. 1985): There was an accident at a chemical plant in New Jersey (a chemical spill from a tank) that caused a fire in the defendant's freight yard. Due to the risk of explosion, people were evacuated within a one-mile radius, which included a terminal of the Newark airport where the plaintiff airline company operated. As the terminal could not be used for twelve hours, the plaintiff considered that it had suffered business-interruption losses due to the evacuation (cancelled flights, lost reservations, and fixed operation expenses). No physical damage or personal injuries resulted from the fire. The court decided that the defendant owed a duty of care to take reasonable measures to avoid the risk of causing economic loss, aside from physical injury, to particular plaintiffs who the defendant knew or had reason to know were likely to suffer damage from its conduct. It therefore also took into consideration the principle of foreseeability with regard to the persons or entities that might be affected and to the type of economic loss.

for economic loss even though it did not suffer any loss of or damage to its property (there were no casualties or persons injured). The court therefore did not follow the "pure economic loss" rule because the loss was evident, as well as the causal link.

Nuclear liability principles are usually interpreted by the competent court in light of the applicable general tort law. In the US general tort law, there are three principles that allow you to determine whether a person can claim compensation:

- **Duty of care**: "a legal relationship arising from a standard of care, the violation of which subjects the actor to liability" (Black's Law Dictionary). In principle, you only have a duty of care to those who have property or ownership rights. This rule has been confirmed in the case *J'Aire Corporation v. Gregory*.[31]
- **Foreseeability**: "the quality of being reasonably anticipatable; foreseeability, along with actual causation, is an element of proximate cause in tort law" (Black's Law Dictionary). This rule has been confirmed in the case of *Union Oil Co. v. Oppen*.[32] When operating a nuclear power plant, you can easily foresee that a nuclear incident with off-site consequences will have a major impact on the persons living nearby. Even in the absence of damage to property, they will certainly have to evacuate and businesses will have to close. Nuclear safety measures are there to prevent potential damage.
- **Remoteness or proximate cause**: is there sufficient connection between the accident and the economic loss to allow someone to claim? This concept was used in the case *In re Kinsman Transit Co.*[33] However, remoteness can also be considered from a geographical perspective: as it was the case for the past nuclear incidents and for other accidents in ultra-hazardous activities (such as the Deepwater Horizon accident that will be

31. J'Aire Corporation v. Gregory, 598 P.2d 60 (Cal. 1979): J'Aire Corporation managed a restaurant that it rented in an airport. Under the terms of the lease, the owner of the premises was to provide heat and air conditioning, but without a certain date. Despite requests to complete the construction promptly, the works were not completed within a reasonable time. The restaurant could not operate properly during such time and therefore incurred loss of profits. The restaurant filed for damages against the contractor for business losses suffered by the contractors' failure to complete the project with due diligence. The Supreme Court of California considered that J'Aire Corporation was entitled to damages for business losses caused by the contractor that had been hired by the airport, the owner of the premises. Even in the absence of contractual relationship, the contractor owed a duty of care to the restaurant to complete its works in a manner that did not cause undue damage to its business, where such damage was reasonably foreseeable. Damages were due even though there were no damages to property or a person.
32. Union Oil Co. v. Oppen, 501 F.2d 558 (9th Cir. 1974): Union Oil Company drilled for oil in the waters of the Santa Barbara Channel and vast quantities of raw crude oil were released and subsequently carried by wind, wave and tidal currents over vast stretches of the coastal waters of Southern California. Some commercial fishermen suffered various injuries resulting from "an interference by defendants with [plaintiffs'] economic right to fish in public waters". The court considered that the defendants could reasonably have foreseen that negligently conducted drilling operations might diminish aquatic life and thus injure the business of commercial fishermen. The defendants were under a duty to commercial fishermen to conduct their drilling and production in a reasonably prudent manner so as to avoid the negligent diminution of aquatic life. This is not foreclosed by the fact that the defendants' negligence could constitute a public nuisance under California law.
33. In re Kinsman Transit Co. 330 F.2d 708 (2d Cir. 1964) and 388 F.2d 821 (2d Cir. 1968): As a result of the negligence of the Kinsman Transit Company and the Continental Grain Company, the ship "S.S. MacGilvray Shiras" broke loose and careened down the river channel. She struck the ship "S.S. Michael K. Tewksbury", which in turn broke loose from her moorings and drifted downstream until she crashed into the Michigan Avenue Bridge, in the city of Buffalo. Even though the city had been notified in time, it failed to raise the bridge promptly. The bridge collapsed and its wreckage, together with other ships, formed a dam which caused extensive flooding and an ice jam reaching almost 3 miles upstream. As a result of this disaster, transportation on the river was disrupted for about two months. Several businesses were impacted; two plaintiffs, Cargill and Cargo Carriers, were denied damages because their injuries were too "remote" or "indirect" a consequence of the defendants' negligence. Because of the accident, Cargill could not access some wheat that was stored in a ship near the damaged bridge that needed to be delivered to a client; therefore it had to buy wheat to comply with its contract and therefore incurred additional unexpected costs. Cargo Carriers could not carry out the unloading of a cargo of corn as expected and had to rent a special equipment.

mentioned below) for which geographical areas were established to only give the right to compensation to those living or working within those areas.

In the United States, you can also bring a claim for "nuisance", an activity or physical condition that interferes with reasonable use and enjoyment of life or property (*Cook v. Rockwell Int'l Corp.*).[34] This type of claims could be brought under the catch-all clause provided in the Vienna Conventions and the CSC.

Finally, a good example of how the United States tort law would apply the concept of "economic loss" is the case of Deepwater Horizon.[35] The settlement covered a fair amount of economic loss suffered by individuals and businesses as long as they were situated within a determined perimeter. Then the above-mentioned principles were applied to establish whether they have cause to claim for compensation. In this case, guidelines were also established.[36]

V. Conclusion

Even though the Conventions provide a description of the "economic loss" that may be considered as nuclear damage, there may still be some uncertainty on what exactly should be considered for compensation under the law of the competent court in case a nuclear incident occurs. Not only should "direct costs" be explained, but "indirect costs" should also be determined in order to circumscribe the individuals and businesses entitled to compensation, if such distinction is relevant in the law of the competent court.

Therefore, it would be advisable that, immediately following the occurrence of a nuclear incident, an independent group of experts provides some non-binding guidance to the operator, the victims and the insurance industry to allow them to swiftly reach an out-of-court agreement on compensation for nuclear damage, not withholding the fact that in case of disagreement only the competent court will have the final say, though that will take some months, especially in case of a major nuclear incident with numerous claims and, potentially, disputes.

In case of a major nuclear incident, as for any other ultra-hazardous activity, there will be public and political pressure to compensate a wide range of damage; it will be important for all stakeholders to have clear guidelines to determine what "economic loss" will be compensated by the operator, as was done for example for the Fukushima Daiichi and the Deepwater Horizon accidents. As the concept of "economic loss" and the establishment of the causal link can differ from one jurisdiction to another, such guidelines will also help in compensating foreign victims, in case there was transboundary damage, whether the installation state and the affected state have treaty relations or not.

The expert group has established a Food-for-thought Table to assist in the development of a framework that might be used as a starting point for making payments by claims adjustors immediately following a nuclear incident without the need for court or other governmental review.

34. Cook v. Rockwell Int'l Corp., 273 F.Supp.2d 1175, 1201-1208, (d.Colo.2003): Property owners in the vicinity of the Rocky Flats Nuclear Weapons Plant alleged that operations at the plant resulted in actual or threatened releases of plutonium and other hazardous substances that caused and continued to cause damage to their properties, including diminution of value. Among other claims, the property owners asserted a nuisance claim on the basis that operation of the plant substantially interfered with their use and enjoyment of their property. The court found that physical change or intrusion is not required to prove substantial and unreasonable interference with a person's right to use and enjoy property. What is important is whether the interference is substantial and unreasonable from the perspective of a normal person. In making this determination, fears and other mental reactions common to the community can be taken into account, even if they are without scientific foundation or other factual support.
35. The 2010 Deepwater Horizon oil spill, also called Gulf of Mexico oil spill, was caused by an explosion on the Deepwater Horizon oil rig – located in the Gulf of Mexico, off the coast of Louisiana – and its subsequent sinking. The oil rig was owned by BP. For more information on this accident, see www.bp.com/en_us/united-states/home/community/gulf-commitment.html (accessed 24 Apr. 2024).
36. For more information, see *In Re: Oil Spill by the Oil Rig "Deepwater Horizon" in the Gulf of Mexico, on April 20, 2010 – Deepwater Horizon Economic and Property Damages Settlement Agreement, as Amended on May 2, 2012*.

Table 3.1. **Food-for-thought table**

Types of economic loss*	Potential elements to determine economic loss**	Potential overlap with other heads of damage***
Individuals		
Loss of earnings of an individual due to incapacity to work due to personal injury		
Loss of income of the family due to death of the wage earner		
Examination and decontamination expenses concerning property and goods		
Storage and destruction of contaminated property and goods		
Loss or decrease of movable and immovable property value		
Temporary or permanent incapacity to work due to external reasons (e.g. evacuation, restriction orders, contamination of workplace or lay-off due to business loss of the company)		
Loss of personal perspective (e.g. impact on education and on possibility of doing certain studies; impact on promotion and job perspectives)		
Economic loss caused by preventive measures		
Increase in living expenses (e.g. accommodation related expenses, increase in groceries cost, distance to go to work or school)		
Homecoming expenses (related to going back to the evacuated area)		
Businesses (for-profit corporations and self-employed)		
Loss of income resulting from the loss or damage of property		
Examination and decontamination expenses concerning property and goods		
Setting up radiological controls and processes to ensure that property and goods are not contaminated		
Contamination of property, equipment, products or goods		
Storage and destruction of contaminated property, equipment, products or goods		
Slaughtering of cattle (contaminated due to contaminated fields)		
Fish in the sea are contaminated by radiation and may no longer be sold in the marketplace: fishermen's economic loss even though the fishermen do not own the contaminated fish		
Tourists may stay away from a particular holiday resort because the public beach used by the resort is contaminated by radiation (resort owner does not own the beach)		

Table 3.1. **Food-for-thought table** *(cont'd)*

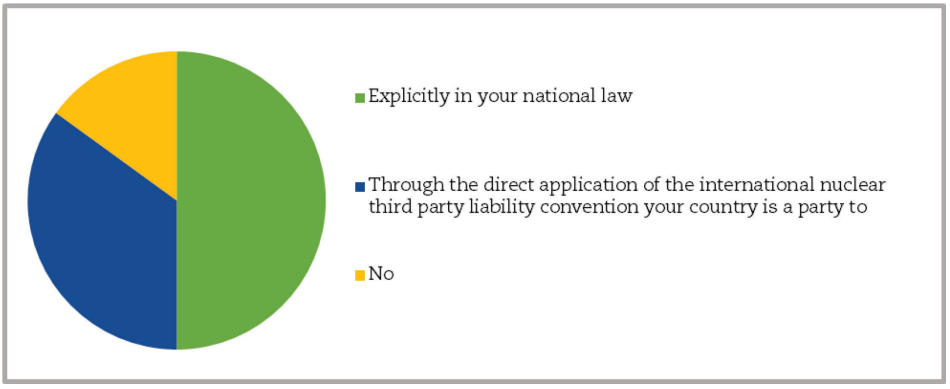
Types of economic loss*	Potential elements to determine economic loss**	Potential overlap with other heads of damage***
Suspension, reduction or termination of production/activity due to external reasons directly caused by the evacuation or restriction orders		
Suspension, reduction or termination of production/activity due to external reasons caused by the nuclear incident (e.g. activities which need raw materials or components from the affected areas)		
Rumour-related damage		
Suspension, reduction or termination of production/activity due to loss of power		
Indemnification paid to staff laid off		
Expenses aimed at recovering the pre-accident production level		
Homecoming expenses (related to going back to the evacuated area)		
Increased costs in transportation due to restriction orders (e.g. finding longer routes)		

Notes: * What other types of economic loss may be added to the table (column 1)? ** How should you prove that you have suffered such "economic loss" (column 2)? *** Is there a risk that the "economic loss" be compensated under other heads of damage under your national law (column 3)?

Annex 3.A1. **Compilation of responses to the Questionnaire**[1]

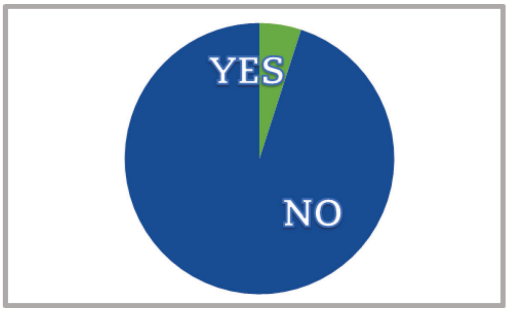
Question 4.a.

Do your national legislation, regulations and/or case law provide for this type of damage (i.e. economic loss arising from loss of life or property, damage to property or personal injury) in the context of a nuclear damage?



Question 4.b.

Do your national legislation, regulations and/or case law provide for a specific definition of "economic loss" and/or measures to determine what an "economic loss" is in the context of a nuclear damage?

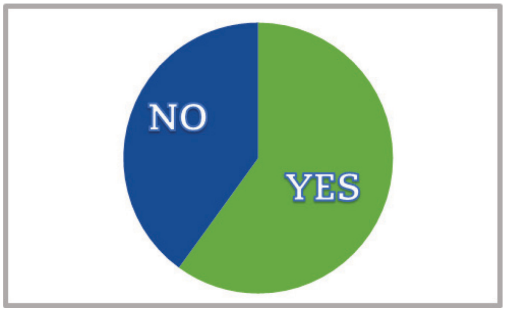


1. The charts included in the present Annex 3.A1 provide an overview of the answers to the questions relating to the Expert Group 3 topic "Economic loss".

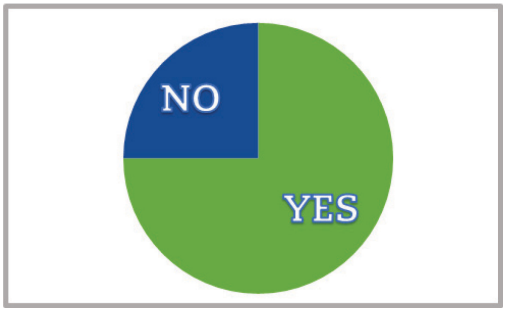
Question 4.c.

Do your national legislation, regulations and/or case law cover:

(i) indirect economic loss?

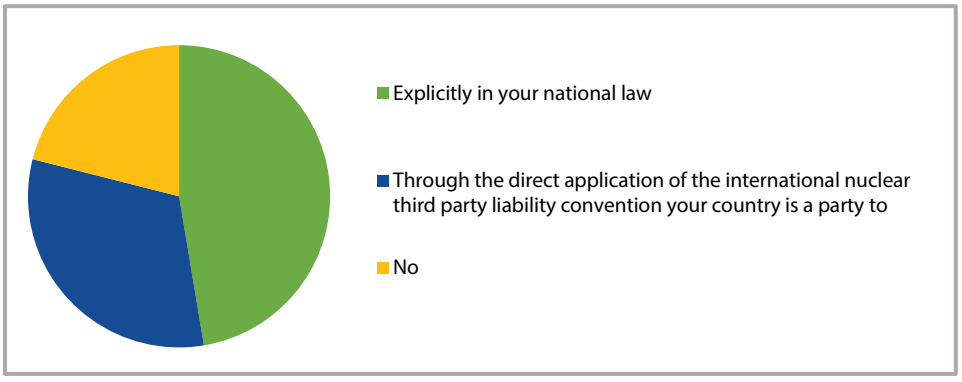


(ii) direct economic loss?



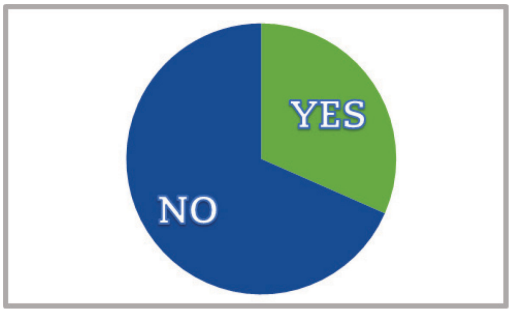
Question 6.a

Do your national legislation, regulations and/or case law provide for this type of damage (i.e. loss of income deriving from an (direct) economic interest in any use or enjoyment of the environment) in the context of a nuclear damage?



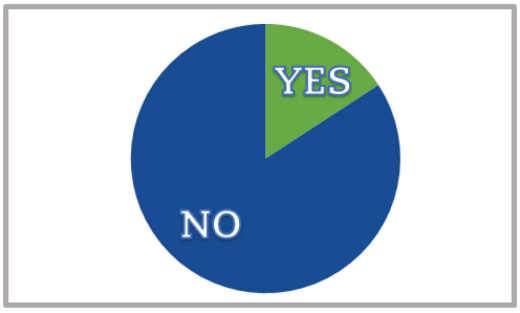
Question 6.b.

Do your national legislation, regulations and/or case law require that such loss of income derives exclusively from a "direct" economic interest in any use or enjoyment of the environment"?



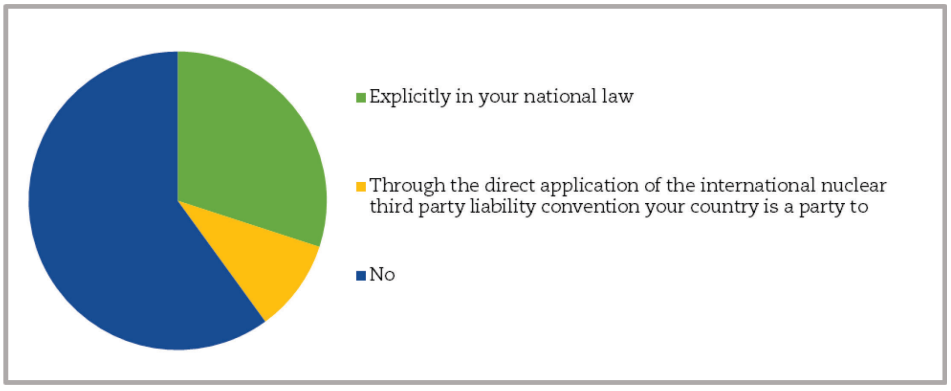
Question 6.c.

Do your national legislation, regulations and/or case law specify when an impairment must be considered as "significant"?



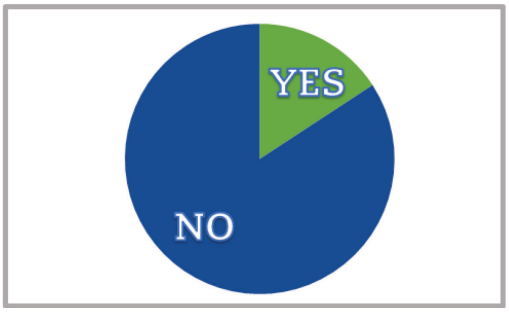
Question 8.a.

Do your national legislation, regulations and/or case law provide for this type of damage (i.e. any other economic loss, other than any caused by the impairment of the environment) in the context of a nuclear damage?



Question 8.c.

Do your national legislation, regulations and/or case law already provide for "rumour related damage"?



Annex 3.A2. Some examples of economic loss mentioned in the different sources

1. Examples of consequential economic loss (subject to the law of the competent court)

- A factory owner's loss of income resulting from a production stoppage in that factory which is directly linked to the factory building having been damaged by a nuclear incident.
- Loss of earnings due to illness or death.
- Loss of income deriving from the destruction of contaminated crops.

2. Examples of loss of income deriving from an economic interest in any use or enjoyment of the environment (subject to the law of the competent court)

- Fishermen may suffer economic loss because fish in the sea are contaminated by radiation and may no longer be sold in the marketplace. Since the fishermen do not own the fish until after they have been caught, under certain jurisdictions the fact that the fish are contaminated does not constitute a loss of or damage to property of the fishermen.
- Tourists may stay away from a particular holiday resort because the public beach used by the resort is contaminated by radiation. Since the owner of the resort is not the owner of the beach, the fact that the beach is contaminated does not constitute a loss of or damage to the resort owner's property. Yet it will almost certainly result in a loss of income for the resort owner who will be entitled to compensation if they can show a sufficient direct economic interest in the use or enjoyment of the damaged environment.

2.1 The concept of "direct economic interest" or how to evaluate the remoteness:

- the fishermen having suffered economic loss because fish in the sea are contaminated by radiation and may no longer be sold in the marketplace may be compensated for their loss of income;
- the right to compensation of a supplier of goods to those fishermen who loses business because the fishermen are no longer fishing may be challenged because it may be considered as being too remote in the chain of causation;
- the holiday resort owner in the example cited above will only be compensated if it can be shown that there is a geographical proximity between the resort and the impaired environment (the contaminated beach) and that the business of the hotel depends upon guests being able to use that beach;
- the right to compensation of hotel suppliers who have lost income due to the decrease in hotel orders may be challenged because it may be considered too remote in the chain of causation.

3. Examples of pure economic loss (subject to the law of the competent court)

- Reduction in tourism due to nuclear contamination or fear of nuclear contamination.

  After the Chernobyl accident, there were extensive cancellations of holidays in Europe, especially in the former USSR and Eastern Europe. Although this type of loss has regularly been awarded in certain oil pollution cases, in many countries compensation for pure economic loss is not available. Consequently, some states are opposed to the inclusion of the provision. Others consider the provision to be "overly broad". As a compromise, in the current draft, the issue is left to the national courts to decide.

- If a factory is damaged as a result of a nuclear incident and damage leads not only to a halt in production but also to a loss of jobs on the part of the employees thereof, these employees will suffer a loss which may not be covered either under (iii) or (v) [of the definition of nuclear damage under the Revised Vienna Convention and the CSC]. As alluded to earlier, however, this residual category of economic loss can only be compensated if permitted by the "general law on civil liability of the competent court". Consequently, whereas compensation for the other heads of damage must be provided although the extent of coverage is left to the "law of the competent court", the admissibility of claims under this head is totally dependent upon the provisions of the applicable substantive law.

4. Open questions

Should compensation be paid to a tourist agency having its place of business far from the polluted area, but whose main business activity consists of making bookings for hotel rooms in the polluted area, or to hoteliers who are not in the immediate vicinity, but nevertheless suffer loss of income because tourists avoid the whole area? What should be done with claims of the fish processing industry involved in long-standing business relations with fishermen who suffer reduced catches of fish? If claims for loss of profit are paid to companies, should they be paid also to employees of companies? Could the recovery for pure economic loss extend to claims of the local authorities for reduced taxes as a result of diminished economic activities, or to the cost of advertising campaigns designed to remedy the "loss of image" of the polluted area?

Annex 3.A3. **Additional sources**

Explanatory Report by the Representatives of the Contracting Parties on the Revision of the Paris Convention and the Brussels Supplementary Convention, Annex IV to the Final Act of the Conference on the Revision of the Paris Convention and of the Brussels Supplementary Convention, 12 Feb. 2004 available at: www.oecd-nea.org/law/final-act-conference-revision-pc-bc.pdf (accessed 24 Apr. 2024).

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Chapter 4. **Cost of measures of reinstatement of impaired environment**

Conclusions from the Workshop

- The primary aim of measures of reinstatement of impaired environment is generally to **reduce human exposure** to sources of radiation.
- However, definitions of the environment in national legislations have expanded over the last decades, allowing for reinstatement of the environment to protect other interests, such as **natural resources and non-human biota**, even if those elements of the environment do not have an inherent economic value.
- **Optimisation of reinstatement measures**, including cost-benefit analyses, reviews of available technologies and their efficiency, is essential to ensure adequate choices; **social factors** will also require thorough consideration, as those will also have an impact on choices made for reinstating the environment.
- **Procedural aspects**: there is a need for clear legal frameworks regarding the authorities' competency to approve the measures of reinstatement and the bodies which are entitled to implement such measures, especially in the context of a nuclear incident with transboundary impacts on the environment.
- **An effective and early co-ordination between competent authorities,** at national and international level, would provide substantial help with regard to the approval of measures of reinstatement and working towards a shared understanding of their reasonableness.
- **Potential overlaps with the compensation of damage to property** should be considered when compensating the cost of reinstatement measures, with a view to avoid double compensation for the same damage, which would limit access to compensation for other victims.

I. Technical scenarios of impairment of the environment due to a nuclear incident and remediation of such impairment

1. General considerations

a. Environmental impacts of a nuclear power plant accident

Major nuclear accidents, as defined for example by the International Nuclear and Radiological Event Scale (INES), result in the major release of radioactive material with widespread health and environmental effects. The environmental effects of a large-scale release of radionuclides largely depend on accident-specific circumstances, such as reactor damage and pathways of the release. On the basis of such circumstances, a major accident may result in the contamination of a wide range of environmental media (such as soil, water, sediment and air) in various environmental settings (e.g. urban, agricultural, aquatic or forests). Environmental contamination may result in human health-related impacts through external or internal exposure (see Chapter 1 of this report, "Loss of life or personal injury") or in the loss of human use of the contaminated environment, such as for economic, cultural or spiritual activities. Contamination of the environment may also lead to adverse impacts on non-human biota (i.e. animals and plants), due to external and/or internal exposure. Exposure to high doses may induce changes at the molecular and cellular levels of the concerned biota, potentially leading to impairment of reproductive functions or even increased mortality of animals and plants.[1] Consequently, such adverse effects could result in broader and more complex impacts on species populations, biodiversity and ecosystems. It should be noted that such biota exposure to very high doses is mainly expected in the close vicinity of the nuclear incident. In addition, non-radiological factors caused directly or indirectly by a nuclear incident may also lead to changes in the habitat that may affect biodiversity, such as reduced human activity in evacuated areas.

b. Potential measures of reinstatement of impaired environment

Experience from the Chernobyl and Fukushima Daiichi accidents (described further below in Sections I.2 and I.3) showed that most measures taken to remedy contamination of the environment following a nuclear incident are primarily aimed at the protection of the human population. In addition, many adopted measures may not strictly speaking qualify as reinstatement measures but rather as preventive measures, such as:

- permanent or temporary restrictions of access to, or use of the contaminated areas;
- limitation of movement of contaminated species;
- provision of non-contaminated food to farm animals;
- management of contaminated dead animals;
- measures to prevent fire in contaminated forest areas; or
- measures to prevent or reduce the radionuclides migration in the ecosystem by adding contaminant absorbers or creating physical barriers.

The aforementioned measures are primarily aimed at preventing further human or biota exposure or contamination of the environment and not at reinstating an already impaired environment to its pre-accident status. Nevertheless, some technical measures may be considered to reinstate the impaired environment, such as:

- decontamination of soil, buildings and installations through clean-ups;
- removal of the top soil layer, weed, grass or pastures and management of this radioactive waste;

1. See IAEA (2006), *Environmental Consequences of the Chernobyl Accident and their Remediation: Twenty Years of Experience*, IAEA, Vienna, pp. 138-153.

- planting of vegetation that contributes to the reduction of radioactive contaminants from the soil;
- water treatment to remove radioactive contaminants; or
- the addition of chemicals to promote the precipitation or reduce the solubility of the radioactive contaminants in water bodies.

Implementing such measures can take several years, and in some instances decades, as was the case with the Chernobyl accident. Such long time frames may raise specific issues related to long-term implementation. Decontamination activities may also lead to the generation of significant quantities of waste, the management of which may span over even longer periods of time.

Social factors may have a significant impact on the choices made regarding the measures of reinstatement of impaired environment. Notably, a low tolerance of the general public to nuclear incidents may lead to the adoption of extensive measures with potentially limited effects on the state of the impaired environment and high costs when applied to large areas. Other social factors may be relevant as well, such as cultural or religious considerations. For example, Norway established special measures to allow the Sami population to continue the traditional rearing of reindeers and consumption of their meat taking into account contamination due to the Chernobyl accident (see Section I.2 below). In other areas, the implementation of measures of reinstatement may be difficult due to restrictions in accessing or intervening in areas of specific cultural or religious significance. Such specificities may be reflected in the definition of "environment" provided under national legislations (see Section III.2).

2. Chernobyl nuclear power plant accident

a. Environmental impacts

On 26 April 1986, an explosion occurred at the Chernobyl nuclear power plant in Ukraine, resulting in a ten-day reactor fire and a large-scale release of radioactive material into the environment. According to an assessment of the environmental impacts published by the Chernobyl Forum[2] 20 years after the accident,[3] many European countries were affected by the release of radionuclides into the atmosphere. Most of the contamination occurred in three former republics of the Soviet Union, now Belarus, the Russian Federation (Russia) and Ukraine. An area of 200 000 km^2 was contaminated by radiocaesium throughout Europe, 71% of that area being located in the three aforementioned countries. It is worth noting that the contamination was highly heterogeneous and strongly dependent on the amount of precipitation at the critical time when the contaminated air masses passed over the region.

In its report, the Chernobyl Forum identified several types of environmental settings contaminated due to the accident, as follows:

- *Urban environment*: The accident led to the contamination of various open surfaces, such as lawns, parks, streets, roofs and walls. Depending on weather conditions, most of the contamination occurred either on urban vegetation (particularly under dry conditions) or horizontal surfaces (particularly under wet conditions). The Chernobyl Forum noted that due to wind and human activities, including street washing and clean-up, surface contamination by radioactive material decreased significantly in the years following the

2. The Chernobyl Forum was established in 2003 at the initiative of the International Atomic Energy Agency (IAEA), in co-operation with the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP – now UN Environment), the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the World Health Organization (WHO) and the World Bank, as well as the competent authorities of Belarus, Russia and Ukraine.
3. IAEA (2006), *Environmental Consequences of the Chernobyl Accident and their Remediation: Twenty Years of Experience*, *supra* note 1.

accident, leading however to secondary contamination of sewage systems and sludge storage areas. Twenty years after the accident, the air dose above solid surfaces has returned to pre-accident background level in most inhabited urban areas affected by contamination and the elevated air dose rate remains mostly over undisturbed soil.

- *Agricultural environment*: The accident led to the direct surface deposition of various radionuclides, causing contamination of agricultural plants and in turn of the animals consuming them. This contamination resulted in the rapid transfer of short-lived radioiodine into cow milk, which was then the source of significant human internal exposure mainly in Belarus, Russia and Ukraine. The Chernobyl Forum noted that after the early phase of direct contamination, the uptake of radionuclides through plant roots from soil became increasingly significant, mainly due to radiocaesium contamination. While this contamination decreased over time in vegetation and animals, the Chernobyl Forum noted the persistence of problems in some affected areas, in particular affecting rural residents in the former Soviet Union, who are commonly subsistence farmers with privately owned dairy cattle.
- *Forest environment*: The accident led to contamination of vegetation and animals in forests and mountainous areas in many European countries. The Chernobyl Forum noted high radiocaesium activity concentrations in mushrooms, berries and game, which had persisted since the accident. It also noted that contamination levels in forest food products still exceeded intervention limits in many countries. In particular, the Chernobyl Forum reported that "the high transfer of radiocaesium in the lichen-reindeer meat-humans pathway was demonstrated after the Chernobyl accident in the Arctic and sub-Arctic areas of Europe. The Chernobyl accident led to considerable contamination of reindeer meat in Finland, Norway, the Russian Federation and Sweden, and caused significant problems for the Sami people".[4] The Chernobyl Forum also reported that, while fires in contaminated forests led to increased air activity concentration of radionuclides in 1992, forest fires in general are not expected to cause any problems of radionuclide transfer from such forests, except possibly in the nearest vicinity of the fire.
- *Aquatic environment*: The accident led to the contamination of surface water systems in many parts of Europe, not only in the vicinity of the Chernobyl nuclear power plant. At first, the contamination was mainly caused by direct deposition of short-lived radioiodine on the surface of rivers and lakes. This initial contamination, however, decreased rapidly in the weeks following the accident, primarily through dilution, physical decay, absorption of radionuclides by catchment soils and, for lakes and reservoirs, through the settling of contaminated particles to the bed sediments. The Chernobyl Forum noted that bioaccumulation of radiocaesium in the aquatic food chain caused significant concentrations in fish in highly affected areas, as well as in some lakes in Scandinavia and Germany. Twenty years after the accident, the radiocaesium activity concentrations in the waters and fishes were found low, except in a few closed lakes in Belarus, Russia and Ukraine, notably because of the limited inflow and outflow of water (or "limited exchange of water"). The Chernobyl Forum reported much lower activity concentrations in sea water, due to the large distance of the Black and Baltic seas from Chernobyl and higher dilution, therefore not raising particular concerns regarding contamination of marine fish.

Regarding non-human biota, the Chernobyl Forum report concluded that the accident only caused acute adverse effects, however numerous, in the areas of highest exposure (i.e. the Chernobyl Exclusion Zone or CEZ, up to a distance of a few tens of kilometres from the accident site). In this area, the accident led to (i) increased mortality of coniferous plants, soil invertebrates and mammals; (ii) reproductive losses in plants and animals; and (iii) chronic radiation syndrome in animals, such as mammals or birds. These impacts resulted not only in individual but also population-wide effects. The Chernobyl Forum reported that the natural reduction of exposure levels and migration of animals enabled the recovery of populations

4. *Ibid.*, pp. 3-4.

affected by the accident within a few years. The Chernobyl Forum also noted that genetic effects of radiation in somatic and germ cells were observed in biota located in the CEZ during the first years following the accident. While cytogenetic anomalies attributable to radiation were reported, the Chernobyl Forum could not conclude on their detrimental biological significance, which therefore remained unknown. Last, the Chernobyl Forum noted that the termination of human activities (e.g. agriculture and industry) in the CEZ led to the expansion of the population of many plants and animals in that area.

b. Measures of reinstatement of impaired environment

Following the Chernobyl accident, the authorities of the Soviet Union introduced short- and long-term countermeasures to reduce environmental contamination and its effects, consuming extensive amounts of human, economic and scientific resources.[5] Those measures are as follows:

- *Urban countermeasures*: Those measures mainly comprised the decontamination of inhabited areas with a view to reduce external exposure of the public and internal exposure through inhalation of re-suspended radioactive substances. These activities included the washing of buildings, residential areas and roads with water and/or special solutions, the removal of contaminated soil and decontamination of open water supplies, with a specific emphasis on kindergartens, schools, hospitals and frequently-visited public buildings. However, the high cost of these measures hindered their comprehensive application to more contaminated areas.[6] In 2005, the Chernobyl Forum noted that some urban decontamination activities remained ongoing in Belarus, although large-scale decontamination in the countries of the former Soviet Union stopped by 1990. The Chernobyl Forum concluded that "decontamination was cost effective with regard to reduction of external dose when its planning and implementation were preceded by a remediation assessment based on cost-benefit techniques and external dosimetry data".

- *Agricultural countermeasures*: Such measures were taken extensively, not only in the former Soviet Union but also in western European countries mainly in order to ensure the production and consumption of food products with permissible activity concentration levels. This concerned in particular the contamination of milk by radioiodine in the first stage and then radiocaesium contamination of farm products. Most measures taken (such as clean feeding of cattle, banning cattle slaughter, limiting the use of contaminated manure and obligatory milk processing) were preventive in nature and did not strictly speaking intend to reinstate the impaired agricultural environment to its initial status. As noted by the Chernobyl Forum, "decontamination by removal of the top soil layer was not found to be appropriate for agricultural lands because of its high cost, destruction of soil fertility and severe ecological problems related to burial of the contaminated soil". This situation led to the withdrawal of significant areas of land from agricultural use in Belarus, Russia and Ukraine. While part of these areas were rehabilitated since the accident took place, the Chernobyl Forum concluded that there still remain out-of-use areas, which could be returned to agricultural use after appropriate remediation. However, such remediation was made difficult by legal, economic and social constraints.

- *Forest countermeasures*: These measures mainly consisted in restrictions on various activities normally carried out in forests, referred to by the Chernobyl Forum as "management-based countermeasures". These included restrictions on (i) access to identified forest areas; (ii) harvesting of food products by the public, in particular mushrooms, berries and game; (iii) collection of firewood by the public and (iv) hunting practices, as well as (v) the implementation of specific monitoring programmes to prevent fire and subsequent secondary contamination. In its report, the Chernobyl Forum notes that while technology-based countermeasures to alter the transfer of radiocaesium in forests exist, the cost effectiveness of such measures is questionable, especially when

5. *Ibid*., section 1.3.
6. *Ibid*., section 4.2.2.

applied on a large scale.[7] These measures, which may include mechanical removal of leaf litter, removal of soil, clear cutting and ploughing or the application of specific fertilisers, may cause further damage to the ecological functioning of the forest. Such measures were not applied on a large-scale following the Chernobyl accident.

- *Aquatic countermeasures*: These measures were aimed at reducing human internal exposure through the consumption of either drinking water or freshwater fish. As noted by the Chernobyl Forum, the most effective countermeasure was the early restriction of drinking water production from contaminated rivers and switch to an alternative supply, notably in the Kiev area. The Chernobyl Forum also noted that several countries, such as Sweden and Germany, imposed restrictions on the consumption of freshwater fish. However, the Chernobyl Forum concluded that measures to reduce direct or secondary contamination of surface waters proved ineffective and expensive and led to relatively high exposure of the workers implementing them.[8]

3. Fukushima Daiichi nuclear power plant accident

a. Environmental impacts

On 11 March 2011, the Great East Japan Earthquake and its subsequent tsunami caused substantial destruction of the Fukushima Daiichi nuclear power plant's operational and safety infrastructure. As a result, the three operating units of Fukushima Daiichi lost cooling function, leading to nuclear fuel melt and breach of the containment vessels. A large release of hydrogen caused explosions and the release of radionuclides from the plant into the atmosphere that later deposited on land and ocean, as well as direct release of radionuclides into the sea.

The releases of radionuclides from the Fukushima Daiichi accident into the atmosphere were estimated by the IAEA in 2015 to have amounted to approximately one tenth of the releases caused by the Chernobyl accident.[9] Due to prevailing winds at the time of the release, most radionuclides were blown eastward from the Fukushima Daiichi nuclear power plant, depositing onto, and subsequently dispersing within, the North Pacific Ocean. However, due to changes in the wind directions, a relatively small fraction of the atmospheric releases was deposited on land, North West of the accident site in the Fukushima Prefecture. The deposition pattern was heterogeneous, depending on rain, snowfall and other local conditions, such as topography and land use. Following the accident, high levels of radioactive deposits could be measured within an area of approximately 50 km by 20 km.

Direct release of radionuclides into the sea occurred mainly through leakage of highly radioactive water from a trench at the Fukushima Daiichi nuclear power plant and voluntary discharge of contaminated water from storage tanks. Most such radionuclides moved eastward with the Kuroshio Current and were transported over long distances via the North Pacific Ocean gyre.

Regarding non-human biota, the IAEA report indicated that no observations of direct radiation-induced effects in plants and animals were reported, although the report points to the limited number of observational studies conducted in the period immediately following the accident. Based on previous experience and the levels of radionuclides present in the environment, the report concludes that it is unlikely that there would be any major radiological consequences for biota populations or ecosystems as a result of the accident. A similar conclusion had been reached by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) in 2013.[10]

7. *Ibid*., section 4.4.2.2.
8. *Ibid*., section 4.5.2.
9. IAEA (2015), *The Fukushima Daiichi Accident – Report by the Director General*, IAEA, Vienna, section 4.1.1.
10. UNSCEAR (2014), *Sources, effects and risks of ionizing radiation: UNSCEAR 2013 Report*, United Nations, New York, Chapter III.A.4.

b. Measures of reinstatement of impaired environment

In August 2011, Japan adopted the Act on Special Measures concerning the Handling of Environmental Pollution by Radioactive Materials Discharged by the Nuclear Power Station Accident Associated with the Tohoku District – Off the Pacific Ocean Earthquake that Occurred on 11 March 2011 (the "Special Measures Act"), to address specific decontamination activities related to the Fukushima Daiichi nuclear power plant accident.[11] The Special Measures Act became fully effective on 1 January 2012. In addition, the Japanese government issued in November 2011 the Basic Principles for the implementation of the Special Measures Act.[12] Under this framework two decontamination zones were established:

- the Special Decontamination Area (SDA), comprising the evacuation zone within a 20 km radius from the Fukushima Daiichi nuclear power plant and the "Deliberate Evacuation Area", where the annual cumulative dose was estimated to be above 20 mSv. In this area, which included 20 municipalities, the national government implemented all decontamination activities;
- the Intensive Contamination Survey Area (ICSA), comprising approximately 100 municipalities, where the estimated annual dose ranged between 1 and 20 mSv. In this area, municipalities were in charge of monitoring programmes to identify the required decontamination actions with the technical and financial support of the national government.

By 2013, the areas in which evacuation orders had initially been issued were further rearranged into three distinct zones:

- Area 1, where the estimated annual dose was expected to be lower than 20 mSv and evacuation orders were ready to be lifted;
- Area 2, where the estimated annual dose was expected to exceed 20 mSv and residents were still not permitted to live; and
- Area 3 (also referred to as Area where Return is Difficult or ARD), where the estimated annual dose was expected to reach over 50 mSv and residents would not be able to return for a long time.

The Japanese government set the focus of the off-site remediation strategy on the decontamination of schools, public buildings, residential areas, farmlands and roads in Areas 1 and 2, with the primary objective to reduce human external exposure. For these areas, the government set a long-term target of 1 mSv of cumulative annual dose, which corresponds to the lower end of the internationally recommended range for cumulative annual exposure (between 1 and 10 mSv). According to the IAEA, the application of such a low reference level, however, had "the effect of increasing the quantity of contaminated materials generated in remediation activities, and thereby increasing the costs and the demands on limited resources".[13]

The most commonly implemented remediation measures in the concerned municipalities of Areas 1 and 2 were as follows:

- removal of deposits from roofs, decks and gutters, wiping of roofs and walls, vacuum sanding and high-pressure washing of houses and buildings;
- removal of topsoil and of weed, grass or pasture in schoolyards, gardens and parks;

11. See Ministry of Environment of Japan (MOE), Outline of the Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials Discharged by the Nuclear Power Station Accident Associated with the Tohoku District – Off the Pacific Ocean Earthquake that Occurred on 11 March 2011, available at: http://josen.env.go.jp/en/policy_document/pdf/outline_of_the_act.pdf (accessed 24 Apr. 2024).
12. A tentative English translation of the Basic Principles was published by the Japanese MOE, available at: http://josen.env.go.jp/en/framework/pdf/basic_principles.pdf (accessed 24 Apr. 2024).
13. IAEA (2015), *The Fukushima Daiichi Accident – Report by the Director General*, *supra* note 9, Section 5.1.

- removal of deposits in ditches and high-pressure washing of roads;
- mowing, removal of topsoil and high pressure washing of gardens, as well as removal of fallen leaves and paring of tree surfaces;
- with respect to farmlands: tillage reversal, topsoil removal, soil treatment through fertilizers or removal;
- removal of fallen leaves and lower twigs in forest areas.

The decontamination activities in the SDA were completed at the end of March 2017. The decontamination activities conducted by the municipalities in the ICSA were completed in March 2018. As a result, all decontamination activities for Areas 1 and 2 were completed, therefore excluding Area 3.[14] The effects of the decontamination in the SDA led to an average decrease in air dose rate of 60% in residential areas, 58% in farmland areas, 27% in forest areas and 42% on roads.[15] Over time, a further reduction has been monitored, notably due to radioactive decay and the weathering from surfaces and vertical migration of radionuclides further into the soil.

Decontamination activities generated a considerable amount of radioactive waste (e.g. removed topsoil, vegetables and trees), estimated at approximately 17 million m^3 as of the end of 2017. The management of such waste required the construction of an interim storage facility (ISF), to which waste is gradually being transported, after having been stored in temporary repositories. The Japanese government intends to complete the construction of a final disposal facility within 30 years following start of the ISF.

As of the end of the fiscal year 2018, the Japanese MOE had budgeted approximately JPY 2.9 trillion (equivalent to approximately USD 27 billion as of September 2019) for decontamination activities.[16]

II. General background on the compensation of environmental damage in international and national laws

1. The international nuclear liability conventions

The original international legal instruments governing nuclear third party liability, the Paris Convention and the Vienna Convention, both provide for the coverage of personal injury and damage to property, without any specific mention of the environment.

This does not mean, however, that these two instruments do not allow for the potential compensation of damage to the environment. Under the Paris Convention, experts noted that national legislators may benefit from sufficient latitude in the definition of property damage to include requirements to compensate damage to the environment. Article 1(k)(i) of the Vienna Convention is even more explicit, as it allows contracting parties to provide for the compensation of environmental damage under the heading "any other loss or damage so arising or resulting if and to the extent that the law of the competent court so provides". However, neither the Paris Convention nor the Vienna Convention provides for the mandatory coverage of damage to the environment resulting from a nuclear incident.

14. Japanese Government (2018), *Events and highlights on the progress related to recovery operations at Fukushima Daiichi Nuclear Power Station*, June 2018, available at: www.iaea.org/sites/default/files/18/06/events-and-highlights-june-2018.pdf (accessed 24 Apr. 2024).
15. Japanese MOE (2018), *Environmental Remediation in Affected Areas in Japan*, December 2018, available at: http://josen.env.go.jp/en/pdf/environmental_remediation_1812.pdf (accessed 24 Apr. 2024).
16. *Ibid.*

The Chernobyl accident demonstrated the significant and large-scale consequences that a severe nuclear incident may have for the environment, as well as the great amount of human, economic and scientific resources required to remedy such damage, as presented in Section I above.

This accident led to the adoption of modernised nuclear third party liability instruments, namely the Revised Vienna Convention, the CSC and the Revised Paris Convention. These three instruments include in their respective definitions of nuclear damage the "cost of measures of reinstatement of impaired environment" and define "measures of reinstatement" as "any reasonable measures which have been approved by the competent authorities of the state where the measures were taken, and which aim to reinstate or restore damaged or destroyed components of the environment, or to introduce, where reasonable, the equivalent of these components into the environment". [17] The Revised Paris Convention, Revised Vienna Convention and CSC introduce a mandatory coverage of this head of damage, however only "to the extent that the law of the competent court so provides", giving a margin of discretion to the national legislation of the concerned contracting parties.

The Revised Paris Convention, Revised Vienna Convention and CSC do not provide for the mandatory coverage of damage to the general environment per se – often referred to as "pure environmental damage". Instead, mandatory compensation is limited to the cost of reasonable measures of reinstatement actually taken or to be taken and approved by competent authorities, to the extent provided by the applicable law, and insofar as such costs were not already compensated as damage to, or loss of property. The present Chapter aims to identify the challenges related to each of the cumulative criteria laid down by such definition. It should also be noted that many countries not parties to any Convention would enforce their domestic environmental legislations (either specific to nuclear or not) in the event of damage caused by a nuclear incident; those legislations may wholly or partly differ from the provisions of the aforementioned Conventions.

2. Other sources of international law regarding reinstatement of impaired environment and environmental damage

The development of the international nuclear liability regimes must be considered in the context of the broader development of civil liability regimes for the prompt compensation of victims of pollution and other environmental damage. As early as in 1972, the United Nations Conference on the Human Environment adopted the Stockholm Declaration, the Principle 22 of which stated that "States shall cooperate to develop further the international law regarding liability and compensation for the victims of pollution and other environmental damage caused by activities within the jurisdiction or control of such States to areas beyond their jurisdiction".[18] This principle was reaffirmed 20 years later in Principle 13 of the 1992 Rio Declaration on Environment and Development.[19]

In line with the aforementioned principles, several multilateral environmental agreements (MEAs) providing for civil liability in the field of environmental damage have been adopted in fields other than nuclear energy, such as oil pollution, the transport of dangerous goods and substances and living modified organisms.[20]

17. See Article 1(a)(viii) of the Revised Paris Convention, Article I.1(m) of the Revised Vienna Convention and Article 1(g) of the CSC.
18. United Nations Conference on the Human Environment, "Report of the United Nations Conference on the Human Environment", UN Doc. A/CONF.48/14/Rev.1, Stockholm, 5-16 June 1972.
19. United Nations Conference on Environment and Development (UNCED), "Resolutions Adopted by the Conference", UN Doc. A/CONF.151/26/Rev.1 (Vol. I), Rio de Janeiro, 3-14 June 1992.
20. See paragraph 98 in "Gaps in International Environmental Law and Environment-related Instruments: Towards a Global Pact for the Environment", report of the UN Secretary-General of 30 November, 2018 (A/73/419), https://wedocs.unep.org/bitstream/handle/20.500.11822/27070/SGGaps.pdf?sequence=3&isAllowed=y (accessed 24 Apr. 2024). A separate written contribution by Els Reynaers, member of Expert Group 4, addresses in further detail these MEAs and is referenced as Annex 3.A1 in several sections of the present Chapter.

While variations exist, the terminology used in these MEAs regarding environmental damage is mainly consistent with, and actually provided the basis for the drafting of, the Revised Vienna Convention, CSC and Revised Paris Convention,[21] as acknowledged by the drafters of these conventions.[22] While a significant number of these MEAs have not yet entered into force, some have already been the subject of valuable discussions and implementation regarding the costs of measures of reinstatement of impaired environment, most notably in the field of oil pollution.

It is also worth referring to other sources of international law regarding liability for environmental damage, such as the work of the United Nations International Law Commission (ILC) on the 2006 Draft Principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities[23] or the decisions of the United Nations Compensation Commission (UNCC), even though the latter were adopted in the context of state liability.[24] Furthermore, in the context of state liability, reference should be made to the 2018 decision of the International Court of Justice (ICJ) regarding compensation for environmental damage in the Costa Rica v. Nicaragua case,[25] as this was the first time that the ICJ adjudicated a claim of this nature.

3. Compensation of environmental damage following a nuclear incident under domestic laws

As of today, most countries have enacted general environmental legislations that grant public bodies,[26] and in some instances environmental non-governmental organisations,[27] the right to claim restoration for environmental damage in general or natural resource damage. Some domestic legislations also grant the right to claim monetary compensation for environmental loss, should restoration measures prove not feasible.[28]

These legislations may however exclude nuclear damage from their scope of application, such as the EU Directive on Environmental Liability in the context of the European Union.[29] Such legislations may nonetheless be used as reference by experts and national courts when considering the application of the international nuclear liability conventions, notably in the absence of specific domestic legislation addressing the issue of reinstatement of impaired environment due to nuclear damage, as stated by a number of countries that responded to the Questionnaire.

21. A table of definitions of "damage" as found in international law instruments and treaties is provided in Annex 3.A1 to this Chapter, paragraph 19.
22. IAEA (2020), *The 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage – Explanatory Texts*, IAEA International Law Series, No. 3 (Rev. 2), IAEA Doc. STI/PUB/1906, IAEA, Vienna (*Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*), Section 2.3.3.
23. ILC (2006), Draft principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities.
24. See Annex 3.A1 to this Chapter, paragraphs 5, 9-11 and 23-25.
25. Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua) – Compensation owed by the Republic of Nicaragua to the Republic of Costa Rica, Judgement of 2 February 2018, ICJ Reports 2018, available at: www.icj-cij.org/files/case-related/150/150-20180202-JUD-01-00-EN.pdf (accessed 24 Apr. 2024).
26. E.g. Brazil: Art. 14(1) Law 6938/81; Italy: Art. 311 Environmental Protection Code; Portugal: Art. 48 LBA Law No. 11/87, as amended by Law No. 13/2002 (framework law on the environment) and Art. 73 DL no. 236/98 (water pollution law).
27. E.g. Belgium, Netherlands, Portugal, and Sweden; see M. Hinteregger (ed.) (2008), *Environmental Liability and Ecological Damage in European Law, Cambridge University Press,* at 632 et seq.
28. E.g. the comprehensive liability regimes for ecological harm in France (Articles 1246-1252 of the Civil Code) and Mexico (Federal Law for environmental Liability of 7 June 2013).
29. Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with Regard to the Prevention and Remedying of Environmental Damage, *Official Journal of the European Union* (OJ) L 143, 30 Apr. 2004 (EU Directive on Environmental Liability). For the exclusion of nuclear third party liability from the scope of application see Article 4(4) and Annex V of the Directive.

It is worth noting that several countries reported having adopted domestic legislation specifically addressing compensation for environmental damage following a nuclear incident, as illustrated below.

- In **Austria**, which is not a party to any of the Conventions, Section 11(2) and (3) of the Federal Act on Civil Liability for Damage Caused by Radioactivity (AtomHG)[30] provide that

  > (2) If the damage to physical property also creates serious harm to the environment and if the person liable is unable or unwilling to restore it to its former condition, then the person who suffered damage shall also be entitled to recover compensation for costs of reinstatement, even if such costs exceed the value of the property damaged. The injured party can request these costs in advance, but must return the excess of costs over value if he does not restore the damaged property to its former condition within a reasonable time.
  >
  > (3) The duty to compensate includes the costs of reasonable preventive measures adopted in order to avoid an imminent threat of emission of ionising radiation from a nuclear installation, nuclear material or a radionuclide (rescue expenses). Such costs shall be recoverable by the person who actually incurs them.

- In **Canada**, which is a party to the CSC, Section 18 of the Nuclear Liability Compensation Act (NCLA) states that "Reasonable costs of remedial measures that are taken to repair, reduce or mitigate environmental damage that is caused by a nuclear incident are compensable if the measures are ordered by an authority acting under federal or provincial legislation relating to environmental protection."[31] In addition, Section 19 of the NLCA provides that "Unless the damage is insignificant, reasonable costs of remedial measures that are taken to repair, reduce or mitigate environmental damage that is caused by a nuclear incident are compensable if the measures are ordered by an authority of a Contracting State [to the CSC] other than Canada acting under the laws of that State relating to environmental protection."

- In **Czechia**, which is a party to the Vienna Convention, Section 34(2) of the Atomic Act[32] provides that

  > (2) Nuclear damage shall also be damage arising in the form of costs of interventions necessary to prevent or reduce exposure or restore the original or equivalent state of the environment, if these interventions were made necessary by a nuclear event and the nature of the damage thus permits.

- In **Japan**, which is a party to the CSC,[33] the aforementioned Special Measures Act was adopted in August 2011 to address specific decontamination activities related to the Fukushima Daiichi nuclear power plant accident. Article 44 of this Act, which became fully effective on 1 January 2012, specifies that measures taken in accordance with the Special Measures Act shall be considered to be related to damage to be compensated

30. Federal Act on Civil Liability for Damage Caused by Radioactivity, as amended, 1998 (*BGBl.* I No. 170/1998).
31. Nuclear Liability and Compensation Act, 2015 (SC 2015, c. 4, s. 120) (NLCA).
32. Act No. 18/1997 Coll. Of 24 January 1997 on the Peaceful Uses of Nuclear Energy and Ionising Radiation and on Amendments and Alterations to Some Acts (the "Atomic Act").
33. Japan deposited its instrument of acceptance of the CSC on 15 January 2015. At the time of the Fukushima Daiichi nuclear power plant accident, Japan was not yet a party to any international nuclear liability convention.

under the Act on Compensation for Nuclear Damage,[34] and are thus to be implemented at the expense of the relevant nuclear operator.[35]

- In the **United Kingdom**, which is a party to the Revised Paris Convention, Section 11A of the Nuclear Installations Act 1965 provides that:[36]

  > (1) Where as a result of a breach of a duty imposed by section 7, 7B, 8, 9 or 10 there is significant impairment of the environment, a qualifying public authority may make a claim under this Act for compensation in respect of the reasonable cost of relevant measures of reinstatement relating to that impairment.

  In addition, Section 11E of the Nuclear Installations Act provides for rules specifically applicable to claims for reinstatement of impaired environment made under relevant foreign law (further detailed below in the present Chapter).

Several countries also reported that their national legislations specific to nuclear liability provide for direct references to the definitions provided under the international nuclear liability conventions.[37]

III. Definition of the impaired environment under the international and national legal frameworks for nuclear third party liability

1. Impaired environment under the international nuclear third party liability regimes and other international liability regimes

The texts of the Revised Paris Convention, the Revised Vienna Convention and the CSC do not provide for a specific definition of what is to be considered impaired environment in the context of nuclear third party liability. Those conventions do, however, specify that the measures of reinstatement should aim to reinstate or restore "damaged or destroyed components of the environment", without further specifying what those components may be.

The absence of such definition in the modernised nuclear third party liability conventions appears to have been an intentional choice by the drafters of the Conventions, as noted by the International Expert Group on Nuclear Liability (INLEX) in 2005:[38]

> … the addition of explicit categories of damage such as 'impairment of the environment' and 'economic loss' in the definition of 'nuclear damage' in the revised Paris and Vienna Conventions and the CSC was intended to require the competent court to consider such damage. The addition of the phrase 'to the extent determined by the law of the competent court' was intended to emphasize that the breadth of such coverage continued to be left to the competent court to determine. The Group felt that it was **desirable to leave this discretion as to the exact coverage of nuclear damage to national law and the competent court**, recognizing at the same time that this may result in different coverage in different situations. (emphasis added)

34. For more information on the Act No. 147 of 1961 on Compensation for Nuclear Damage, see NEA (2012), *Japan's Compensation System for Nuclear Damage as related to the TEPCO Fukushima Daiichi nuclear accident*, OECD Publishing, Paris.
35. See Ministry of Environment of Japan (MOE), Outline of the Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials Discharged by the Nuclear Power Station Accident Associated with the Tohoku District – Off the Pacific Ocean Earthquake that Occurred on 11 March 2011, *supra* note 11.
36. UK Nuclear Installations Act 1965 (c. 57), as amended (NIA 65).
37. E.g. Article L. 597-3 of the French Environmental Code, which directly refers to the definition of nuclear damage under the Revised Paris Convention.
38. IAEA (2020), *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*, Section 2.3.1, *supra* note 22.

While Germany made a proposal at the time of the drafting of the Revised Vienna Convention to define "impairment of the environment" as "considerable and lasting adverse impact on nature and landscape by contamination", this definition did not receive consensual support and was not retained in the final text of that convention.[39] Therefore, the modernised Conventions rely on the national law of the competent court to define what type of impairment of the environment may be subject to measures of reinstatement.

On this matter, the Conventions do not appear to significantly differ from many other international civil liability regimes, which do not provide substantive definition of impairment of the environment or pollution damage. Nevertheless, some international law instruments do provide valuable examples as to how environmental impairment, or the environment itself, may be defined.[40] For example, the 1985 Vienna Convention for the Protection of the Ozone Layer[41] defines "adverse effects" as "changes in the physical environment or biota, including changes in climate, which have significant deleterious effects on human health or on the composition, resilience and productivity of natural and managed ecosystems, or on materials useful to mankind". Another example is provided by the 1993 Lugano Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment,[42] which provides that "'environment' includes: natural resources both abiotic and biotic, such as air, water, soil, fauna and flora and the interactions between the same factors; property which forms part of the cultural heritage; and the characteristic aspects of landscape". Similarly, the ILC, in its Draft Principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities, defines the environment as including "natural resources, both abiotic and biotic, such as air, water, soil, fauna and flora and the interaction between the same factors, and the characteristic aspects of the landscape".

2. Examples of definitions of the environment in the national laws of selected countries

In the countries surveyed at the occasion of the Lisbon Workshop, those that provide a specific definition of "components of the environment" do so through general domestic environmental law, rather than laws specific to nuclear third party liability. It was not always clear whether such definitions would be directly applicable to nuclear third party liability or whether such definitions would provide a *de facto* basis for the consideration of national courts. As illustrated below, most countries appear to use similar definitions of the environment, with sometimes noticeable variations (notably regarding cultural and heritage values), consistent with definitions found under international law.

- In **Australia**, Section 528 of the Environment Protection and Biodiversity Conservation Act 1999 provides the following definition:

  Environment includes:

  (a) ecosystems and their constituent parts; including people and communities; and

  (b) natural and physical resources; and

  (c) the qualities and characteristics of locations, places and areas; and

  (d) the heritage values of places: and

  (e) the social, economic and cultural aspects of a thing mentioned in paragraph (a), (b), (c) or (d).

39. *Ibid*. note 134.
40. See Annex 3.A1, section II.
41. UNEP (1985), Vienna Convention for the Protection of the Ozone Layer.
42. Council of Europe (1993), Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment (Lugano, 21 June 1993), European Treaty Series (ETS) - No. 150.

- In **Canada**, Section 3 of the Canadian Environmental Protection Act, 1999 (CEPA) provides the following definition:

  "Environment" means the components of the earth and includes

  (a) air, land and water;

  (b) all layers of the atmosphere;

  (c) all organic and inorganic matter and living organisms; and

  (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

- In **Czechia**, Section 2 of the Act no. 17/1992 Coll. On Environment states:

  The environment is all that creates natural conditions for the existence of organisms, including humans, and is a prerequisite for their further development. Its components are air, water, rocks, soil, organisms, ecosystems and energy.

- In **France**, Article L. 110-1 of the Environmental Code defines the environment as "terrestrial and marine natural areas, resources and habitats, the sounds and smells that characterise them, sites, diurnal and nocturnal landscapes, air quality, water quality, living species and biodiversity".

- In **Greece**, Article 2 of the Law No. 1650/1886 defines the environment as "all natural and anthropogenic factors and elements that interact and affect ecological balance, quality of life, inhabitants' health, historical and cultural tradition and aesthetic values".

- In **India**, Section 2(a) of the Environment (Protection) Act, 1986 provides that the environment includes "water, air and land and the interrelationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organisms and property".

- In **Spain**, Article 2 of the Act No. 26/2007 on Environmental Liability defines "environmental damage" as:

  (a) Damage to wildlife and habitats, that is, any damage that produces significant adverse effects on the possibility of reaching or maintaining the favourable state of conservation of those habitats or species. […]

  (b) Damage to the waters, understood as any damage that produces significant adverse effects both in the ecological, chemical and quantitative state of surface or underground water bodies, as well as in the ecological potential or artificial and highly-modified water bodies.

  (c) Damage to the shore of the sea and estuaries, understood as any damage that produces significant adverse effects on their physical integrity and adequate conservation, as well as those that imply difficulty or inability to achieve or maintain an adequate level of quality of such.

  (d) Damage to the soil, that is, any contamination of the soil that poses a significant risk of adverse effects on human health or the environment due to the direct or indirect deposit, discharge or introduction of substances, preparations, organisms or microorganisms in the soil or subsoil.

3. Interpretation of the de minimis threshold

The texts of the Revised Paris Convention, Revised Vienna Convention and CSC provide for the mandatory compensation of the costs of measures of reinstatement of impaired environment, "unless such impairment is insignificant". The modernised Conventions therefore provide for a threshold, commonly referred to as *de minimis*, under which compensation would not be required. The Conventions do not provide further definition or criteria to assess the significance of an environmental impairment following a nuclear incident.

At the time of the drafting of the Revised Vienna Convention, two wordings were considered in respect of the *de minimis* threshold, either "unless insignificant" or "unless at tolerable levels". A decision was eventually made in favour of the first wording, noting that in any instance, the responsibility for determining either the significant or the tolerable nature of the environmental impairment would be that of the competent national court.[43] Likewise, the *Exposé des Motifs of the Revised Paris Convention* provides that "It is up to the competent court to decide whether the environmental impairment is significant."[44] In this context, it is interesting to note than none of the countries that provided information as part of the Questionnaire circulated prior to the Lisbon Workshop reported having definitions of, or criteria to define the "significant" nature of an environmental impairment in their national legislations applicable to nuclear third party liability.

The use of the *de minimis* threshold is also found in most other international law instruments in the field of civil liability for environmental damage, although such instruments may refer to different terms, such as "substantial", "serious" or "above tolerable levels".[45] There does not appear to be any agreed international standard for such threshold.[46] In most instances, this threshold appears to have been introduced to avoid disproportionate costs of restoration. In this regard, such requirements are comparable to that of the "reasonableness" of measures of reinstatement of impaired environment (see Section IV below).

Some international law sources may provide valuable information regarding criteria to assess whether an impairment meets the required threshold. In its 2001 Report on the Draft Articles on Prevention of Transboundary Harm from Hazardous Activities, the ILC acknowledged that:

> The term "significant" is not without ambiguity and a determination has to be made in each specific case. It involves more factual considerations than legal determination. It is to be understood that "significant" is something more than "detectable" but need not be at the level of "serious" or "substantial". The harm must lead to a real detrimental effect on matters such as, for example, human health, industry, property, environment or agriculture in other States. Such detrimental effects must be susceptible of being measured by factual and objective standards.[47]

In addition, the 2010 Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety,[48] in its Article 2(3), defines criteria that can be used to determine the significance of an adverse effect in the context of that Protocol, as follows:

A "significant" adverse effect is to be determined on the basis of factors, such as:

(a) the long-term permanent change, to be understood as change that will not be redressed through natural recovery within a reasonable period of time;

(b) the extent of the qualitative or quantitative changes that adversely affect the components of biological diversity;

(c) the reduction of the ability of components of biological diversity to provide goods and services;

(d) the extent of any adverse effects on human health in the context of the Protocol.

43. IAEA (2020), *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*, Section 2.3.3, *supra* note 22.
44. NEA (2024), *Exposé des Motifs of the Paris Convention as amended by the Protocols of 1964, 1982 and 2004*, adopted by the Contracting Parties to the Paris Convention on 18 Nov. 2016, NEA Doc. NEA/NLC/DOC(2020)1/REV1/FINAL (*Exposé des Motifs of the Revised Paris Convention*).
45. See Report of the UN Secretary-General on Gaps in international environmental law and environment-related instruments: towards a global pact for the environment (A/73/419), paragraph 99.
46. *Ibid*.
47. Report of the ILC on, *inter alia*, Draft Articles on prevention of transboundary harm from hazardous activities, Official Records of the General Assembly, 56th Session, Supplement No. 10 (A/56/10), Chapter V.E (pp. 146-170), at page 152: http://legal.un.org/ilc/documentation/english/reports/a_56_10.pdf (accessed 24 Apr. 2024).
48. The text of the Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety is available at: https://bch.cbd.int/protocol/NKL_text.shtml (accessed 24 Apr. 2024).

Similarly, Annex I of the EU Directive on Environmental Liability[49] provides criteria to assess the significance of adverse effects on reaching or maintaining the favourable conservation status of natural habitats and protected species, reproduced below:

> The significance of any damage that has adverse effects on reaching or maintaining the favourable conservation status of habitats or species has to be assessed by reference to the conservation status at the time of the damage, the services provided by the amenities they produce and their capacity for natural regeneration. Significant adverse changes to the baseline condition should be determined by means of measurable data such as:
>
> - the number of individuals, their density or the area covered,
>
> - the role of the particular individuals or of the damaged area in relation to the species or to the habitat conservation, the rarity of the species or habitat (assessed at local, regional and higher level including at Community level),
>
> - the species' capacity for propagation (according to the dynamics specific to that species or to that population), its viability or the habitat's capacity for natural regeneration (according to the dynamics specific to its characteristic species or to their populations),
>
> - the species' or habitat's capacity, after damage has occurred, to recover within a short time, without any intervention other than increased protection measures, to a condition which leads, solely by virtue of the dynamics of the species or habitat, to a condition deemed equivalent or superior to the baseline condition.
>
> Damage with a proven effect on human health must be classified as significant damage.
>
> The following does not have to be classified as significant damage:
>
> - negative variations that are smaller than natural fluctuations regarded as normal for the species or habitat in question,
>
> - negative variations due to natural causes or resulting from intervention relating to the normal management of sites, as defined in habitat records or target documents or as carried on previously by owners or operators,
>
> - damage to species or habitats for which it is established that they will recover, within a short time and without intervention, either to the baseline condition or to a condition which leads, solely by virtue of the dynamics of the species or habitat, to a condition deemed equivalent or superior to the baseline condition.

In the specific context of nuclear third party liability, elements to assess the significance of environmental impairment are likely to be provided by legal and technical sources in the field of radiological protection, such as, inter alia, the International Basic Safety Standards,[50] the Basic Safety Standards Directive,[51] the Euratom Council Regulation laying down maximum permitted levels of radioactive contamination of food and feed following a nuclear accident or

49. Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with Regard to the Prevention and Remedying of Environmental Damage, *Official Journal of the European Union* (OJ) L 143, 30 Apr. 2004 (EU Directive on Environmental Liability), *supra* note 29.
50. IAEA, 2014, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, jointly sponsored by the European Commission, Food and Agriculture Organization of the United Nations (FAO), IAEA, International Labour Organization (ILO), OECD Nuclear Energy Agency (NEA), Pan American Health Organization (PHO), United Nations Environment Programme (UN Environment) and World Health Organization (WHO).
51. Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom.

any other case of radiological emergency,[52] or documentation issued by the International Commission on Radiological Protection (ICRP).[53]

In practice, questions may also arise regarding risk perception and expectations of the general public following a nuclear incident. While the aforementioned legal frameworks stress the importance of a factual and objective assessment of the significance of environmental impairment, social factors may lead to a de facto lowering of such threshold and the adoption of measures of reinstatement with limited to very limited effects on risks faced by the public and the environment due to an already low exposure.

IV. Consideration of the reasonableness of measures of reinstatement of impaired environment

1. Definition of "reasonable measures" under the international nuclear third party liability regimes

As previously explained, the Revised Vienna Convention, the Revised Paris Convention and the CSC provide for the mandatory compensation of the costs of measures of reinstatement of impaired environment due to a nuclear incident. The modernised Conventions further define "measures of reinstatement" as "reasonable measures which have been approved by the competent authorities of the State where the measures were taken, and which aim to reinstate or restore damaged or destroyed components of the environment, or to introduce, where reasonable, the equivalent of these components into the environment." The following definition of "reasonable measures" is laid down in the text of these conventions:

> "Reasonable measures" means measures which are found under the law of the competent court to be appropriate and proportionate having regard to all the circumstances, for example
>
> i) the nature and extent of the damage incurred or, in the case of preventive measures, the nature and extent of the risk of such damage;
>
> ii) the extent to which, at the time they are taken, such measures are likely to be effective; and
>
> iii) relevant scientific and technical expertise.

The inclusion of such definition in the text of the modernised Conventions highlights the importance of the reasonableness criterion for compensation to be awarded for the cost of measures of reinstatement of impaired environment. This definition also makes it clear that findings as to the reasonableness – or in other words the appropriateness and proportionality – of measures of reinstatement, are to be made under the law of the competent court.[54] This means that, in the case of a nuclear incident causing transboundary environmental impairment, the measures of reinstatement taken in all affected countries will be in principle subject to the same test of reasonableness under the law of the competent court, i.e. the substantive law of the country where the accident occurred.

It is worth noting that the criteria to assess the appropriateness and proportionality of measures of reinstatement provided by the Conventions are only stated as examples, implying that such criteria are not exhaustive and, therefore, leaving a certain degree of discretion to the

52. Council Regulation (Euratom) 2016/52 of 15 January 2016 laying down maximum permitted levels of radioactive contamination of food and feed following a nuclear accident or any other case of radiological emergency, and repealing Regulation (Euratom) No 3954/87 and Commission Regulations (Euratom) No 944/89 and (Euratom) No 770/90.
53. See, for example, ICRP, 2014. Protection of the Environment under Different Exposure Situations. ICRP Publication 124. Ann. ICRP 43(1), regarding the protection of biota.
54. See IAEA (2020), *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*, Section 2.3.3, *supra* note 22.

competent court to refer to additional relevant criteria. While not stated in the text of the Conventions, it could be expected that a cost-benefit analysis of measures of reinstatement be considered as a criterion to assess the reasonableness of such measures, so as to avoid grossly disproportionate expenditures – this being especially relevant where the availability of funds to compensate victims for other types of damage is limited.

In practice, as highlighted in Section I of the present Chapter, different choices as to the extent of measures of reinstatement of impaired environment following a nuclear incident may lead to significant impacts on available financial resources, as noted by the IAEA regarding decontamination activities following the Fukushima Daiichi nuclear power plant accident.[55] In addition, it was noted in the context of the Chernobyl nuclear power plant accident that some intended measures of reinstatement may lead to either further impacts on habitats and biodiversity or to a significant exposure of workers implementing such measures (see Section I.2.b. of the present Chapter regarding forest and aquatic countermeasures). On the other hand, several measures of reinstatement taken following major nuclear incidents to date have proven to be effective in reducing the dose rates in the reinstated areas.

Similar to the impact of social factors on the *de minimis* threshold (see Section III.3 of the present Chapter), the low tolerance of populations to nuclear incidents and radiological risk may also influence the determination of whether measures of reinstatement of impaired environment are to be considered appropriate and proportionate.

2. Definition of reasonable measures under other international liability regimes for environmental damage

While the text of the nuclear liability conventions appears rather detailed regarding the definition of "reasonable measures" compared to other aforementioned instruments in the field of civil liability for environmental damage, several international law instruments and sources may provide relevant examples as to how the reasonableness criteria is interpreted or applied in their respective scope of application.

In the 2006 Draft Principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities, the ILC defines damage as including "the costs of reasonable measures of reinstatement of the property, or the environment, including natural resources". In the commentaries, the ILC explains that "the reference to "reasonable" is intended to indicate that the costs of such measures should not be excessively disproportionate to the usefulness resulting from the measure".[56] The ILC also quotes a decision by the United States First Circuit Court of Appeals in the *Commonwealth of Puerto Rico v. SS Zoe Colocotroni* case, in which the court held that

> [Recoverable costs or costs] reasonably to be incurred … to restore or rehabilitate the environment in the affected area to its pre-existing condition, or as close thereto as is possible without grossly disproportionate expenditures. The focus in determining such a remedy should be [on] the steps a reasonable and prudent sovereign or agency would take to mitigate the harm done by the pollution, with attention to such factors as technical feasibility, harmful side effects, compatibility with or duplication of such regeneration as is naturally to be expected, and the extent to which efforts beyond a certain point would become either redundant or disproportionately expensive.[57]

55. See IAEA (2015), *The Fukushima Daiichi Accident – Report by the Director General*, *supra* note 9.
56. ILC (2006), Draft principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities, with commentaries, Report of the ILC on the work of its fifty eighth session, page 68, paragraph 16.
57. Commonwealth of Puerto Rico, et al. v. SS Zoe Colocotroni, et al., 628 F.2d, p. 652, United States Court of Appeals, First Circuit, 1980. Background and case available at: www.ecolex.org/details/court-decision/commonwealth-of-puerto-rico-v-ss-zoe-colocotroni-5825fcf1-8d5e-476b-bb7e-9253b796085e/ (accessed 24 Apr. 2024).

Another example may be found in the international civil liability regime for the compensation of oil pollution.[58] The 1992 Convention on Civil Liability for Oil Pollution Damage (CLC) provides for the mandatory compensation of impairment of the environment, limited to "costs of reasonable measures of reinstatement actually undertaken or to be undertaken".[59] The Claims Manual adopted for the 1992 International Oil Pollution Compensation (IOPC) Fund[60] specifies that

> … claims for the costs of measures of reinstatement of the environment will qualify for compensation only if the following criteria are fulfilled:
>
> - The measures should be likely to accelerate significantly the natural process of recovery.
> - The measures should seek to prevent further damage as a result of the incident.
> - The measures should, as far as possible, not result in the degradation of other habitats or in adverse consequences for other natural or economic resources.
> - The measures should be technically feasible.
> - The costs of the measures should not be out of proportion to the extent and duration of the damage and the benefits likely to be achieved.

Lastly, in the context of the EU, Annex II to the EU Directive on Environmental Liability[61] provides criteria based on which reasonable remedial options should be evaluated "using best available technologies", as follows:

- the effect of each option on public health and safety,
- the cost of implementing the option,
- the likelihood of success of each option,
- the extent to which each option benefits to each component of the natural resource and/or service,
- the extent to which each option takes account of relevant social, economic and cultural concerns and other relevant factors specific to the locality,
- the length of time it will take for the restoration of the environmental damage to be effective,
- the extent to which each option achieves the restoration of site of the environmental damage,
- the geographical linkage to the damaged site.

3. Definition of reasonable measures in the national laws of selected countries

As mentioned previously, the modernised Conventions state that the determination on the reasonableness of measures of reinstatement is to be made in accordance with the national law of the competent court. However, only a limited number of countries surveyed at the occasion of the Lisbon Workshop reported definitions of, or criteria to assess the reasonableness of measures of reinstatement following a nuclear incident in their national legislations applicable to nuclear third party liability.

58. For more information, see Annex 3.A1 to this Chapter, paragraphs 26 to 34.
59. Article I.6 of the 1992 International Convention on Civil Liability for Oil Pollution Damage (1992), 1956 UNTS 255.
60. IOPC Funds (2019), *Claims Manual*, Section 3.6.5.
61. Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with Regard to the Prevention and Remedying of Environmental Damage, *Official Journal of the European Union* (OJ) L 143, 30 Apr. 2004 (EU Directive on Environmental Liability), *supra* note 29.

Some countries reported that, while their legislation does not provide for specific criteria to assess the reasonableness of measures of reinstatement specifically applicable to nuclear third party liability, references could be made by the competent court to other national environmental legislation. In France, for example, Articles R. 162-9 to 10 of the Environmental Code on general environmental liability[62] provide that reinstatement measures are implemented on the basis of the use of the site as defined by the applicable planning documentation, or, in the absence of such documentation, on the basis of the use of the land when the damage occurred. The identification and assessment of measures of reinstatement is made using the best available practices and technologies, in accordance with the aforementioned Annex II of the Environmental Liability Directive. Some other countries (e.g. Spain; United Kingdom) reported that their national legislation provides for criteria identical or very similar to those provided under the modernised Conventions.[63]

V. Procedural requirements regarding the approval and implementation of measures of reinstatement of impaired environment

1. Definition of "competent authorities" under the international nuclear third party liability regimes and relevant national laws

As previously mentioned, the modernised nuclear liability conventions include, as part of their definition of measures of reinstatement of impaired environment, a requirement that such measures be approved by the "competent authorities of the State where the measures were taken" for their cost to be compensable.[64]

The survey performed at the occasion of the Lisbon Workshop showed that several countries faced difficulties in identifying in their national laws the authorities responsible for approving the measures of reinstatement of impaired environment in the context of nuclear third party liability. In various countries, such responsibilities within governments may be shared or delegated between different entities at national/federal, regional or local levels.[65] Ensuring an explicit and unambiguous allocation of responsibilities therefore appears of paramount importance to facilitate the implementation of the nuclear civil liability regimes and payment of compensation. In particular, in the event of a nuclear incident with transboundary environmental impacts, payment of such compensation would be subject to the due approval of measures of reinstatement by competent authorities of different countries. Difficulties in the identification of competent authorities may generate additional complexity in the management of claims.

A very valuable example of how this issue may be addressed is found in the United Kingdom Nuclear Installation Act 1965. Section 11B of this act specifically provides that the compensation by virtue of a claim for the cost of measures of reinstatement of impaired environment is payable if such measures were approved by the Secretary of State (or the relevant court if the decision of the Secretary of State is appealed). Section 11B further provides that the approval of the Secretary of State is granted if satisfied that

(a) there is significant impairment of the environment;

62. Articles R. 162-9 to 10 of the Environmental Code transpose the provisions of the EU Directive on Environmental Liability, which excludes nuclear third party liability from its scope of application.
63. See, for example, Article 3.1.i of the Spanish Act 12/2011 of 27 May 2011 on Third party liability for nuclear damage or produced by radioactive materials or, in the United Kingdom, Section 11A(6) of the Nuclear Installations Act 1965.
64. See, notably, NEA (2004), Explanatory Report by the Representatives of the Contracting Parties on the Revision of the Paris Convention and the Brussels Supplementary Convention, Annex IV to the Final Act of the Conference on the Revision of the Paris Convention and of the Brussels Supplementary Convention, 12 February 2004, paragraph 11 [under Article 1(a): Definitions].
65. In Belgium, for example, competence for environmental matters is conferred to regions (i.e. Brussels, Flanders and Wallonia) under the Constitution.

(b) the measure is, in relation to that impairment, a relevant measure of reinstatement within the meaning of section 11A;

(c) the amount claimed in respect of the cost of the measure is reasonable;

(d) the public authority applying for approval in relation to a measure of reinstatement is a qualifying public authority within the meaning of section 11A as regards that measure [i.e. an authority entitled to take the measure of reinstatement under UK legislation].

In accordance with this section 11B, the Secretary of State may approve some but not others of the measures to which the application relates. Interestingly, an independent person shall be appointed and act as competent authority to approve measures of reinstatement in the event the cost of such measures is claimed by the Secretary of State.

In accordance with Section 11D of the Nuclear Installations Act 1965, the decision of the Secretary of State on the approval of measures of reinstatement may be appealed in court, either by the person claiming for compensation in case of refusal of the measures, or by the person liable for the costs of measures of reinstatement in case of approval. Furthermore, Section 11E provides for the specific rules applicable to claims for compensation introduced under a relevant foreign law for the cost of measures of reinstatement made in the United Kingdom (i.e. a scenario which would be applicable following a nuclear incident occurring outside the United Kingdom and causing an impairment of the environment in the territory of the United Kingdom). Section 11F provides for the specific rules applicable to claims for measures of reinstatement made outside the United Kingdom (i.e. the opposite situation, where a nuclear incident in the United Kingdom would have caused environmental impairment in the territory of a qualifying country). As such, it appears that the Nuclear Installations Act 1965 provides for comprehensive procedural rules applicable to the approval of measures of reinstatement of impaired environment by competent authorities and may serve as an example on this matter.

2. Question regarding the bodies or persons entitled to take the measures of reinstatement

Another important procedural matter regarding the cost of measures of reinstatement of impaired environment regards the determination of who is entitled to take such measures. The modernised Conventions provide, as part of their definitions of "measures of reinstatement", that "the legislation of the State where the nuclear damage is suffered shall determine who is entitled to take such measures." The *Exposé des Motifs of the Revised Paris Convention* further specifies that "since measures of reinstatement mostly cover components of the environment which are not owned by anyone, but rather available for the benefit of the general public, it will normally be the competent public authorities who are entitled to take such measures and claim for compensation therefor".[66]

While the approach retained by the drafters of the modernised Conventions appears to favour the responsibility of public authorities in carrying out reinstatement measures, the Conventions do not appear, in principle, to prohibit the national laws of respective contracting parties from authorising other organisations or persons to implement such measures of reinstatement. In any event, such measures would require the approval of competent authorities for their cost to be compensable under the modernised international nuclear liability regimes.

In most surveyed countries that provided information regarding the organisations or persons entitled to take measures of reinstatement, it appears that the responsibility rests on public authorities, although such authorities are not necessarily listed.[67] In Japan, as mentioned above, the Special Measures Act provided that either the national government or the local municipalities were responsible for implementing the measures of decontamination resulting from the Fukushima Daiichi accident, depending on the affected area (see Section I.3.b).

66. See NEA (2024), *Exposé des Motifs of the Revised Paris Convention*, paragraph 59 [under Article 1(a)(viii) and (x)], *supra* note 44.
67. See, for example, Section 11A(4) of the UK Nuclear Installations Act 1965.

It should, however, be kept in mind that in countries that are not contracting parties to any of the modernised Conventions, the national law applicable to nuclear third party liability may not require that a specific entity implement the measures of reinstatement of impaired environment for their costs to be compensable.[68]

3. Consideration of the retroactive approval of measures of reinstatement by competent authorities

The last procedural matter that was considered by the Expert Group 4 in the preparation of the Lisbon Workshop regards the timing of the approval of measures of reinstatement of impaired environment. The texts of the modernised Conventions are explicit regarding the requirement that measures of reinstatement be approved prior to claiming compensation for their costs. However, neither the texts of the Conventions, nor the national laws surveyed in the preparation of the Workshop, provide clarity as to whether the measures of reinstatement shall be approved prior to their implementation.

Notably, it was discussed whether organisations or persons could retroactively request approval by competent authorities of measures of reinstatement already taken unilaterally, with the aim to introduce a claim for the compensation of their costs. While there does not appear to be a clear answer to this specific question, it should be noted that in such an instance, the organisation or person unilaterally implementing the measures of reinstatement would assume the financial risk associated with their cost, as there would be no prior determination made by the competent authority as to the appropriateness and reasonableness of such measures.

VI. Consideration regarding the potential overlaps between damage to property and the cost of measures of reinstatement of impaired environment

1. The subsidiary nature of costs of measures of reinstatement of impaired environment under the modernised nuclear liability conventions

The texts of the modernised Conventions provide for the mandatory compensation of the costs of measures of reinstatement of impaired environment, insofar as not included as loss of, or damage to property. It appears from the *Explanatory Text of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage* and the *Exposé des Motifs of the Revised Paris Convention* that the drafters of these conventions mainly considered that measures of reinstatement of impaired environment, the cost of which would be compensated, would primarily cover components of the environment owned by the general public or not owned by anyone. As such, and as illustrated in the extract of the *Explanatory Text of the 1997 Vienna Convention on Civil Liability for Nuclear Damage* and the *1997 Convention on Supplementary Compensation for Nuclear Damage* reproduced below, it was anticipated that the impairment of components of the environment constituting private property would primarily be compensated as damage to, or loss of such property:

> For example, measures taken by a farmer whose land has been contaminated will be included, in most cases, in the concept of property damage; subparagraph (iv) [regarding the cost of measures of reinstatement of impaired environment] is, therefore, mainly designed to cover measures taken in respect of areas owned by the general public.[69]

68. See, for example, Section 11 of the Austrian AtomHG, *supra* note 30.
69. IAEA (2020), *Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*, Section 2.3.3, *supra* note 22.

This intention may also have been supported by the fact that, while the compensation of costs of measures of reinstatement of impaired environment must satisfy several cumulative criteria addressed previously in this report and is only provided to the extent determined by the law of the competent court, the compensation of property damage appears to be less limited in nature.

As nearly all land areas constitute either private or public property, and internal waters usually constitute public property, it was discussed within the Expert Group whether, in most instances, the costs of reinstating impaired environment would not already be covered as damage to, or loss of property. However, as illustrated in the Section below, the concept of property damage may not always adequately cover all costs of reinstating an impaired environment that would constitute property.

For components of the environment that are not owned by anyone (e.g. protected species), it appears rather straightforward that the costs of measures of reinstatement would only be compensable under the head of damage discussed in the present Chapter.

2. Challenges related to the reinstatement of non-marketable components of the environment

The first challenge regarding a potential overlap between compensation for damage to, or loss of property and the costs of measures of reinstatement of impaired environment regards the reinstatement of non-marketable components of the environment in areas that constitute private (or public) property.

Traditionally, compensation for damage to, or loss of property will cover the costs for the restoration of such property, up to its market value. Should restoration costs be higher than the market value, compensation would only be paid for that amount, in which case the reinstatement of impaired environment would not be legally ensured. This raises a significant question regarding the reinstatement of components of the environment with little or no market value, for which the criteria to assess damage to property would pose difficulties. Indeed, in many situations, as illustrated by the decontamination activities following the Fukushima Daiichi accident, measures of reinstatement of impaired environment may prove significantly costlier than the market value of the concerned property.

To tackle this challenge, different methods of evaluation and quantification of environmental impairment have been developed. For example, Annex II of the EU Directive on Environmental Liability provides for a framework to be followed in order to choose the most appropriate measures to ensure the remedying of environmental damage.[70] This framework is inspired by the model for damage assessment set up under several United States statutes,[71] most notably the Comprehensive Environmental Response, Compensation and Liability Act (CERLA) and the Oil Pollution Act (OPA).

Outside of the modernised Conventions, another example of how such a challenge may be addressed is provided under Section 11 of the Austrian AtomHG, which provides that the claimant is entitled to the cost of measures of reinstatement of environmental damage, even if such costs exceed the value of the impaired property.[72]

70. In particular, specific attention may be given to the definitions of "primary" remediation and "complementary" remediation, as well as to the specific section regarding the remediation of land damage, as these items appear to correspond to the provisions of the modernised Conventions.
71. Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. § 9607(1980), s. 107; Clean Water Act (CWA), 33 U.S.C. § 1321, s. 311(f)(4); Oil Pollution Act, 33 U.S.C. § 2702, s. 1002; Marine Protection Research and Sanctuary Act, 16 U.S.C. § 1443; National Park System Resource Protection Act, 16 U.S.C. § 19 jj.
72. AtomHG, *supra* note 30.

3. Practical challenges related to overlap and double compensation for damage to property and the costs of measures of reinstatement of impaired environment

Lastly, the potential overlaps between the compensation of damage to, or loss of property and that of the cost of measures of reinstatement of impaired environment may also lead to practical challenges in the administration of claims following a nuclear incident.

While it does not necessarily appear problematic that claimants be able to seek compensation for the cost of measures of reinstatement of impaired environment under one of the discussed heads of damage, it will be necessary to ensure that compensation for the cost of reinstating a specific component of the environment is not paid twice. This could notably happen if the owner of a component of the environment claims compensation for damage to, or loss of property, while that same component of the environment is the subject of measures of reinstatement approved by, and taken or to be taken by the relevant competent authorities.

VII. Conclusions

The new head of damage introduced in the modernised Conventions regarding the costs of measures of reinstatement of impaired environment presents several challenges, namely the definition of the impaired environment and that of the several specific criteria set forth by the conventions which must be met in order to receive compensation. The costs are only compensable if the considered measures:

- are reinstating a significantly impaired environment;
- are considered reasonable;
- have been approved by competent authorities;
- are taken, or to be taken, by an entitled person or organisation; and
- have not already been compensated as damage to, or loss of property.

For each of the aforementioned elements, the modernised Conventions appear to give broad discretion to either the national law of the competent court (notably regarding the definition of environmental impairments, including their significance, and the reasonableness of measures of reinstatement) or that of the court where the measures are taken (regarding the competent authorities to approve the measures of reinstatement and the definition of persons or organisations entitled to take them).

In this context, it appears important to foster discussions amongst the concerned countries and more generally amongst legal experts, with a view to identify, discuss and address practical challenges that would arise in the event of a nuclear incident with transboundary environmental impacts. In particular, the following issues require careful consideration:

Historically, the primary aim of measures of reinstatement of impaired environment following a nuclear incident has generally been to reduce human exposure to sources of radiation, mostly through cleanups in areas concentrating human activities. However, the legal definition of what constitutes the environment has gradually expanded over time in many domestic laws and international environmental treaties, leading to requirements to protect and possibly reinstate a broader range of components of the environment, including natural resources, non-human biota, biodiversity, landscapes or the cultural value of specific sites. As the modernised Conventions refer to national law in defining the requirements to compensate measures of reinstatement of impaired environment, specific consideration should be given to commonalities and potential differences in the definition of the environment in national legal frameworks.

The modernised Conventions provide for the compensation of measures of reinstatement of impaired environment, insofar as such measures are considered reasonable under the national law of the competent court. Apart from the definitions of “reasonable measures” in the Conventions, it is important to consider the broader corpus of international and domestic environmental law applicable to the reinstatement of impaired environment – even if such

provisions are not directly applicable to nuclear damage – as those instruments may be used as reference by national courts. Lessons learnt from the Chernobyl and Fukushima Daiichi accidents illustrate the very significant implications of decisions on the scope and extent of reinstatement measures, notably in terms of costs and other available resources. Countries should therefore endeavour to optimise reinstatement measures, notably through cost-benefit analyses, as well as reviews of available technologies and their efficiency. Notwithstanding technical elements, it is also important to thoroughly consider social factors, as those will also have an important impact on choices made for reinstating the environment.

The modernised Conventions also provide for procedural requirements limiting the mandatory compensation of measures of reinstatement of impaired environment to measures (i) approved by a competent authority and (ii) taken by an entitled person or organisation under the national law of the country where the environment was impaired. Thus, it is important that national laws provide for a clear framework defining (i) which authority or authorities have the competence to approve measures of reinstatement, (ii) the procedures for issuing such approval and (iii) the persons or organisations that are entitled to take reinstatement measures and have legal standing to claim compensation for the cost of these measures.

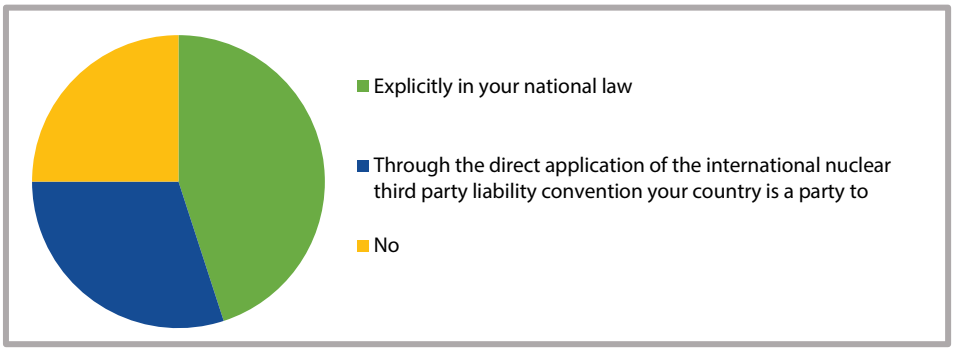
Effective and early co-ordination between countries affected in the event of a nuclear incident and their competent authorities at international level would considerably facilitate the compensation of cost of measures of reinstatement of impaired environment under the modernised Conventions. Effective international co-ordination would allow the liable entity, claims handlers or even national courts to expeditiously identify the authorities competent to approve measures of reinstatement in other affected countries, as well as the persons or organisations entitled to compensation under the foreign national laws. In addition, effective co-ordination between competent authorities at a transboundary level would support the approval of measures of reinstatement and promote a shared understanding of their reasonableness.

Finally, potential overlaps with the compensation of damage to property should be considered when compensating the cost of measures of reinstatement of the impaired environment. The modernised Conventions provide for a subsidiary compensation for the cost of measures of reinstatement, complementing the compensation already paid to cover damage to or loss of property. The drafters of the modernised Conventions indicated that the compensation for the cost of measures of reinstatement would primarily cover components of the environment not owned by anyone. However, lessons learnt from the Fukushima accident indicate that the cost of measures of reinstatement may in several instances be higher than the market value of impaired components of the environment, even if such components are privately owned. Furthermore, as illustrated by the post-Fukushima environmental remediation measures, cleanups in evacuated zones comprising private property are likely to be ordered and carried out by public authorities in the event of a severe nuclear incident. This situation would create a risk of overlapping claims for compensation filed by the owner of the concerned component of the environment and the public authorities implementing reinstatement measures. This aspect should be considered in the event of a nuclear incident, in order to avoid compensation being paid twice for the same damage, and exhaustion of available funds at the expense of other victims.

Annex 4.A1. **Compilation of responses to the Questionnaire**[1]

Question 5.a.

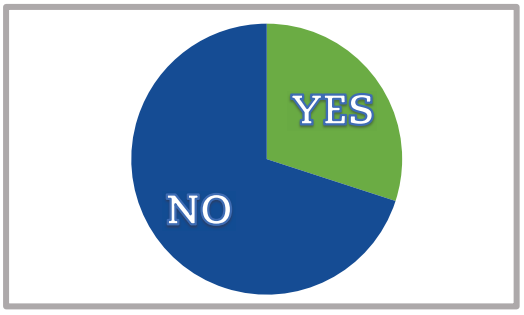
Do your national legislation, regulations and/or case law provide for this type of damage (i.e. costs of measures of reinstatement of impaired environment) in the context of a nuclear damage?



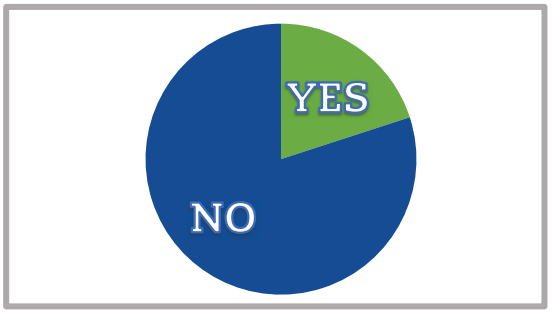
Question 5.b.

Do your national legislation, regulations and/or case law provide for:

(i) a specific definition of "*measures of reinstatement*"?



(ii) a specific definition of "*reasonable measures*" and/or a procedure to determine when a measure is "reasonable"?

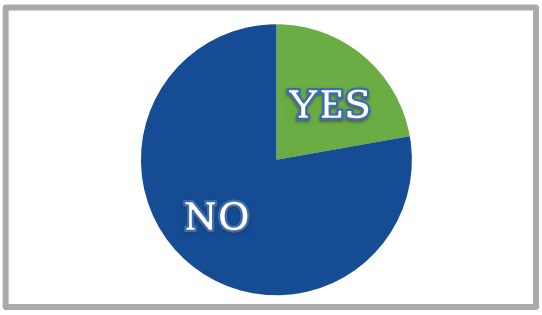


1. The charts included in the present Annex 4.A1 provide an overview of the answers to the questions relating to the Expert Group 4 topic "Cost of measures of reinstatement of impaired environment".

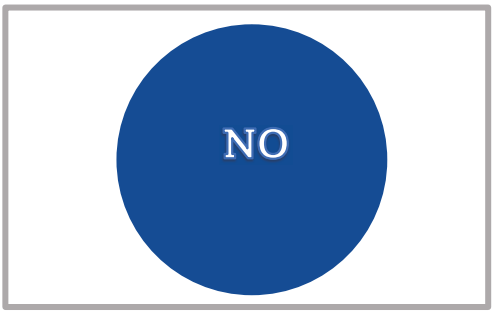
Question 5.c.

Do your national legislation, regulations and/or case law provide for:

(i) a specific definition of "*impaired environment*" and/or measures to determine what an "impaired environment" is?

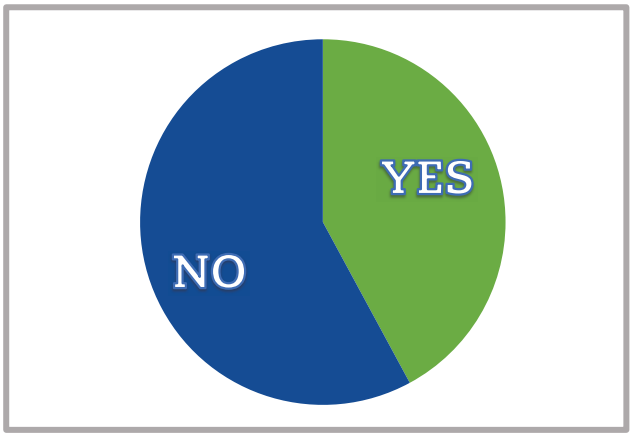


(ii) when an impairment of the environment must be considered as "*insignificant*"?



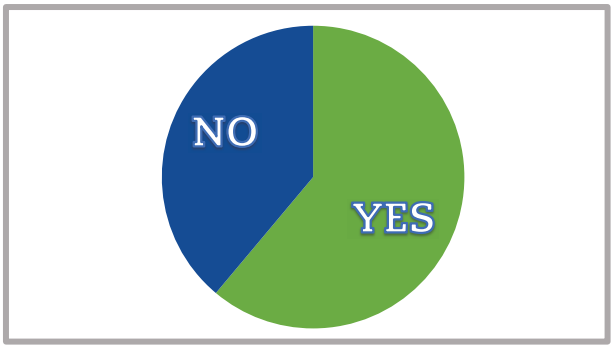
Question 5.d.

Do your national legislation, regulations and/or case law define what the "*components of the environment*" are?



Question 5.e.

Do your national legislation, regulations and/or case law already define the *competent authorities* which would approve the measures of reinstatement?



Annex 4.A2. **Cost of measures of reinstatement of impaired environment analysis of terms used**

by Els Reynaers

I. General background

1. There has been a renewed focus on the importance of developing effective civil liability regimes (domestically and internationally) for the prompt compensation of victims of pollution and other environmental damage after the adoption at the United Nations Conference on Environment and Development in 1992 of the Rio Declaration on Environment and Development (Rio Declaration).[1] More specifically, Principle 13 of the Rio Declaration states that: "States shall develop national law regarding liability and compensation for the victims of pollution and other environmental damage. States shall also cooperate in an expeditious and more determined manner to develop further international law regarding liability and compensation for adverse effects of environmental damage caused by activities within their jurisdiction or control to areas beyond their jurisdiction."

2. It is important to distinguish between *state liability* versus *civil liability* for environmental damage. State liability refers to the liability of international persons governed by rules of international law of state responsibility (and related case law from the International Court of Justice); whereas civil liability refers to the liability of any legal or natural person under the rules of national law adopted either *suo moto* or pursuant to international treaty obligations with the aim to harmonise civil liability rules. However, the distinction between state and civil liability is blurring as an increasing number of treaties establish obligations on States to provide public funds where an operator cannot meet the costs of environmental damage.[2] It must be noted that most transboundary environmental issues are actually resolved through negotiations between states, and that there have only been a few cases where the environmental disputes have led to a formal dispute settlement.[3]

3. Some of the analyses in the context of state liability for environmental damage, remains relevant in the context of our discussions on civil liability for nuclear damage, given that the same terms pertaining to environmental damage and cost of measures or reinstatement of impaired environment – which are terminologies which we find in several other multilateral environmental agreements (MEAs) – have given rise to discussions amongst experts. For instance, the work by the United Nations' International Law Commission (ILC) on the "Draft Principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities" as finalised in 2006 remains a very valuable source of information for our discussions,

1. United Nations Conference on Environment and Development (UNCED), "Resolutions Adopted by the Conference", UN Doc. A/CONF.151/26/Rev.1 (Vol. I), Rio de Janeiro, 3-14 June 1992. Note how Principle 22 of the Stockholm Declaration adopted in 1972 already called on States to "co-operate to develop further the international law regarding liability and compensation for victims of pollution and other environmental damage caused by activities within the jurisdiction or control of such States to areas beyond their jurisdiction".
2. See: Sands, P. and Peel, J. (2012), *Principles of International Environmental Law*, third edition, Cambridge University Press, pp. 926, at pp. 700-701.
3. See: Brunnée, J. (2004), "Of Sense and Sensibility: Reflections on International Liability Regimes as Tools for Environmental Protection", *International and Comparative Law Quarterly*, Vol. 53, No. 2, pp. 351-368, at p. 353.

particularly because its aim is to contribute to the development of international law in this field.[4]

4. In the context of the European Union, the White Paper on Environmental Liability prepared by the European Commission[5] is also relevant, particularly because the discussions contained therein are broader than the final scope of the EU Directive on Environmental Liability with regard to the prevention and remedying of environmental damage,[6] which identifies only three types of damage: to protected species and habitats (as per the Wild Birds Directive (79/409/EEC) and the Habitats Directive (92/43/EC)); to water (as per the Water Framework Directive (2000/60/EC)); and to land. Although earlier drafts of the Directive did include rights to bring civil actions; the ELD as it currently stands is only a public/ administrative law instrument, where liability will be enforced solely by public authorities with no scope for private claims.[7]

5. It may also be worth referring to the decisions from the United Nations Compensation Commission (UNCC) (although in the context of State liability) to appreciate how environmental damage and costs or reasonable measures of reinstatement of the environment have been interpreted in the context of recent claims. The UNCC was created in 1991 as a subsidiary organ of the United Nations Security Council to process claims and pay compensation for losses and damage suffered as a direct result of Iraq's unlawful invasion and occupation of Kuwait in 1990-91. About 2.7 million claims, with an asserted value of USD 352.5 billion, were filed with the UNCC.[8] The UNCC concluded claims-processing in 2005, and the total compensation awarded was USD 52.4 billion to approximately 1.5 million successful claimants. Nineteen UNCC Panels reviewed and evaluated the claims submitted by governments, international organisations, companies and individuals.[9] However, claims relating to the environment (referred to as "F4" claims) could only be made by States and international organisations. The UNCC received 168 such F4 claims seeking approximately USD 80 billion in compensation.[10]

6. Only few international civil liability regimes, which cover compensation for environmental damage, are actually in force; and only the oil pollution-related agreements have been successfully relied upon by pollution victims,[11] which is why we will discuss some of the cases handled by the International Oil Pollution Compensation Funds at greater length below.

II. Meaning "environment"/"environmental damage" and de minimis threshold (significant/substantial) to trigger civil liability

7. In the earliest environmental laws or international treaties in the 1970s-1980s, environment and damage/pollution affecting the environment was interpreted as covering damage to natural resources alone, that is: air, water, soil, fauna and flora, and their interaction. Broader

4. See: 2006 Report of the International Law Commission (ILC Report), 58th Session (May-June/July-August, 2006), submitted to the UN General Assembly, UN Doc. A/61/10, (Chapter V, pp. 101-182)).
5. European Commission, *White Paper on Environmental Liability*, COM(2000)/66/Final, 9 Feb. 2000.
6. Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with Regard to the Prevention and Remedying of Environmental Damage, *Official Journal of the European Union* (OJ) L 143, 30 Apr. 2004 (EU Directive on Environmental Liability).
7. For more information, see Global CCS Institute: www.globalccsinstitute.com/resources/publications-reports-research (accessed 24 Apr. 2024).
8. Note that the UNCC established criteria for claims in respect of environmental damage and the depletion of natural resources based upon a Working Paper submitted by the United States, which in turn drew upon its domestic legislation, including the Oil Pollution Act of 1990 adopted following the *Exxon Valdez* spill in 1989. See Philippe Sands, *supra* note 2, p. 721.
9. For instance, compensation was sanctioned for loss of rangeland and habitats (Jordan got USD 160 million); for shoreline preserves (Kuwait got USD 8 million); and for replacing ecological services there were irreversibly lost (Saudi Arabia got USD 46 million).
10. See for a detailed analysis: Sands, P. and Peel, J. (2012), *supra* note 2, pp. 722-723.
11. See: Brunnée, J. (2004), *supra* note 3, p. 365.

definitions would cover property that forms part of cultural heritage; environmental values or non-service values such as aesthetic aspects of the landscape. Such non-service values include the enjoyment of nature because of its natural beauty and its recreational attributes. The ILC in its 2006 Report pertaining to the Draft Principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities, which it presents as being general and residual in nature, fully supports the view of adopting a broader concept of environmental damage.

8. The ILC also refers to the recent trends where compensation is granted for loss of "non-use value" of the environment (e.g. biodiversity). For instance, the Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety, 2010 ("Nagoya-KL Supplementary Protocol"),[12] which entered into force in 2014, defines damage as an adverse effect on the conservation and sustainable use of biological diversity, taking also into account risks to human health (see Table below for other examples).

9. Moreover, as Philippe Sands points out, clear support for the provision of compensation for environmental damage under the rules of State liability was provided by the UN Security Council in 1991 when it reaffirmed that Iraq was "liable under international law for any direct loss, damage, including environmental damage and the depletion of natural resources, or injury to foreign Governments, nationals and corporations" occurring as a result of its unlawful invasion of Kuwait. The globally binding UN Security Council Resolution 687 determined that a State can be liable for the environmental damage and depletion of natural resources which result from unlawful use of force (without, however, further defining environmental damage).[13]

10. The recent UNCC Panel decisions also used a broad interpretation of the term "environmental damage". For instance, one of the UNCC Panels allowed claims for compensation for damage to natural resources without commercial value, so-called "pure" environmental damage, and also claims where there was only temporary loss of resource use during the period prior to full restoration.[14] Indeed, in 1992, the Governing Council of the UNCC mandated that payments would be available with respect to direct environmental damage and the depletion of natural resources, including losses or expenses resulting from:

    a) Abatement and prevention of environmental damage, including expenses directly relating to fighting oil fires and stemming the flow of oil in coastal and international waters;

    b) Reasonable measures already taken to clean and restore the environment or future measures which can be documented as reasonably necessary to clean and restore the environment;

    c) Reasonable monitoring and assessment of the environmental damage for the purposes of evaluating and abating the harm and restoring the environment;

    d) Reasonable monitoring of public health and performing medical screenings for the purposes of investigation and combating increased health risks as a result of the environmental damage; and

    e) Depletion of or damage to natural recourses.[15]

12. United Nations Environment Programme (UNEP) (2010), "Nagoya - Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety", UN Doc. UNEP/CBD/BS/COP-MOP/5/17, entered into force 5 Mar. 2018, at: www.wipo.int/edocs/lexdocs/treaties/en/cbd-sp/trt_cbd_sp.pdf (accessed 24 Apr. 2024).
13. Sands, P. and Peel, J. (2012), *supra* note 2, p. 708.
14. ILC Report (2006), p. 132, with reference to detailed analysis by Peter H. Sand on the various cases handled by the UNCC.
15. UN Security Council, UNCC Governing Council, Decision 7, UN Doc. S/AC.26/1991/7/Rev.1, 17 March 1992, para. 35.

11. In 1996, A UNEP Working Group tried to analyse this mandate given to the UNCC, and interpreted the distinction between "depletion of natural resources" and "environmental damage" as the former primarily having a commercial value, whereas "environmental damage" relates to injury caused to components of the environment to which typically no commercial value is attached. The UNEP Working Group further suggested that environmental damage could relate to "impairment of the environment" which may be defined as: "A change which has measurable adverse impact on the quality of a particular environment of any of its components including its use and non-use values and its ability to support and sustain an acceptable quality of life and viable ecological balance".[16]

12. The International Court of Justice ("ICJ") in the 1997 *Case concerning the Gabcikovo-Nagymaros Project* also held that: "mindful that, in the field of environmental protection, vigilance and prevention are required on account of the often irreversible character of damage to the environment and of the limitations inherent in the very mechanism of reparation of this type of damage".[17] More recently, the ICJ in the 2018 *Costa Rica v. Nicaragua* case held that

> … it is consistent with the principles of international law governing the consequences of internationally wrongful acts, including the principle of full reparation, to hold that compensation is due for damage caused to the environment, in and of itself, in addition to expenses incurred by an injured State as a consequence of such damage … The Court is therefore of the view that damage to the environment, and the consequent impairment or loss of the ability of the environment to provide goods and services, is compensable under international law. Such compensation may include indemnification for the impairment or loss of environmental goods and services in the period prior to recovery and payment for the restoration of the damaged environment … Payment for restoration accounts for the fact that natural recovery may not always suffice to return an environment to the state in which it was before the damage occurred. In such instances, active restoration measures may be required in order to return the environment to its prior condition, in so far as that is possible.[18]

13. The ILC in its 2001 report on the *Draft Articles on Prevention of Transboundary Harm from Hazardous Activities*, which applies to activities not prohibited by international law which involve a risk of causing significant transboundary harm through their physical consequences, acknowledged that the term "significant" is not without ambiguity and requires a determination in each specific case. [19] That said, the ILC opined that it involves more factual considerations than legal determination and that "significant" is something more than "detectable" but need not be at the level of "serious" or "substantial". The harm must lead to a real detrimental effect on matter, such as, human health, industry, property, environment or agriculture in other states. Such detrimental effects must be susceptible to being measured by factual and objective standards. Conversely, in carrying out lawful activities within their own territories, states have impacts on each other; and such mutual impacts, so long as they have not reached the level of "significant", are considered tolerable. The ILC reiterated this position in its 2006 report on *International Liability in Case of Loss from Transboundary Harm arising out of Hazardous Activities*.[20]

14. The ILC in its 2001 report further referred to the fact that the idea of a "threshold" is reflected in the earliest transboundary environmental disputes, the *Trail Smelter* arbitration

16. See: UNEP (1998), *Report of the Working Group of Experts on Liability and Compensation for Environmental Damage arising from Military Activities*, UN Doc. UNEP(02)/L693, quoted in Sands, P. and Peel, J. (2012), *supra* note 2, pp. 721-722.
17. Case concerning the Gabcikovo-Nagymaros Project (Hungary v. Slovakia), Judgement, *ICJ Reports 1997*, p. 7.
18. Case on Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua), Compensation, Judgement, *ICJ Reports 2018,* p. 15.
19. Report of the ILC on, *inter alia*, *Draft Articles on prevention of transboundary harm from hazardous activities*, Official Records of the General Assembly, 56th Session, Supplement No. 10 (A/56/10), Chapter V.E (pp. 146-170), at p. 152 (Emphasis added).
20. See: ILC Report (2006), *supra* note 4, pp. 123-124; and n. 326 to 328.

addressing air pollution between Canada and the USA (1941), where the award referred to "serious consequences" and the need for the injury to be established by clear and convincing evidence; and the *Lake Lanoux* arbitration between France and Spain (1957) referred to "serious injury" – thresholds which have been reiterated in numerous subsequent environmental treaties as well as domestic environmental laws.[21]

15. The Nagoya-KL Supplementary Protocol refers to an "adverse effect" on biodiversity and identifies various factors based on which "significant" adverse effect is to be determined (see Table below).

16. The Vienna Convention for the Protection of the Ozone Layer, 1985,[22] with its almost universal support, doesn't address civil liability as such but does define "adverse effects" – and thereby embeds an obligation threshold within the treaty – as "changes in the physical environment or biota, including changes in climate, which have significant deleterious effects on human health or on the composition, resilience and productivity of natural and managed ecosystems, or on materials useful to mankind" (see Article 1(2) of the 1985 Vienna Convention). The Parties must adopt appropriate legislative or administrative measures and cooperate in harmonizing appropriate policies to control, limit, reduce or prevent human activities under their jurisdiction should it be found that these activities have or are likely to have "adverse effects" resulting from modification or likely modification of the ozone layer (see Article 2(b) of the 1985 Vienna Convention).

17. The Lugano Convention, in its exemption clause, states that the operator shall not be liable for damage which he proves "was caused by pollution at tolerable levels under local relevant circumstances" (see Article 8(d) of the Lugano Convention).[23]

18. The White Paper on Environmental Liability prepared by the European Commission refers to the importance of the EU Directive on Environmental Liability to contain a minimum threshold for triggering the regime and that only significant damage should be covered (based on the interpretation of the Habitats Directive). It also underscores the need of valuation criteria for the damaged natural resource to be used, "in order to avoid disproportionate costs of restoration"; and that a cost-benefit or reasonableness test will have to be undertaken in each separate case. The starting point for such a test, for cases where restoration is feasible, should be the restoration costs (including the costs of assessing the damage). If restoration is technically not or only partially possible, the valuation of the natural resource has to be based on the costs of alternative solutions, aiming at the establishment of natural resources equivalent to the destroyed natural resources.[24]

19. Perhaps unsurprisingly, there is no agreed international standard for the de minimis threshold for environmental damage, and international conventions use different adjectives to indicate when liability might be triggered under their respective regimes, such as "significant", "substantial" or "serious".[25] In Table A3.1.1. you will find some illustrative definitions of "damage" as found in international law instruments and treaties (all international treaties are listed in the **Annex** to this note):

21. *Ibid*., see in particular references in footnotes 872 to 875.
22. Vienna Convention for the Protection of the Ozone Layer (1985) (1985 Vienna Convention), 1513 UNTS 293, entered into force 22 Sept. 1988, available at: https://treaties.un.org/doc/Treaties/1988/09/19880922%2003-14%20AM/Ch_XXVII_02p.pdf (accessed 24 Apr. 2024).
23. Council of Europe (1993), Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment (Lugano, 21 June 1993) (Lugano Convention), European Treaty Series (ETS) - No. 150, not yet in force, at: www.coe.int/en/web/conventions/full-list?module=treaty-detail&treatynum=150 (accessed 24 Apr. 2024).
24. See EC White Paper on Environmental Liability, *supra* note 5, at pp. 19-20.
25. Report of the UN Secretary General, "Gaps in international and environmental law and environment-related instruments: towards a global pact for the environment", UN Doc. A/73/419, 30 November 2018, para. 99. The Report identifies the lack of such uniform *de minimis* threshold as a notable deficiency in the civil liability regimes of international environmental treaties, but given that these are negotiated by different parties in different moments of time, with different sectoral contexts in mind, this is a hardly surprising result.

Table A3.1.1

Term - source	Definition
Damage & significant adverse effect – Nagoya-KL Supplementary Protocol, 2010 (entered into force in 2014)	- Article 2 – Use of terms – Article 2(2)(b): "Damage" means an adverse effect on the conservation and sustainable use of biological diversity, taking also into account risks to human health, that: i. Is measurable or otherwise observable taking into account, wherever available, scientifically established baselines recognized by a competent authority that takes into account any other human induced variation and natural variation; and ii. Is significant as set out in paragraph 3 below: […] - Article 2(3): A "significant" adverse effect is to be determined on the basis of factors, such as: (a) The long-term permanent change, to be understood as change that will not be redressed through natural recovery within a reasonable period of time; (b) The extent of the qualitative or quantitative changes that adversely affect the components of biological diversity; (c) The reduction of the ability of components of biological diversity to provide goods and services; (d) The extent of any adverse effects on human health in the context of the Protocol. - Article 3 – Scope – Article 3(1): This Supplementary Protocol applies to damage resulting from living modified organisms which find their origin in a transboundary movement. […]. Article 3(6): Parties may use criteria set out in their domestic law to address damage that occurs within the limits of their national jurisdiction. Article 3(7): Domestic law implementing this Supplementary Protocol shall also apply to damage resulting from transboundary movements of living modified organisms from non-Parties.
Damage & Transboundary damage - International Law Commission (ILC), Draft Principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities (2006)	- Principle 2 – Use of Terms: (a) "damage" means significant damage caused to persons, property or the environment; and includes: i. loss of life or personal injury; ii. loss of, or damage to, property, including property which forms part of the cultural heritage[26]; iii. **loss or damage by impairment of the environment**; iv. **the costs of reasonable measures of reinstatement of the property, or environment, including natural resources**; v. the costs of reasonable response measures. Principle 2 – Use of Terms: (e) "transboundary damage" means damage caused to persons, property or the environment in the territory or in other places under the jurisdiction or control of a State other than the State of origin.
Damage – Kiev Protocol, 2003	- Article 2(d) "damage" means: i. Loss of life or personal injury; ii. Loss of, or damage to, property other than property held by the person liable in accordance with the Protocol; iii. Loss of income directly deriving from an impairment of a legally protected interest in any use of the transboundary waters for economic purposes, incurred as a result of impairment of the transboundary waters, taking into account savings and costs; iv. The **costs of measures of reinstatement of the impaired transboundary waters, limited to the costs of measures actually taken or to be undertaken**; v. The costs of response measures, including any loss or damage caused by such measures, to the extent that the damage was caused by the transboundary effects of an industrial accident on transboundary waters.

26. Note that the 1972 Convention concerning the Protection of World Cultural and Natural Heritage contains a comprehensive definition of "cultural heritage", and other treaties, which may have to be consulted to give meaning to the term. See ILC Report (2006), *supra* note 4, pp. 126-127, and footnote 338 for further references.

Damage – Basel Protocol, 1999	- Article 2(c): for the purpose of the Protocol: "Damage" means: vi. Loss of life or personal injury; vii. Loss of or damage to property other than property held by the person liable in accordance with the present Protocol; viii. Loss of income directly deriving from an economic interest in any use of the environment, incurred as a result of impairment of the environment, taking into account savings and costs; ix. The **costs of measures of reinstatement of the impaired environment, limited to the costs of measures actually taken or to be undertaken**; and x. The costs of preventive measures, including any loss or damage caused by such measures, to the extent that the damage arises out of or results from hazardous properties of the wastes involved in the transboundary movement and disposal of hazardous wastes and other wastes subject to the Convention [*reference to Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal*].
Damage – Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment, 1993 (Lugano Convention)	- Article 2(7): "Damage" means: a. loss of life or personal injury; b. loss of or damage to property other than to the installation itself or property held under the control of the operator, at the site of the dangerous activity; c. loss or damage by **impairment of the environment in so far as this is not considered to be damage within the meaning of sub-paragraphs a) or b) above provided that compensation for impairment of the environment, other than for loss of profit from such impairment, shall be limited to the costs of measures of reinstatement actually undertaken or to be undertaken**; d. the costs of preventive measures and any loss or damage caused by preventive measures, to the extent that the loss or damage referred to in sub-paragraphs a) to c) of this paragraph arises out of or results from the hazardous properties of the dangerous substances, genetically modified organisms or micro-organisms or arises or results from waste.
Damage - Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, 2010 (2010 HNS Convention)	- Article 1(6) – Damage means: a) loss of life or personal injury on board or outside the ship carrying the hazardous and noxious substances caused by those substances; b) loss of or damage to property outside the shop carrying the hazardous and noxious substances caused by those substances; c) loss or damage by **contamination of the environment caused by the hazardous and noxious substances, provided that compensation for impairment of the environment other than loss of profit from such impairment shall be limited to costs of reasonable measures of reinstatement actually undertaken or to be undertaken**; and d) the costs of preventive measures and further loss or damage caused by preventive measures.
Pollution damage – costs of reasonable measures of reinstatement - Convention on Civil Liability for Oil Pollution Damage, 1992 (CLC, 1992)	- Article 1(6) "Pollution damage" means: a) Loss or damage caused outside the ship by contamination resulting from the escape or discharge of oil from the ship, wherever such escape or discharge may occur, **provided that compensation for impairment of the environment other than loss of profit from such impairment shall be limited to costs of reasonable measures of reinstatement actually undertaken or to be undertaken.** b) The costs of preventive measures and further loss or damage caused by preventive measures.
Pollution damage - Convention on Civil Liability for Bunker Oil Pollution Damage, 2001	- Article 1(9) "Pollution damage" means: a) Loss or damage caused outside the ship by contamination resulting from the escape or discharge of bunker oil from the ship, wherever such escape or discharge may occur, **provided that compensation for impairment of the environment other than loss of profit from such impairment shall be limited to costs of reasonable measures of reinstatement actually undertaken or to be undertaken.** b) The costs of preventive measures and further loss or damage caused by preventive measures.

Adverse effects - Vienna Convention for the Protection of the Ozone Layer, 1985	- Article 1(2): "adverse effects" means changes in the physical environment or biota, including changes in climate, which have significant deleterious effects on human health or on the composition, resilience and productivity of natural and managed ecosystems, or on materials useful to mankind.
Pollution damage - Convention on Civil Liability for Oil Pollution Damage resulting from Exploration for and Exploitation of Seabed Mineral Resources, 1977	- Article 1(6): "pollution damage" means loss or damage outside the installation caused by contamination resulting from the escape or discharge of oil from the installation and includes the cost of preventive measures and further loss or damage outside the installation caused by preventive measures.

20. In Table A3.1.2. we give an overview of some definitions used to describe "environment". Many domestic laws and international treaties or multilateral environmental agreements (MEAs) may not contain an explicit description of "environment" and instead focus on what constitutes "pollution of the environment" in the context of the specific sectoral law/ treaty.

Table A3.1.2.

Term - source	Definition
Environment – domestic laws	- ***India*:** Environment (Protection) Act, 1986, Section 2(a), "environment" includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organisms and property. - ***New Zealand*:** Environment Act, 1986: environment includes— (a) ecosystems and their constituent parts including people and communities; and (b) all natural and physical resources; and (c) those physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes; and (d) the social, economic, aesthetic, and cultural conditions which affect the matters stated in paragraphs (a) to (c) or which are affected by those matters. - ***England*:** Environmental Protection Act, 1990: The "environment" consists of all, or any, of the following media, namely, the air, water and land; and the medium of air includes the air within buildings and the air within other natural or man-made structures above or below ground.
Natural resources United States: 1980 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), known as Superfund (as amended in 1986) & 1990 Oil Pollution Act (OPA)	- Both CERCLA and OPA define "**natural resources**" to include "land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources..." - Both statutes limit "natural resources" to those resources held in trust for the public, termed **Trust Resources**; and state that a "natural resource" is a resource "belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by" the United States, any State, an Indian Tribe, a local government, or a foreign government [CERCLA §101(16); OPA §1001(20)]. [27]
Environment – Lugano Convention, 1993	- Article 2(10), "Environment" includes: i. natural resources both abiotic and biotic, such as air, water, soil, fauna and flora and the interaction between the same factors; ii. property which forms part of the cultural heritage; and iii. the characteristic aspects of the landscape.
Environment - ILC Draft Principles, 2006	- Principle 2 – Use of Terms: (b) "environment" includes natural resources, both abiotic and biotic, such as air, water, soil, fauna and flora and the interaction between the same factors, and the characteristic aspects of the landscape.

27. For more information, see the US EPA website: www.epa.gov/superfund/natural-resource-damages-primer (accessed 24 Apr. 2024).

III. Meaning of "cost of measures of reinstatement" and "reasonable measures" – including experience with oil pollution incidents

21. A recent trend is observable, both in treaty practice and domestic law, to include the costs of reasonable measures of reinstatement of the environment as a head of damage (see Table above), but it has by and large been left to domestic law to indicate who may be entitled to take such measures.[28] Nevertheless, the cases handled by the United Nations Compensation Commission (UNCC) and he IOPC Funds are relevant in the context of the present note as they addressed transboundary claims pertaining to environmental damage (as interpreted in their respective regimes).

22. The ILC states that it is generally understood that the reference to "reasonable" is to indicate that the costs of such measures should not be excessively disproportionate to the usefulness resulting from the measure, while referring by way of example to *Commonwealth of Puerto Rico v. SS Zoe Colocotroni* handled by the US Court of Appeals (1981) pertaining to oil pollution, in which it held:

> [Recoverable costs are costs] reasonably to be incurred… to restore or rehabilitate the environment in the affected area to its pre-existing condition, or as close thereto as is possible without grossly disproportionate expenditures. The focus in determining such a remedy should be the steps a reasonable and prudent sovereign or agency would take to mitigate the harm done by the pollution, with attention to such factors as technical feasibility, harmful side effects, compatibility with or duplication of such regeneration as is naturally to be expected, and the extent to which efforts beyond a certain point would become either redundant or disproportionately expensive.[29]

A. United Nations Compensation Commission (UNCC)

23. The UNCC has interpreted "costs of reasonable measures of reinstatement" to mean as "any reasonable measures aiming to assess, reinstate, or restore damaged or destroyed components of the environment or where this is not possible, to introduce, where appropriate, the equivalent of these components into the environment".[30] The summary by one of the F4 Panel commissioners of the UNCC, Peter H. Sand, about the elements of the UNCC's practice and interpretation is relevant for the wider environmental field.[31] The F4 Panel held that monitoring and assessment activities (M&A) activities were "reasonable" whenever there was a plausible risk of environmental harm, even if the monitoring results eventually established that no damage had been caused. With regard to proposed M&A projects, he F4 Panel did seek to ensure that these should be technically optimal for fact-finding as well as cost-effective. Importantly, and possibly of relevance for the nuclear energy sector as well, the F4 Panel (mainly in the field of public health) approved a number of M&A claims which were precautionary in nature, designed to identify potential risks attributable to the Gulf War so as to inform necessary future action – remedial or preventive. As explained by Sand, several of those projects (e.g. for cancer detection) will require long-term monitoring over periods of decades after the conflict.[32]

28. See: ILC Report (2006), *supra* note 4, pp. 130-131, and n. 350-351, including reference to domestic law in Germany.
29. See: ILC Report (2006), *supra* note 4, p. 131, and: *Commonwealth of Puerto Rico v. SS Zoe Colocotroni*, United States Court of Appeals, First Circuit, 682 F.2 d, p. 652 (1st Cir. 1981). Background and case available at: www.ecolex.org/details/court-decision/commonwealth-of-puerto-rico-v-ss-zoe-colocotroni-5825fcf1-8d5e-476b-bb7e-9253b796085e/ (accessed 24 Apr. 2024).
30. See: ILC Report (2006), *supra* note 4, p. 131 and n. 352, with further references to the UNCC decisions.
31. Peter H. Sand, Compensation for Environmental Damage from the 1991 Gulf War, available at: www.researchgate.net/publication/292506890_Compensation_for_environmental_damage_from_the_1991_Gulf_War (accessed 24 Apr. 2024). See also analysis by Philippe Sands, footnote 2, pp. 723-725.
32. *Ibid.*, analysis under heading 1.

24. It is noteworthy that there were also several government claims of environmental solidarity costs for reimbursement of costs that they had incurred in assisting the Gulf countries in the abatement and prevention of environmental damage resulting from the 1991 conflict, such as the provision of technical experts and equipment for oil spill control.[33] Importantly, in the context of transboundary environmental damage, the F4 Panel repeatedly stressed that claimant countries also had a duty to mitigate and contain environmental damage to the extent possible and reasonable in the circumstances. Conversely, a failure to take measures to prevent aggravation of the environmental damage, led the F4 Panel to deny or reduce the compensation amounts claimed by some governments.[34]

25. With regard to valuation of ecological losses, the F4 Panel took into account a number of novel methodologies proposed by leading experts in the field. While it considered retrospective contingent valuation and 'travel cost' surveys inadequate for quantifying some government's alleged loss of recreational shoreline uses, it accepted "habitat equivalency analysis" (HEA)[35] as an appropriate method for determining the nature and extent of compensatory remediation in order to make up for the loss of ecological services, such as rangeland wildlife habitats and natural shoreline habitats.[36] The 4F Panel had previously defined the primary objective of remediation as "restoring the environment to pre-invasion conditions, in terms of its overall ecological functioning rather than on the removal of specific contaminants or restoration of the environment to a particular physical condition." Hence, with regard to ecological services that were irreversibly lost in the wake of the 1991 Gulf War, the only practicable remediation was to provide victim countries with new ecological services that would be roughly equivalent in value.[37] This approach stands in sharp contrast to the view taken under the oil pollution conventions, which we will discuss below.

B. International Oil Pollution Compensation Funds (IOPC Funds)

26. Civil liability for damage caused by oil pollution is essentially governed by three well-developed international instruments adopted under the auspices of the International Maritime Organisation (IMO): the Convention on Civil Liability for Oil Pollution Damage, 1992 (CLC); the Convention on the Establishment of an International Fund for Compensation of Pollution Damage (Oil Fund Convention); and the 2003 Supplementary Fund Convention (see Annex/Table below with references). This regime also led to the creation of the International Oil Pollution Compensation Funds (IOPC Funds), which are two intergovernmental organisations (the 1992 Fund and the 2003 Supplementary Fund) which provide compensation for oil pollution damage resulting from spills of persistent oil from tankers, in circumstances where the shipowners' limit of liability has been exceeded or there is no financial security in place to cover the shipowners' liabilities.[38] The 1992 Fund is composed of States Parties to the 1992 Fund Convention, which covers the payment of compensation to people, businesses or organisations that suffer losses due to pollution caused by persistent oils from tankers; the Supplementary Fund provided an additional tier of compensation to victims in States which are Party to the Supplementary Fund Protocol.[39]

33. *Ibid*., analysis under heading 2.
34. *Ibid*., analysis under heading 3.
35. See, for instance, Desvousges, W. H. and N. Gard, "Habitat and Resource Equivalency Analysis: A Critical Assessment", *Ecological Economics*, Vol. 143, Jan. 2018, pp. 74-98 (discussing applications of HEA in both the US and the EU).
36. *Ibid*., analysis under heading 4.
37. *Ibid*.
38. International Oil Pollution Compensation Funds (IOPC Funds), *Guidelines for Presenting Claims for Environmental Damage*, 2018 Edition (IOPC Funds' Guidelines).
39. *Ibid*., paras. 1.1-1.2. The *Erika* oil spill (1993) and the *Prestige* oil spill (2002) raised concerns that the maximum compensation under the 1992 Fund Convention were insufficient to meet compensation needs, which prompted the adoption of the 2003 Supplementary Fund Convention, *infra* note 115.

27. The aim of the 1992 Fund is to provide compensation for losses resulting from a pollution incident involving a tanker, so that the claimant is returned to the same economic position in which they would have been if the oil spill had not happened. In the case of claims for environmental damage, such losses may be for loss of profit, but more often are likely to be costs incurred in respect of post-incident studies and reinstatement measures.[40] The Fund, in cooperation with the insurer, usually appoints experts to assess the impact of the spill and progress of the clean-up operations and will also be used to review the technical merits of claims and to independently determine the losses.[41]

28. In the 2018 IOPC Funds' *Guidelines for Presenting Claims for Environmental Damage* ("IOPC Funds' Guidelines"), it is acknowledged that "impairment of the environment" is not defined in the Conventions, but is generally understood to mean "an adverse alteration to the environment leading to a deterioration or weakening of its functioning".[42] Importantly, the IOPC Funds' Guidelines underscore the fact that the Conventions do not provide compensation for "pure" environmental damage, that is, compensation for the loss of environmental services. Rather, they cover the costs of reinstatement of the damaged environment to restore those lost services, as far as possible.[43] Indeed, the 1992 Fund Claims Manual explicitly states that "compensation is not paid in respect of claims for environmental damage based on an abstract quantification calculated in accordance with theoretical models." It further states that compensation will also not be paid for damages of a punitive nature on the basis of the degree of fault of the wrongdoer.[44]

29. Although the reinstatement measures as such are not defined in the 1992 Conventions, the *Claims Manual* states that "in view of the fact it is virtually impossible to bring a damaged site back to the same ecological state that would have existed had the oil spill not occurred, the aim of any reasonable measures of reinstatement should be to re-establish a biological community in which the organisms characteristic of that community at the time of the incident are present and are functioning normally.[45] This more pragmatic approach is also driven by the fact that bringing back a damaged site to a theoretical baseline or pre-spill condition is not always achievable, particularly in the absence of baseline conditions (only few areas where, for instance, comprehensive surveys of resources vulnerable to oil pollution are regularly undertaken, would have such baseline information).

30. The *Claims Manual* further identifies criteria which need to be fulfilled for the costs of measures of reinstatement to qualify for compensation:

    i. The measures should be likely to accelerate significantly the natural process of recovery.

    ii. The measures should seek to prevent further damage as a result of the incident.

    iii. The measures should, as far as possible, not result in the degradation of other habitats or in adverse consequences for other natural economic resources.

    iv. The measures should be technically feasible.

    v. The costs of the measures should be in proportion to the extent and duration of the damage and the benefits likely to be achieved.[46]

    vi. Moreover, the link between the measures taken and the damaged component of the environment is essential.[47]

40. *Ibid.*, para. 1.3.
41. *Ibid.*, para. 1.9.
42. *Ibid.*, para. 1.10.
43. *Ibid.*, para. 1.14.
44. IOPC Funds, *Claims Manual*, 2019 Edition, (IOPC Claims Manual) para. 1.4.13.
45. *Ibid.*, para. 3.6.4 (emphasis added).
46. *Ibid.*, para. 3.6.5.
47. IOPC Funds' Guidelines, *supra* note 38, p. 11, para. 4.2.

31. The *Claims Manual* and the IOPC Funds' Guidelines further clarify that costs of studies to establish the nature and extent of environmental damage and to determine whether or not reinstatement measures are necessary and feasible may be admissible as well as studies to monitor recovery, both occurring naturally and following the implementation of reinstatement measures.[48]

32. Importantly, as this is more akin to what is foreseen under the international civil liability regimes for nuclear damage as well, anybody in a 1992 Fund Member State who has suffered a financial loss due to oil pollution caused by a tanker can claim compensation. Although the 1992 Conventions do not restrict who can claim compensation, in the case of environmental damage, claims are mostly presented by governments or government agencies mandated to manage natural resources. The IOPC Funds' Guidelines further elaborate that under certain circumstances, individuals or organisations may submit claims but only as the natural resource owner or manager or with the co-operation, consent and co-ordination of the resource owner or manager, where the link with the resource is established, such as a wildlife organisation or non-governmental organisation (NGO) that has historically been active in the affected area.[49]

The IOPC Funds' Guidelines give two examples in terms of who can claim under their regime (which we reproduce below):[50]

Example 1

Seabirds are particularly vulnerable to oil pollution and NGOs or special interest groups concerned with the welfare of seabirds often take responsibility for efforts to clean and rehabilitate oiled birds. Such groups might also initiate studies to determine the impact of mortalities resulting from the spill on populations of the affected seabirds and subsequently propose reinstatement measures to restore populations to pre-spill levels. Subject to the reinstatement criteria, it is possible that claims for associated costs for both the study and the reinstatement measures are admissible.

Example 2

Landowners who either own the shoreline or own land abutting the shoreline might routinely allow their animals to graze along the shoreline. As a result of a spill, a claim for economic loss for the cost of alternative fodder might be admissible, but the landowner may also wish to undertake reinstatement measures to restore the shoreline as quickly as possible. In many countries the shoreline is a national asset and so any such measures would need to be undertaken with the agreement of the appropriate national authority, but in principle, a claim for reasonable reinstatement costs might be admissible.

33. The Annex to the IOPC Funds' Guidelines gives an overview of potential reinstatement measures that might be considered in the event of pollution damage for a range of habitats and populations and a commentary on the likely admissibility of the measures proposed.[51] For instance, with regard to sand beaches, sand replenishment as a potential reinstatement measure will rarely be considered a reasonable option as long as natural processes are likely to replenish sand removed in clean-up operations; whereas for sand dunes, the replanting of dune plants may be acceptable together with measures to reduce disturbance by restricting access to the dunes; and with regard to marine mammals, the capture/cleaning/rehabilitation /release of oiled animals is considered to be a preventive measure, etc.

48. IOPC Funds Claims Manual, *supra* note 44, para. 1.4.12 and IOPC Funds' Guidelines, *supra* note 38, paras. 1.13 and 4.3.
49. IOPC Funds' Guidelines, *supra* note 38, para. 2.1.
50. *Ibid*., para. 2.2.
51. *Ibid*., para. 5.26 and Annex, p. 33.

34. The 1992 Fund (and its preceding 1971 Fund) has handled many claims by now, including pertaining to environmental damage, and some of the cases highlighted in the IOPC Funds' Guidelines as well as Fund cases analysed by Philippe Sands, an environmental law expert, may be worth referring to:[52]

Table A3.1.3.

Patmos spillage, 1985[53]

- "In 1985… the IOPC Fund addressed a… GBP 2.3 million case by the Italian [G]overnment for damage to the marine environment arising out of a spillage from the *Patmos*, a Greek-registered tanker, off the coast of [Italy]… [However, i]n the absence of any documentation from the Italian government indicating the nature of the damage or the basis on which the amount claimed had been calculated, the IOPC Fund rejected the claim."[54]
- Subsequently, the Italian Government pursued the case before domestic courts. In 1986, the Court of First Instance rejected the claim for compensation for ecological damage, *inter alia*, because the State had not incurred any direct or indirect loss as a result of the oil spill since no disbursements for the cleaning up of the coastline had been incurred nor had any loss for profit occurred.[55]
- "In 1989, the [Italian] **Court of Appeal** overruled the decision, interpreting the 1969 CLC to include as environmental damage 'everything which alters, causes deterioration in or destroys the environment in whole or in part'" and further held that

  > the environment must be considered as a unitary asset, separate from those of which the environment is composed (territory, territorial waters, beaches, fish, etc.) and it includes natural resources, health and landscape. The right to the environment belongs to the State, in its capacity as representative of the collectivities. The damage to the environment prejudices immaterial values, which cannot be assessed in monetary terms according to market prices, and consist of the reduced possibility of using the environment. The **damage can be compensated on an equitable basis**, which may be established by the Court on the grounds of an opinion of experts (…) The definition of "pollution damage" as laid down in Article 1(6) [of the CLC, 1969] is wide enough to include damage to the environment of the kind described above.[56]

- In 1993, the Court of Appeal awarded a final amount of GBP 827 000 for environmental damage (well above the amount suggested by experts). "It found that the experts were wrong to calculate damages based only on market prices for [affected] fish… [instead b]ecause the environment and its natural resources were worth more to the community, [it] determined the damages according to **principles of equity."**[57]

Haven case, 1991 (earlier versions applied: 1969 CLC and 1971 Fund Convention)[58]

- "[In] 1991, the Haven, a Cypriot-registered tanker, caught fire and broke apart close to the coast of Genoa, Italy and released over 10 000 tonnes of oil, causing damage to both the Italian and the French coasts, requiring extensive clean-up operations."[59]
- The Italian Government submitted a claim for damage to the marine environment for a provisional amount of GBP 47 million before the Fund, which was joined by claims from 1200 Italian claimants, the French government and municipalities and public bodies.
- However, the Director of the IOPC Fund concluded that the "Conventions were designed to provide compensation to victims of pollution damage, and that claims which did not related to such compensation fell outside the scope of the Conventions."[60] Claims relating to "non-quantifiable elements of damage to the environment were of punitive nature", calculated on the basis of the seriousness of the fault of the wrongdoer or the profit earned by the wrongdoer, are out of scope of the Conventions, and must be pursued on the basis of national law.[61]
- "[In] 1996, the Court of First Instance in Genoa ruled that 'pollution damage' in the 1969 CLC and 1971 Fund Convention had a wide enough meaning to include natural resource and environmental damage. Because these could not be calculated according to commercial or economic valuations, the court awarded GBP 13 million [ ], about one-third of the clean-up cost [since some of the clean-up did not repair all the damage caused and the award essentially wanted to cover the un-remedied residual damage]." The IOPC Fund appealed this decision, and Italy also increased its request for environmental damages to GBP 284 million.
- In 1999, the parties of the case before the Italian courts (that is: Italy, the shipowner, the UK Mutual Steam Ship Assurance Association and the IOPC Fund) withdrew all legal actions and signed an agreement. "The shipowner and the UK Club [insurance body] made an *ex gratia* payment to Italy of GBP 9.1 million in addition to the amount indicated by the Court of First Instance, without admitting liability beyond the shipowner's limits under the 1969 CLC."[62]

52. *Ibid.*, pp. 13, 15, 16, 18, 19, 20, 24. See also Sands, P. and Peel, J. (2012), *supra* note 2, pp. 748-755 for discussion of earlier cases handled by the 1992 Fund.
53. *Ibid.*, pp. 751-752.
54. *Ibid.*
55. *Ibid.*
56. *Ibid.* Emphasis added.
57. *Ibid.*, p. 752. Emphasis added.
58. *Ibid.*, pp. 752-754.
59. *Ibid.*, p. 752.
60. *Ibid.*, p. 753.
61. *Ibid.*
62. *Ibid.*

Sea Empress oil spill, 1996[63]

- The *Sea Empress* ran aground and spilled 72 000 tonnes of crude due to which some 200 km of coastline were impacted, including a national park.
- The UK Government set up a committee of marine scientists, tasked with assessing the impact of the incident, which in turn commissioned some 80 studies of the key species and habitats most heavily impacted by oil. However, "many of the studies were inconclusive citing difficulties due to lack of pre-spill data, natural variability and inadequate information on the degree of contamination and distribution of oil to allow comparisons between sites that had been oiled and those that had not."[64]
- "Although the overall cost of these studies was more than [GBP] 2 million, no claim for compensation was submitted because at that time it was not clear that this might have been an admissible claim"; whereas "the subsequent interpretation agreed by the 1992 Fund Assembly and reproduced in the Claims Manual, indicates that such a claim submitted today would, in principle, be eligible for compensation."[65]

Erika oil spill, 1999[66]

- This case addressed the issue of "pure" environmental damage.
- In 1999 the *Erika* tanker (registered in Malta) broke in two off the coast of Brittany, France, spilling some 19 800 tonnes of heavy oil and causing damage to around 400 km of shoreline.
- By 2010, about 7 100 claims for compensation had been submitted to the **IOPC Fund** in respect of the incident for a total of EUR 389 million; out of which Steamship Mutual, the shipowner's insurer, paid EUR 12.8 million and the 1992 Fund about EUR 117 million. Some 1000 claims totalling EUR 32 million were rejected.
- "On the basis of a report by an expert appointed by the magistrate in the **Tribunal Correctionnel de Paris**, **criminal charges** were also brought against the master of the *Erika*, the representative of the registered owner, and various other entities. A number of claimants, including the French Government, local authorities and environmental associations **joined the criminal proceedings as civil parties, claiming compensation totalling Euro 400 million**."[67]
- "[In] 2008, the [French] court held four parties criminally liable for the offence of causing pollution **and also jointly and severally liable in civil law for the damage caused by the incident…** The court held that the 1992 Conventions did not deprive the civil parties of their right to obtain compensation for their damage in the criminal courts."[68]
- "Claimants in the proceedings were awarded compensation based on national law for economic losses, damage to the image of several regions and municipalities, moral damages and **damages to the environment."**[69]
- **The Tribunal Correctionnel de Paris assessed the total damages to be about EUR 204 million, including EUR 154 million for the French State.**
- "The court recognised the right to compensation for damage to the environment for a local authority with special powers for the protection, management and conservation of a territory." Importantly, the court also "recognised the right of an environmental protection association to claim compensation, not only for the moral damage caused the collective interests, which it seeks to defend, but also for the damage to the environment which affected the collective interests that it had a statutory mission to safeguard."[70]
- In 2010, the **Cour d'appel de Paris** confirmed the Judgment of the Tribunal Correctionnel de Paris. "The Court of Appeal accepted not only material damages (clean-up, restoration measures and property damage) and economic losses, but also accepted **moral damage resulting from the pollution**, including loss of enjoyment, damage to reputation and brand image, and **moral damage arising from damage to the natural heritage**."[71]
- It also held that it was sufficient that the pollution touched the territory of a local authority for these authorities to be able to claim for the direct or indirect damage caused to them by the pollution; and accepted claims for moral damage from other civil parties.[72]

63. IOPC Funds' Guidelines, *supra* note 38, p. 13.
64. *Ibid*.
65. *Ibid*.
66. Sands, P. and Peel, J. (2012), *supra* note 2, pp. 754-755. Emphasis added.
67. *Ibid*.
68. *Ibid*.
69. *Ibid*.
70. *Ibid*., p. 754 and n. 416 referring to D. Papadopoulou, The Role of French Environmental Associations in Civil Liability for Environmental Harm: Courtesy of Erika, 21(1) *Journal of Environmental Law* 87 (2009), for further analysis.
71. Sands, P. and Peel, J. (2012), *supra* note 2, p. 755. Emphasis added.
72. Cour d'appel de Paris, 30 March 2010, 08-02278 &, available at: https://actu.dalloz-etudiant.fr/fileadmin/actualites/pdfs/MARS_2014/Erika_CA_Paris_30_mars_2010.pdf (accessed 24 Apr. 2024).

- **"The Court of Appeal also accepted the right to compensation for "pure" environmental damage, i.e. damage to non-marketable environmental resources that constitute a legitimate collective interest";**[73] **and assessed the civil damages as follows: (1) material damages – EUR 165.4 million; (2) moral damages (loss of enjoyment, damage to reputation and brand image, moral damage arising from damage to the natural heritage) – EUR 34.1 million; and (3) pure environmental damage (damage to non-marketable environmental resources) – EUR 4.3 million. Total civil damages = EUR 203.8 million.**[74]
- In final instance, the **French Court of Cassation (Criminal Chamber),** confirmed the judgement of the Paris Court of Appeals in its decision rendered on 25 September 2012.[75] It confirmed the notion of "**pure ecological damage",** as interpreted by the lower courts, as an "**objective, autonomous injury**", which means **"any significant interference with the natural environment, including, but not limited to, air, atmosphere, water, soils, land, landscapes, natural sites, biodiversity and the interaction between these elements, which has no repercussions on a particular human interest but affects a legitimate collective interest."**[76]
- Importantly, the decision of the Court of Cassation formed the only basis for the compensation of "pure" environmental damage in France until it was included in the **Civil Code by the law of 8 August 2016**.[77] "The new law, known as 'Chapter III of the French Civil Code concerning compensation for environmental damage', inserted Article 1246 of the Civil Code which states that "*any person who causes environmental damage will be held liable*". Environmental damage is described in a very wide sense. It may arise from a significant damage to the elements or functions of ecosystems, or to the collective benefits drawn by human beings from the environment (Art. 1247)."

Hebei Spirit oil spill, 2007[78]

- "[In] 2007, the tanker *Hebei Spirit* was struck by a crane barge while at anchor close to the west coast of the Republic of Korea. The collision resulted in a release of 10 900 tonnes of crude oil at sea."[79] The damage is estimated to have been around KRW 438.5 billion (approx. SDR 276 000).[80]
- The Korean Government instructed a leading scientific organisation in Korea to carry out a number of environmental monitoring programs, including studies on the impact of marine pollution in the affected areas for the period 2007-2009 and restoration studies in 2010-2011.[81]
- The results of the monitoring program from 2007-2009 showed that the level of pollutants attributable to the *Hebei Spirit* oil spill dropped to background levels during 2008 and were undetectable in 2009.
- The Korean Government also financed a long-term monitoring program of the Yellow Sea in the period 2010-2011, with as its focus changes of the environment from a purely scientific point of view. However, the 1992 Fund found this study to be too remote to be linked to the incident.[82]
- "In 2016, the Seosan Court (Court of First Instance) reached the same conclusion as the 1992 Fund, that the studies undertaken in 2007-2009 were admissible", but not the subsequent broader report from 2010-2011.[83]

Volgoneft 139 accident, 2007[84]

- "[In] 2007, the Russian-registered tanker Volgoneft 139 broke in two in the Kerch Strait linking the Sea of Azov and the Black Sea between the Russian Federation and Ukraine", causing it to spill 2 000 tonnes of fuel oil.[85]
- "The Ministry of Natural Resources and Ecology of the Russian Federation… submitted a claim for environmental damage for [ ] RUB 6 048 million, based on the quantity of oil spilled, multiplied by an amount of roubles per tonne [referred to as the 'Metodika' calculation]."[86]

73. Sands, P and Peele, J. (2012), *supra* note 2, p. 755.
74. Cour de cassation, Chambre criminelle, 25 September, 2012, pourvoi no 10-82.938, available at: www.legifrance.gouv.fr/affichJuriJudi.do?oldAction=rechJuriJudi&idTexte=JURITEXT000026430035&fastPos=1 (accessed 24 Apr. 2024).
75. *Ibid.*
76. *Ibid.* Emphasis added.
77. See: Loi n° 2016-1087 du 8 août 2016 pour la reconquête de la biodiversité, de la nature et des paysages. See more at: "The Notion of 'Ecological Prejudice' Now in the French Civil Code": www.latham.london/2017/01/the-notion-of-ecological-prejudice-now-in-the-french-civil-code/ (accessed 24 Apr. 2024). Emphasis added.
78. IOPC Funds' Guidelines, *supra* note 38, p. 15.
79. *Ibid.*
80. Sands, P. and Peele, J. (2012), *supra* note 2, p. 749 and n. 374.
81. IOPC Funds' Guidelines, *supra* note 38, p. 15.
82. *Ibid.*
83. *Ibid.*
84. *Ibid.*, p. 24.
85. *Ibid.*
86. *Ibid.*

- The 1992 Fund rejected the claim based on the ground that the claim was founded "on an abstract quantification of damages, calculated in accordance with a theoretical model, which was in contravention of Article 1(6) of the 1992 CLC" (i.e. the "pollution damage" definition).[87]
- *Note: even under the US Clean Water Act, a similar formula for civil liability is used, where the number of barrels of oil spilled is multiplied (which was used to calculate the maximum possible civil penalty under the CWA in the case of the Deepwater Horizon spill, discussed below).*

For other examples: the IOPC Funds' website contains an updated overview of all the incidents/ claims handled by the Funds: www.iopcfunds.org/incidents/incidents-summary-table (accessed 24 Apr. 2024)

C. Deepwater Horizon oil spill – United States – domestic law: criminal and civil liability & role of Trustees

35. In April 2010, the *Deepwater Horizon* mobile drilling unit exploded, caught fire, and eventually sank in the Gulf of Mexico. Eleven workers died and several more were injured. It also resulted in a massive release of oil and other substances from BP's Macondo well. For 87 days after the explosion, the well continuously discharged oil and natural gas into the northern Gulf of Mexico. Approximately 3.19 million barrels (134 million gallons/507 million litres) of oil were released, by far the largest offshore oil spill in the United States' history. The total volume of oil released is about 12 times more than the 1989 *Exxon Valdez* oil spill that took place in Alaska. Oil spread from the deep ocean to the surface and nearshore environment, from Texas to Florida, affecting about 2 100 km of shoreline. The oil injured natural resources as diverse as deep-sea coral, fish and shellfish, productive wetland habitats, sand beaches, birds, endangered and threatened sea turtles, and protected marine mammals. Additionally, the oil spill prevented people from fishing, going to the beach and enjoying their typical recreational activities along the Gulf of Mexico. Extensive response actions, including clean-up activities and actions to try to prevent the oil from reaching sensitive resources near the shore, were undertaken to try to reduce the harm to people and the environment. However, response actions also had their own impacts on the environment (for instance, burning oil produced air pollution; increased boat traffic and shoreline activity disturbed habitats; etc.).[88]

36. The US *Deepwater Horizon* case led to both complex civil litigation[89] and criminal prosecution. In 2013, BP Exploration and Production Inc. pleaded guilty to 14 criminal counts for its illegal conduct leading to and after the 2010 *Deepwater Horizon* disaster, and was sentenced by the Eastern District of Louisiana to pay USD 4 billion in criminal fines and penalties, the largest criminal resolution in U.S. history. According to the sentence imposed pursuant to the plea agreement, more than USD 2 billion dollars will directly benefit the Gulf region. By order of the court, approximately USD 2.4 billion of the USD 4 billion criminal recovery is dedicated to acquiring, restoring, preserving and conserving – in consultation with appropriate state and other resource managers – the marine and coastal environments, ecosystems and bird and wildlife habitat in the Gulf of Mexico and bordering states harmed by the *Deepwater Horizon* oil spill. This portion of the criminal recovery is also to be directed to significant barrier island restoration and/or river diversion off the coast of Louisiana to further benefit and improve coastal wetlands affected by the oil spill. An additional USD 350 million will be used to fund improved oil spill prevention and response efforts in the Gulf through research, development, education and training.[90]

87. *Ibid*.
88. See: Trustees, *Plan for* Deepwater Horizon *Oil Spill Natural Resource Injury Restoration: An Overview*, October 2015 (Trustees' Plan) available at: www.gulfspillrestoration.noaa.gov/sites/default/files/wp-content/uploads/Overview_10-08-15_for-posting.pdf (accessed 24 Apr. 2024).
89. See: Cruden, J. C., et al (2016), The Deepwater Horizon Oil Spill Litigation: Proof of Concept for the Manual for Complex Litigation and the 2015 Amendments to the Federal Rules of Civil Procedure, *Michigan Journal of Environmental and Administrative Law*, Vol. 6, No. 1, available at: https://repository.law.umich.edu/cgi/viewcontent.cgi?article=1056&context=mjeal (accessed 24 Apr. 2024).
90. See US EPA website for summary of criminal prosecutions: https://cfpub.epa.gov/compliance/criminal_prosecution/index.cfm?action=3&prosecution_summary_id=2468 (accessed 24 Apr. 2024).

37. In April 2016, the federal court in New Orleans entered a consent decree resolving civil claims against BP. This settlement resolves the US government's civil penalty claims under the Clean Water Act, the government's claims for natural resource damages (NRD) under the Oil Pollution Act, and also implements a related settlement of economic damage claims of the Gulf of Mexico states and local governments. Taken together, this resolution of civil claims is worth more than USD 20 billion and is the largest settlement with a single entity in the history of federal law enforcement.[91]

38. Under the Consent Decree, BP will pay a Clean Water Act civil penalty of USD 5.5 billion (plus interest), USD 8.1 billion in natural resource damages (this includes USD 1 billion BP already committed to pay for early restoration), up to an additional USD 700 million (some of which is in the form of accrued interest) for adaptive management or to address injuries to natural resources that are presently unknown but may come to light in the future, and USD 600 million for other claims, including claims under the False Claims Act, royalties, and reimbursement of NRD assessment costs and other expenses due to this incident. The US Department of Justice confirmed that this settlement includes both the largest civil penalty ever paid by any defendant under any environmental statute, and the largest recovery of damages for injuries to natural resources.[92]

39. Under the economic damages settlement, BP will pay USD 4.9 billion to the Gulf of Mexico states in a parallel settlement that resolves their economic damage claims arising from this incident. In other related agreements, BP will also pay up to another USD 1 billion to resolve similar claims the company faces from various local governments in the Gulf of Mexico region.

40. From an international law perspective, it is noteworthy that the Deepwater Horizon incident exposed how the oil pollution conventions (discussed above) essentially relate to oil pollution primarily involving tankers but do not cover oil pollution from fixed platforms, like the *Deepwater Horizon*.[93]

41. For the purpose of the note with its focus on trying to better understand the meaning of "cost of measures of reinstatement of impaired environment", the relevance of studying how the *Deepwater Horizon* incident was handled domestically in the United States, lies less in studying the various litigations but more in reviewing how from a civil liability perspective, the restoration costs and NRD were interpreted, calculated and applied. Under the US Oil Pollution Act, 1990, a Council of federal and state "trustees" was established soon after the spill to assess the natural resource injuries resulting from the *Deepwater Horizon* incident, to develop a restoration plan to compensate for those injuries, and acquire funding to make restoration possible. The Trustees act on behalf of the public and they comprise a group of federal agencies (such as the US Environmental Protection Agency (EPA)) along with designated agencies representing each of the five Gulf of Mexico states (see also separate discussion below on standing of parties).[94]

42. The US Oil Pollution Act makes the parties responsible of an oil spill, liable for the costs of responding to and cleaning up the spill, as well as the costs of assessment and restoration needed to compensate for injuries to natural resources and the services they provide. As mentioned, the Trustees have reached a settlement with BP to resolve BP's liability for natural resource injuries from the *Deepwater Horizon* oil spill. Under this settlement, BP will pay up to USD 8.8 billion for restoration.[95]

91. See US Department of Justice website: www.justice.gov/opa/pr/statement-attorney-general-loretta-e-lynch-agreement-principle-bp-settle-civil-claims (accessed 24 Apr. 2024).
92. *Ibid*.
93. See further analysis, for instance, by: M. Smith, The Deepwater Horizon Disaster: An Examination of the Spill's Impact on the Gap in International Regulation of Oil Pollution from Fixed Platforms, *Emory International Law Review*, 2011, pp. 1477-1516, at: http://law.emory.edu/eilr/_documents/volumes/25/3/comments/smith.pdf (accessed 24 Apr. 2024).
94. For this purpose, we will extensively rely on the Trustees' Plan, see *supra* note 88.
95. See: Trustees' website: www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan (accessed 24 Apr. 2024).

43. Because the injuries affected such a broad array of linked resources and ecological services over such a large area, the Trustees proposed a restoration plan that uses a comprehensive and integrated ecosystem approach to appropriately address these ecosystem-level injuries. This approach is outlined in the "comprehensive restoration plan", which will allocate funds from the BP settlement for restoration.[96]

44. The Trustees conducted a detailed assessment to determine the nature, degree, geographic extent, and duration of injuries from the *Deepwater Horizon* incident to both natural resources (such as water column organisms, bottom-dwelling organisms, nearshore ecosystems, birds, sea turtles, and marine mammals) as well as the services they provide to the public (such as recreational beach use and fishing). To quantify the injuries, the Trustees compared the injured resources and services with baseline conditions – that is, the condition that would have existed if the Deepwater Horizon incident had not occurred. Because of the vast scale of the incident and potentially affected resources, the Trustees evaluated injuries to a set of representative habitats, communities, species and ecological processes. The Trustees evaluated many endpoints, including mortality, immune system suppression, reproductive impairment, growth inhibition, behavioural impairment, developmental defects, etc. The Trustees used more than just counts of animals killed by the spills, because so many of the animals killed were not visible. The Trustees' "Plan for *Deepwater Horizon* Oil Spill Natural Resource Injury Restoration" offers a detailed overview of how they assessed injury (including exposure, toxicity) per natural resource and their methodology for injury quantification.[97] For instance, the Trustees estimated that about 84 500 birds of at least 93 species died as a direct result of the spill, and that an additional 17 900 chicks died before they could fledge because their parents perished and did not return to nest. They further quantified that between 4 900 and 7 600 large adult sea turtles and between 56 000 and 166 000 small juvenile sea turtles, were killed by the oil spill. They further estimated that the spill caused a 35% increase in death of the bottlenose dolphins and a 46% increase in failed reproduction. These injuries are estimated to result in up to a 51% decrease in the dolphin population, which will require approximately 39 years to recover.

45. With regard to lost recreational use of the shoreline and coastal resources, the Trustees calculated that the *Deepwater Horizon* spill caused the public to lose more than 16 million user days of boating, fishing, and beach-going activities. The total recreational use damages due to the spill are estimated at USD 693 million. The reduction in the number of people using the affected resources is an important determinant of that lost value. The Trustees estimated the value of lost recreational use by employing the "travel cost method", a technique that is frequently used in natural resource damage assessments. The model accounts for lost trips, substitute trips, and diminished-value trips. Multiplying the number of lost recreational user days by the value of lost user day provides an estimate of the value of the recreational losses (damages).[98]

46. With regard to restoration, it is important to keep in mind that restoration activities under the US Oil Pollution Act, 1990 (OPA), are intended to restore or replace habitats, species and services to their baseline conditions and to compensate the public for interim losses from the time natural resources are injured until they recover to baseline conditions. The Trustees examined alternative ways to address the injuries caused by the *Deepwater Horizon* incident. The OPA and the National Environmental Policy Act, 1970 (NEPA)[99] require Trustees to follow a specific process to develop and evaluate these alternatives. The Trustees evaluated programmatic restoration alternatives and proposed a comprehensive, integrated ecosystem restoration plan based on five goals: (1) restore and conserve habitat; (2) restore water quality; (3) replenish and protect living coastal and marine resources; (4) provide and enhance recreational opportunities; and (5) provide for monitoring, adaptive management, and administrative oversight to support

96. *Ibid*.
97. See: Trustees' Plan, *supra* note 88.
98. See: *Ibid*., pp. 31-32.
99. National Environmental Policy Act of 1969 (NEPA), 42 USC 4321 et seq. See more about NEPA at the US EPA website: www.epa.gov/nepa/what-national-environmental-policy-act (accessed 24 Apr. 2024).

restoration implementation. The Trustees allocated funding for specific restoration types and restoration areas, based on their understanding and evaluation of exposure and injury, as well as their analysis of where restoration spending for the various restoration types would be most appropriate and effective.[100]

47. Although several international treaties and liability conventions refer to "measures of reinstatement", not many define them. The few which do have been listed in the Table below. We also refer to the important terms of "natural resource damage" (NRD) as used under US law,[101] in particular the OPA and CERCLA:

Table A3.1.4.

Term - source	Definition
Natural resources United States: 1980 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), known as Superfund (as amended in 1986) & 1990 Oil Pollution Act (OPA)	- "**Natural Resources Damage**" (NRD) refers to injury to, destruction of, or loss of natural resources, including the reasonable costs of a damage assessment [CERCLA §§101(6); 107(a)(4)(C); OPA §§1001(5); 1002(b)(2)]. **The measure of damages is the cost of restoring injured resources to their baseline condition, compensation for the interim loss of injured resources pending recovery, and the reasonable cost of a damage assessment** [43 CFR Part 11; 15 CFR Part 990 (emphasis added)]. - CERCLA provides EPA with comprehensive authority to respond to hazardous substance releases by initiating either response activities financed by the Superfund or enforcement actions to force responsible parties to pay for clean-ups. However, for NRD, the US EPA's role is more limited: primarily involving the notification of and coordination with Trustees**.**
Measures of reinstatement – Lugano Convention, 2003	- Article 2(8), "Measures of reinstatement" means any reasonable measures aiming to reinstate or restore damaged or destroyed components of the environment, or to introduce, where reasonable, the equivalent of these components into the environment. Internal law may indicate who will be entitled to take such measures.
Measures of reinstatement - Basel Protocol, 1999	- Article 2(d), "Measures of reinstatement" means any reasonable measures aiming to assess, reinstate or restore damaged or destroyed components of the environment. Domestic law may indicate who will be entitled to take such measures.

IV. Status of property and locus standi

48. It is useful to keep in mind that the status of the property will influence the standing of a party to pursue a claim. A distinction must be made between common property (*res communis omnium*) not open to private possession, as opposed to *res nullius*, that is property not belonging to anyone but open to private possession. Hence, a person does not have an individual right to such common property and would not have standing to file a claim in respect of damage to such property, but in such case it will be a public right held by the state in trust for the common benefit of the people.[102] For instance, in the Amoco Cadiz litigation, following the *Amoco Cadiz* super tanker disaster off the coast of Brittany, the French government itself sued the owner of the *Amoco Cadiz* and its parent company in the United States and filed a claim for recovery of pollution damages and clean-up costs.[103]

49. The ILC also clarifies that based on its proposed definition of "damage" (i.e. significant damage caused to persons, property or the environment, etc.), the notion of "victim" would encompass both natural and legal persons, and include the State as a custodian of public property.[104]

100. See: Trustees' Plan, *supra* note 88, pp. 33-45.
101. See more at US EPA website: www.epa.gov/superfund/natural-resource-damages-primer (accessed 24 Apr. 2024).
102. See ILC Report (2006), *supra* note 4, pp. 129-130, para. 14.
103. *Ibid.*, p. 137 and reference to: *In the matter of the Oil Spill by the Amoco Cadiz off the coast of France on 16 March 1978*, United States Court of Appeals for the Seventh Circuit, 954 F.2d 1279.
104. See ILC Report (2006), *supra* note 4, p. 136.

50. As discussed above, based on this concept of public trust, under the United States Oil Pollution Act of 1990[105] the US Government, a state, an Indian tribe and a foreign government have been given right to lay claims for restoration and clean-up in case of any transboundary damage.[106] Under the 1980 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA),[107] commonly known as Superfund (as amended in 1986), standing has been limited to the federal government, authorised representatives of the states, or by designated trustees of Indian tribes – as trustees of natural resources. These trustees of natural resources are authorized to sue responsible parties to collect damages for injury to such resources arising from the release of hazardous substances. Pursuant to CERCLA, "natural resources" means: land, fish, wildlife biota, air, water, groundwater and drinking water supplies.[108] As mentioned, subsequent to the 2010 *Deepwater Horizon* disaster, the Deepwater Horizon Natural Resource Trustees was set up, consisting of a group of federal agencies and state agencies from all five Gulf of Mexico states which serve as Trustees.

51. Some liability regimes, such as the Lugano Convention and the ELD, provide standing to NGOs. Whereas, in countries such as India, the *locus standi* has been lowered and readily encompasses individuals and NGOs who file Public Interest Litigation (PIL) cases with the aim of protecting the environment from damage, based on an extensive interpretation of the Constitutional "right to life" (Article 21), which is interpreted as a right to a wholesome environment, and courts have awarded compensation to victims of pollution. Moreover, courts in India at times take *suo moto* cognizance of news reports pertaining to environmental issues.[109] This is a trend observable in other countries in the Southern subcontinent as well.

V. Annex – international treaties/MEAs being referred to in this note and their status:

	Treaty / MEA (chronological) – footnotes with reference to original document	Status
1.	Convention on Civil Liability for Oil Pollution Damage resulting from Exploration for and Exploitation of Seabed Mineral Resources, 1977[110]	Not yet in force
2.	The Vienna Convention for the Protection of the Ozone Layer, 1985[111]	Entered into force in 1988
3.	Convention on Civil Liability for Damage caused During Carriage of Dangerous Goods by Road, Rail and Inland Navigation Vessels, 1989 (CRTD).[112]	Not yet in force
4.	Convention on Civil Liability for Oil Pollution Damage, 1992 (CLC).[113]	Entered into force in 1996

105. Oil Pollution Act of 1990, 33 U.S.C. 2701 *et seq*., available at: www.govinfo.gov/app/collection/uscode (accessed 24 Apr. 2024).
106. See ILC Report (2006), *supra* note 4, p. 137.
107. CERCLA, (42 U.S.C.A. Section 9601(2)(A)). See more at: www.epa.gov/superfund/superfund-cercla-overview (accessed 24 Apr. 2024).
108. See: 42 USC 9601(16). See more at: Recovery of Natural Resource Damage under Comprehensive General Liability Policies: https://corporate.findlaw.com/law-library/recovery-of-natural-resource-damages-under-comprehensive-general.html (accessed 24 Apr. 2024).
109. See, for instance: Singh, G. (2005), *Environmental Law in India*, Macmillan India Ltd.; and Reynaers E. (2014), "India's Nuclear Trade – Inching Forward?", in *Key Developments in Environmental Law*, Canada Law Book, pp. 101-129, at p. 103.
110. Convention on Civil Liability for Oil Pollution Damage resulting from Exploration for and Exploitation of Seabed Mineral Resources (1977), not yet in force, available at: www.gov.uk/government/publications/convention-on-civil-liability-for-oil-pollution-damage-resulting-from-exploration-for-and-exploitation-of-seabed-mineral-resources-london-151977 (accessed 24 Apr. 2024).
111. Vienna Convention for the Protection of the Ozone Layer (1985), *supra* note 22.
112. Convention on Civil Liability for Damage caused During Carriage of Dangerous Goods by Road, Rail and Inland Navigation Vessels (1989), not yet in force, at: www.unece.org/trans/danger/publi/crtd/crtd_e.html (accessed 24 Apr. 2024).
113. The original 1969 Convention, which was adopted following the *Torrey Canyon* accident in 1967, has now been replaced by the 1992 CLC: 1992 Protocol to the International Convention on the Civil Liability for Oil Pollution Damage (1992), entered into force 30 May 1996: www.iopcfunds.org/about-us/legal-framework/1992-civil-liability-convention/ and http://library.arcticportal.org/1617/1/Liability_Convention_1992.pdf (accessed 24 Apr. 2024).

5.	Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1992 (Oil Fund Convention, 1992).[114]	Entered into force in 1996
6.	Protocol to the 1992 Oil Fund Convention, 2003 (Supplementary Fund Convention, 2003).[115]	Entered into force in 2005
7.	Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment, 1993 (Lugano Convention)[116]	Not yet in force
8.	Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, 1996 (1996 HNS Convention)[117] & 2010 HNS Protocol → 2010 HNS Convention[118] Note: the 1996 HNS Convention is to be superseded by the 2010 HNS Convention once that enters into force.	Not yet in force
9.	Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal, 1999 ("Basel Protocol").[119]	Not yet in force
10.	Convention on Civil Liability for Bunker Oil Pollution Damage, 2001[120]	Entered into force in 2008
11.	Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes and to the 1992 Convention on the Transboundary Effects of Industrial Accidents, 2003[121] (Kiev Protocol, 2003)	Not yet in force
12.	Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety, 2010.[122]	Entered into force in 2018

114. 1992 Protocol to the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (1992), entered into force 30 May 1996 available at: wwwcdn.imo.org/localresources/en/About/Conventions/StatusOfConventions/Status%202024.pdf (accessed 24 Apr. 2024).
115. 2003 Protocol Establishing an International Oil Pollution Compensation Supplementary Fund (2003), entered into force 3 March 2005, available at: wwwcdn.imo.org/localresources/en/About/Conventions/StatusOfConventions/Status%202024.pdf (accessed 24 Apr. 2024).
116. Lugano Convention, *supra* note 23.
117. International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (1996), not in force, at: www.imo.org/en/About/Conventions/Pages/International-Convention-on-Liability-and-Compensation-for-Damage-in-Connection-with-the-Carriage-of-Hazardous-and-Noxious-.aspx (accessed 24 Apr. 2024).
118. The texts of the 1996 HNS Convention and amending 2010 Protocol are available here: www.hnsconvention.org/the-convention/ (accessed 24 Apr. 2024). The consolidated text of the 2010 HNS Convention (2010), not yet in force, is available at: www.hnsconvention.org/wp-content/uploads/2018/08/2010-HNS-Convention-Consolidated-text_e.pdf (accessed 24 Apr. 2024). Read more about the 1996 HNS Convention, the 2010 Protocol and their status at: www.hnsconvention.org/status/ (accessed 24 Apr. 2024).
119. See more about UNEP (1999), "Basel Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal", UN Doc. UNEP/CHW.1/WG/1/9/2, not yet in force, at: https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-3-b&chapter=27&clang=_en (accessed 24 Apr. 2024).
120. International Convention on Civil Liability for Bunker Oil Pollution Damage (2001), entered into force on 21 November 2008, at: www.imo.org/en/About/Conventions/Pages/International-Convention-on-Civil-Liability-for-Bunker-Oil-Pollution-Damage-(BUNKER).aspx (accessed 24 Apr. 2024).
121. United Nations Economic Commission for Europe (UNECE) (2003), "Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes and to the 1992 Convention on the Transboundary Effects of Industrial Accidents" (Kiev Protocol), UN Doc. ECE/MP.WAT/11-ECE/CP.TEIA/9, not yet in force, at: www.unece.org/fileadmin/DAM/env/civil-liability/documents/protocol_e.pdf (accessed 24 Apr. 2024).
122. UNEP (2010), Nagoya-KL Supplementary Protocol, *supra* note 12.

Chapter 5. **Costs of preventive measures**

Expert Group 5 was tasked specifically with trying to better define what constitute "preventive measures", being an integral component of the definition of "nuclear damage" provided in the modernised Conventions. Four questions in the Questionnaire, numbered 7(a)-7(d) asked for specific information on that issue. A table illustrating "yes" or "no" responses to those four questions is attached as Annex 5.A1. In preparing this Chapter, Expert Group 5 took into account a number of different aspects of "preventive measures" in order to determine, as clearly as possible: (i) what type of activities those measures are intended to cover; and (ii) under what circumstances should victims who suffer loss or damage as a result of the taking of such measures be compensated therefor.

I. The original conventions

It is worth reminding that the Paris Convention and the Vienna Convention define "nuclear damage" as comprising two heads: (i) loss of life or personal injury; and (ii) loss of or damage to property, to the extent that they were caused by a "nuclear incident".

There is no other description of "nuclear damage" in these conventions; the court which has jurisdiction to hear and determine nuclear damage claims (the "competent court") under each of these conventions may interpret these heads of damage in as broad or narrow a manner as it sees fit according to its own law. Such an interpretation might include the cost of preventive measures taken to prevent or minimise nuclear damage and any loss or damage caused by those measures as long as there is a justification for same under the law of the competent court.[1]

As previously mentioned in this report (see Chapter 3, Section I.1), the Vienna Convention actually provides for one additional head of "nuclear damage", which has generally been considered as a catch-all category: "any other loss or damage so arising or resulting if and to the extent that the law of the competent court so provides". Thus, if "so provided" such "other loss or damage" could also include the cost of preventive measures and any loss or damage caused by such measures.

In light of the broad discretion given to the competent court, it becomes readily clear that not all victims of nuclear incidents subject to the application of either of the two conventions will be treated equally. There are significant differences in the national laws of the various Paris Convention states as well as in those of the Vienna Convention states and it is those national laws which will be the reference point for the competent courts to judge what may or may not constitute "nuclear damage".

1. The lack of precision in the definition of nuclear damage in the original Conventions is not surprising given the very wide divergence of legal principles and jurisprudence in the law of torts in European countries which were, generally speaking, the first to adopt and ratify these conventions. Such a divergence still exists notwithstanding the more detailed definition of "nuclear damage" in the modernised Conventions.

II. The post-Chernobyl conventions

As previously outlined in this report (see Chapter 3, Section I.2), the Chernobyl nuclear power plant accident prompted the international community to re-examine the original Conventions and resulted in significant improvements made in both the Revised Paris Convention and the Revised Vienna Convention, as well as the adoption of the CSC. These improvements were made with the intention of enabling more victims to obtain more compensation for more types of damage than ever before in the event of a nuclear incident.

One of the initiatives taken in this regard was the expansion of the definition of "nuclear damage" to include "preventive measures and further loss or damage caused by such measures" in all three instruments.[2] This was a natural consequence of the fact that in most modern legal systems compensation for damage resulting from a tort (wrongful act or omission) may be refused or reduced if the claimant has failed to take reasonable steps to avoid or mitigate any loss, damage or expense it has incurred. The cost of such measures should be compensated even in cases where they prove to be ineffective, because they have been taken in the interest of the person who is liable for the tortious act.

Under the three modernised Conventions, "preventive measures" are defined as "… to the extent determined by the law of the competent court … any reasonable measures taken by any person after a nuclear incident or an event creating a grave and imminent threat of nuclear damage has occurred, to prevent or minimise nuclear damage (as described in other parts of the expanded definition) … subject to any approval of the competent authorities required by the law of the state where the measures were taken."

Several important observations can be made about "preventive measures" as so defined:

a) they may be taken by any "person", a term which is defined identically in the Vienna Convention and the Revised Vienna Convention but in none of the other Conventions;[3]

b) they must be "reasonable", a term which is also defined in all three modernised Conventions;

c) the measures must have been actually taken, thus requiring evidence of payment;

d) any legally required approval of the competent authorities must be obtained;

e) the measures must have been taken to prevent or minimise other types of damage that are described in the expanded definition of nuclear damage; and

f) they will be compensated only to the extent determined by the law of the competent court.[4]

In light of these various requirements, it is important that preventive measures be clarified by the relevant national authorities as quickly as possible after a nuclear incident has occurred or an event creating a grave and imminent threat of nuclear damage has taken place so that victims may start receiving compensation payments as soon as they are needed. This may not always be an easy exercise as the specific nature of the "incident" or "event" will need to be taken into account. Evacuation costs, such as buses to move people, hotel costs, meal expenses, medical examinations, etc. are usually the first things that come to mind when the subject of

2. The precise wording of the term "preventive measures" varies between the Revised Paris Convention on one hand and the Revised Vienna Convention and the CSC, on the other hand. However, all Conventions' parties agree that this is a drafting matter only and not one of substance. See, for example, paragraph 54 of the *Exposé des motifs* of the Revised Paris Convention. NEA (2024), *Exposé des Motifs of the Paris Convention as amended by the Protocols of 1964, 1982 and 2004*, adopted by the Contracting Parties to the Paris Convention on 18 Nov. 2016, NEA Doc. NEA/NLC/DOC(2020)1/REV1/FINAL (*Exposé des Motifs of the Revised Paris Convention*).
3. "'Person' means any individual, partnership, any private or public body whether corporate or not, any international organisation enjoying legal personality under the law of the Installation State, and any State or any of its constituent sub-divisions." See Article I.1(a) of the Vienna Conventions.
4. A contracting party is not free to exclude "preventive measures" as a head of damage but it has the discretion to determine the nature, form and extent of compensation to be granted.

preventive measures is raised, but there may well be additional costs incurred as a result of having taken those measures.

For example, immediately following the accident at the Three Mile Island Nuclear Power Plant on 28 March 1979,[5] representatives of the nuclear insurance pools arrived in Harrisburg, Pennsylvania, and a central claims office was assembled. The insurance paid for the living expenses of families who decided to evacuate, although evacuation was not ordered.[6] Insurance adjusters actually advanced money to these families with the expectation that any excess would be returned (which, in fact, it often was). According to the American Nuclear Society, on the first day of operations, the office made payments of almost USD 12 000. By 2 April, the pools had advanced funds to 2 400 persons. The payments increased daily and reached a per day peak of USD 167 286 on 9 April. A total of about USD 1.2 million in evacuation claims was paid to 3 170 claimants. In addition, the nuclear insurance pools paid over USD 92 000 in lost wages claims to 636 individuals and families,[7] an example of further loss or damage due to the taking of such preventive measures.

Where there are more extensive off-site consequences, compensation for preventive measures might well be justified to cover the costs of forced closures and/or evacuation of industries, halting of transport routes in the vicinity of the plant, and the ensuing absence of earnings for the corresponding period, not all of which are necessarily preventive measures but rather the result of the taking of preventive measures.

III. Preventive measures in theory

A number of other international conventions and regional instruments were examined to determine how they address the concept of "preventive measures", "reasonable measures", "grave and imminent threat/imminent threat of damage" and "appropriate and proportionate". Most of the instruments for comparison purposes are to be found in the environmental protection field or in connection with the transport of dangerous goods. Of the various examples available, the following are probably the most significant.[8]

1. How are "preventive measures" defined elsewhere?

The 1992 Civil Liability Convention and IOPC Guidelines for Presenting Claims for Clean Up and Preventive Measures provide as follows:

> "'Preventive measures' means any reasonable measures taken by any person after an incident has occurred to prevent or minimise pollution damage."[9]
>
> "In practice, the term 'preventive measures' means any reasonable actions taken with the aim of preventing or minimising pollution damage in a Member State. The term usually applies to measures taken in responding to a spill and clean-up operations but may include salvage operations undertaken with the specific purpose of preventing or minimising the loss of oil from a damaged tanker. The costs of repairing damage caused by clean-up operations may also be eligible for compensation, for example, roads or other access points damaged by traffic engaged in clean-up operations. Expenses for preventive measures may be recoverable even if no spill occurs provided that there was a grave and imminent threat of pollution damage."[10]

5. For more information on the Three Mile Island accident, see Chapter 3 of this report (Section I.2).
6. Pennsylvania's governor did eventually "recommend" evacuation of pregnant women and families with young children who lived near the plant.
7. National Association of Insurance Commissioners, Nuclear Liability Insurance (Price-Anderson Act).
8. See Annex 5.A3 to this Chapter for additional examples.
9. See Article I.6 of the 1992 Civil Liability Convention (formerly the International Convention on Civil Liability for Oil Pollution Damage) (1992), 1956 UNTS 255.
10. See International Oil Pollution Compensation Funds (2018), *Guidelines for presenting claims for clean up and preventive measures*, IOPC Funds, London, p. 5, available at: https://iopcfunds.org/wp-content/uploads/2015/08/Clean-up-Guidelines_e.pdf (accessed 24 Apr. 2024).

2. How are "reasonable measures" defined elsewhere?

There is little guidance to be had from other international instruments[11] when it comes to defining "reasonable measures", but the IOPC Claims Manual provides a very helpful explanation:

> "Claims for the costs of measures to prevent or minimise pollution damage are assessed on the basis of objective criteria. The fact that a government or other public body decides to take certain measures does not in itself mean that the measures are reasonable for the purpose of compensation under the Conventions. The technical reasonableness is assessed on the basis of the facts available at the time of the decision to take the measures. However, those in charge of the operations should continually reappraise their decisions in the light of developments and technical advice.
>
> Claims for costs of response measures are not accepted when it could have been foreseen that the measures taken would be ineffective, for example if dispersants were used on solid or semi-solid oils or if booms were deployed with no regard to their ineffectiveness in fast flowing waters. On the other hand, the fact that the measures proved to be ineffective is not in itself a reason for rejection of a claim."[12]

3. How is a "grave and imminent threat" defined elsewhere?

Only the Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with Regard to the Prevention and Remedying of Environmental Damage addresses this issue but in a manner that is not particularly useful: "'imminent threat of damage' means a sufficient likelihood that environmental damage will occur in the near future".[13] However, as part of the implementation process for the EU Directive on Environmental Liability, some EU member states developed guidance documents and a very illustrative draft guidance prepared by the Scottish government is worth examining:

> "An 'imminent threat of 'damage' means that there is a sufficient likelihood that 'damage' will occur in the near future. This may include circumstances where:
>
> - A damaging event has not yet occurred but is sufficiently likely to in the future and lead to 'damage' if action is not taken. For example, where a tank containing dangerous substances, which is situated near a major aquifer,[14] is in very poor condition and is likely to leak without action to secure the tank.
> - An event has occurred and there is no damage yet but there is a sufficient likelihood that 'damage' will occur in the near future if action is not taken. Extending the tank example above, this is where the tank has already started to leak and the substances have entered the soil and are likely to migrate to the aquifer without action to contain the contamination.
> - Damage has occurred which is not yet 'damage' but is sufficiently likely to become 'damage' if action is not taken. Further extending the tank example above, this is where the tank has leaked and the contamination has already started to enter the aquifer. The damage does not yet qualify as water

11. See Annex 5.A3 to this Chapter for additional examples.
12. See International Oil Pollution Compensation Funds (2019), *Claims Manual*, IOPC Funds, London, p. 27, available at https://iopcfunds.org/wp-content/uploads/2018/12/2019-Claims-Manual_e-2.pdf (accessed 24 Apr. 2024).
13. Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with Regard to the Prevention and Remedying of Environmental Damage, *Official Journal of the European Union* (OJ) L 143, 30 Apr. 2004 (EU Directive on Environmental Liability).
14. An aquifer is an underground layer of water-bearing permeable rock, rock fractures or unconsolidated material (gravel, sand or silt) and from which groundwater can be extracted using a water well.

damage but without action to control further migration of contamination into the aquifer the damage is likely to become water damage."[15]

4. How are "appropriate and proportionate" defined elsewhere?[16]

None of the international nuclear liability conventions contains a definition of the term "appropriate and proportionate". However, the International Convention Relating to Intervention on the High Seas in Case of Oil Pollution Casualties (1969) provides for the following in its Article V.3:

> "3. In considering whether the measures are proportionate to the damage, account shall be taken of:
>
> (a) the extent and probability of imminent damage if those measures are not taken; and
>
> (b) the likelihood of those measures being effective; and
>
> (c) the extent of the damage which may be caused by such measures."

To summarise, there are definitions of "preventive measures" in other international civil liability conventions similar to those used in the three modernised nuclear liability conventions but unfortunately no detailed definition of "reasonable measures" can be found in any of them. It could be interesting to compare the definitions of "preventive measures" and "grave and imminent threat" found in the national laws of certain countries (e.g. France). The relevant responses to questions 7(a)-7(d) of the Questionnaire are set out in Annex 5.A2.

IV. Preventive measures in practice[17]

Expert Group 5 considered it important to focus on how preventive measures could be applied in practice, given that, for a nuclear incident, the express purpose of preventive measures is to avoid exposure to radiation. In that context, there seems to be a possible way forward if one can compare "preventive measures" in nuclear liability terms with "protective actions" a term widely used in nuclear emergency planning.

In emergency preparedness terms, "protective actions" is the term used to represent the steps taken in a nuclear or radiological emergency to prevent or reduce the impacts to human life, health, property or the environment. This term is used by the ICRP, the IAEA and, as an example, has recently been adopted by the United Kingdom into its national legislation, the Radiation (Emergency Preparedness and Public Information) Regulations 2019.[18] The European Union Basic Safety Standards Directive (EU BSSD) 2013/59/Euratom uses the term "protective measures" but its principles are still based upon the ICRP.[19]

15. Scottish Government Environmental Quality Directorate (2008), Environmental Liability (Prevention and Remediation) (Scotland) Regulations 2008 Draft Guidance, p. 29, available at: https://webarchive.nrscotland.gov.uk/20190128050152/https://www2.gov.scot/Publications/2008/05/14161737/69 (archived) (accessed 24 Apr. 2024).
16. Interestingly, proportionality is an ancient concept. The Code of Hammurabi, a Babylonian law code dating from about 1722 BC, incorporated the principle of "an eye for an eye, and a tooth for a tooth". The Magna Carta and the English Bill of Rights of 1689 also embodied the principle of "proportional punishment" under which punishment must be proportional to the crime.
17. In this context, the example set by the United Kingdom in its legislation is very useful.
18. See www.legislation.gov.uk/uksi/2019/703/contents/made (accessed 24 Apr. 2024).
19. Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom.

The IAEA's *Generic Safety Requirements Part 7* (IAEA GSR7) "Preparedness and Response for a Nuclear or Radiological Emergency" is a key document that provides practical interpretations of terms similar to "preventive measures".[20] It establishes the requirements for ensuring an adequate level of preparedness and response for a nuclear or radiological emergency, irrespective of its cause. These Safety Requirements are intended to be used by governments, emergency response organisations, other authorities at the local, regional and national levels, operating organisations and the regulatory body as well as by relevant international organisations at the international level. The IAEA definitions of "protective action" are set out in GSR7 (pp. 91-92):

- "**Protective action**. An action for the purposes of avoiding or reducing doses that might otherwise be received in an emergency exposure situation or an existing exposure situation."
- "[**E]arly protective action**. A protective action in the event of a nuclear or radiological emergency that can be implemented within days to weeks and still be effective.

  The most common early protective actions are relocation and longer-term restriction of the consumption of food potentially affected by contamination."
- "**[M]itigatory action**. Immediate action by the operator or other party:

  (a) To reduce the potential for conditions to develop that would result in exposure or a release of radioactive material requiring emergency response actions on the site or off the site; or

  (b) To mitigate source conditions that may result in exposure or a release of radioactive material requiring emergency response actions on the site or off the site."
- "[**U]rgent protective action**. A protective action in the event of a nuclear or radiological emergency which must be taken promptly (usually within hours to a day) in order to be effective, and the effectiveness of which will be markedly reduced if it is delayed.

  Urgent protective actions include iodine thyroid blocking, evacuation, short-term sheltering, actions to reduce inadvertent ingestion, decontamination of individuals and prevention of ingestion of food, milk or drinking water possibly with contamination.

  A precautionary urgent protective action is an urgent protective action taken before or shortly after a release of radioactive material, or an exposure, on the basis of the prevailing conditions to avoid or to minimise severe deterministic effects."[21]

When consulting on proposals to implement the changes to the Paris and Brussels Conventions on nuclear third party liability in 2011,[22] the UK government clarified that the new requirements for preventive measures aligned with the existing emergency planning framework. This specifically refers to the arrangements under the Radiation (Emergency Preparedness and Public Information) Regulations (UK REPPIR), and there was a direct link between these regulations and the United Kingdom's formal transposition of the Revised Paris

20. IAEA (2015), Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series, General Safety Requirements, No. GSR Part 7 (Rev. 1), IAEA, Vienna.
21. A deterministic effect is an effect that can be related directly to the radiation dose received. The severity increases as the dose increases. A deterministic effect typically has a threshold below which the effect will not occur.
22. Implementation of changes to the Paris and Brussels Conventions on nuclear third party liability – A Public Consultation, January 2011, https://assets.publishing.service.gov.uk/media/5a7900d540f0b679c0a07c58/1182-cons-implement-changes-paris-brussels.pdf (accessed 24 Apr. 2024).

Convention within the Nuclear Installations Act 1965 (NIA65).[23] The UK REPPIR has also been updated to include the term "protective action", which is more comprehensively defined than its counterpart in IAEA GSR7:

> "'protective action' means an action or actions taken in order to prevent or reduce the exposure of emergency workers, members of the public, the environment or the contamination of property from ionising radiation in the event of a radiation emergency, and includes the provision of appropriate information to the public in accordance with regulations 21 and 22;"[24]

Hence, Expert Group 5 proposes that "preventive measures" be interpreted in radiological terms consistent with the IAEA and ICRP "protective actions". This provides an opportunity to define the radiological criteria which would indicate that preventive measures should be taken. This is discussed next and will be illustrated in terms of the UK legislation, although it is recognised that other countries may implement the criteria differently.

V. When should preventive measures be taken?

In 1999, Japan experienced its first criticality event at the nuclear fuel fabrication plant operated by the company JCO in Tokai-mura.[25] The event resulted in 439 cases of radiation exposure, 2 fatalities and over JPY 12.73 billion in compensation awarded to victims.[26] After this event, the Act on Special Measures Concerning Nuclear Emergency Preparedness (the "Special Measures Act") was implemented to augment the Basic Act on Disaster Control and establish a framework for preventive measures in Japan. The Special Measures Act defines the duties of the nuclear operators and central and local governments in the prevention of nuclear disaster. It specifies the procedures and requirements necessary to declare a "Nuclear Emergency Situation" and to establish the Nuclear Emergency Response Headquarters; as well as detailing what emergency response measures and restoration measures may be taken. The Special Measures Act identifies four events which may trigger the declaration of a Nuclear Emergency Situation: i) an event where there is a sufficiently high radiation dose near the site boundary; ii) an event where there is a sufficiently high detection of radioactive materials in usual release points such as exhaust pipes; iii) an event where there is a sufficiently high detection of radiation or radioactive materials by fire, explosion, etc. outside the control zone; and iv) an event which occurs in a nuclear installation.

In order to declare a Nuclear Emergency Situation, the operator must notify the competent Minister and relevant local governments of a situation falling under the definition found in Article 10 of the Special Measures Act.[27] Once the relevant Minister confirms that the situation satisfies the requirements found in Article 15, Paragraph 1 of the Special Measures Act, they will notify the Prime Minister who will declare the situation a Nuclear Emergency Situation.[28] Upon declaration of a Nuclear Emergency Situation the Prime Minister will direct relevant local governments to take emergency response measures provided for in Article 15, Paragraph 2, and establish the Nuclear Emergency Response Headquarters.[29] The local governments will also be directed to establish their own emergency response headquarters pursuant to the Special Measures Act.

23. The extract from the UK Nuclear Installations Act, 1965, Section 11H, "Cost of preventive measures" is found in Annex 5.A2 to this Chapter.
24. The UK Radiation (Emergency Preparedness and Public Information) Regulations 2019, Section 2.
25. NEA (2000), "Tokai-mura accident, Japan: third party liability and compensation aspects", *Nuclear Law Bulletin*, No. 66, OECD Publishing, Paris, p. 13.
26. *Ibid*., pp. 13-17.
27. Act on Special Measures Concerning Nuclear Emergency Preparedness, No. 156, 17 December 1999, as amended, Article 10.
28. *Ibid*., Article 15 para. 1.
29. *Ibid*., Article 15, para. 2.

Table 5.1. **Example of when Japan will determine a nuclear emergency has occurred**

Requirement for nuclear emergency situation

Events	Situation provided for by Article 10	Requirement provided for by Article 15
(1) Radiation dose near the site boundary	5 μSv/h or more at one point for more than 10 consecutive minutes	500 μSv/h or more at one point for more than 10 consecutive minutes
	5 μSv/h or more at two or more points simultaneously	500 μSv/h or more at two or more points simultaneously
(2) Detection of radioactive materials in usual release points such as exhaust pipes	When the concentration of radioactive materials equivalent to 5 μSv/h or more continues for 10 minutes or more, or radioactive materials equivalent to 50 μSv/h or more are released	When the concentration of radioactive materials equivalent to 500 μSv/h or more continues for 10 minutes or more, or radioactive materials equivalent to 5 μSv/h or more are released
(3) Detection of radiation or radioactive materials by fire, explosion, etc. (outside the control zone)	Radiation dose of 50 μSv/h or more	Radiation dose of 5 μSv/h or more
	Release of radioactive materials equivalent to 5 μSv/h or more	Release of radioactive materials equivalent to 500 μSv/h or more
(4) Occurrence in nuclear installation		
Failure of reactor scram	When the nuclear reactor shutdown cannot be performed by usual neutron absorbers	When all reactor shutdown functions are lost in a case where emergency reactor shutdown is necessary
Loss of reactor coolant	When leakage of nuclear reactor coolant occurs, requiring operation of the emergency core cooling system (ECCS)	When water cannot be injected into the nuclear reactor by any ECCS
Loss of all AC power supplies	When power supply from all AC power supplies is failed for 5 minutes or more	When all functions for cooling a reactor are lost with loss of all AC power supplies
Decrease in water level of the spent fuel pool at reprocessing facilities	When water level is decreased to the point where a fuel assembly is exposed	

Source: Hokugo, T. (2019), "Preventive Measures in the context of Fukushima Daiichi NPP Accident", presented at the Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, Lisbon, October 2019. Based on the Nuclear Emergency Preparedness Act, Article 10 and 15, Cabinet Order No. 195 of 2000, Article 4 and 6, and Ordinance of Prime Minister's Office, Ministry of International Trade and Industry and Ministry of Transportation No. 2 of 2000, Article 9 and 21.

While a Nuclear Emergency Situation is generally not declared in the absence of leakage, in the case of the Fukushima Daiichi accident it was declared prior to the detection of any leakage as it occurred in a nuclear installation, thus meeting the criteria set out in the Special Measures Act and its associated ordinances and Cabinet Orders. Under this interpretation, a Nuclear Emergency Situation was declared at the Fukushima Daiichi Site 1 on 11 March 2011 and at Site 2 on 12 March 2011. The Nuclear Emergency Situation designation was removed from Site 2 on 26 December 2011 and remains in place at Site 1 (as of October 2019).

Preventive measures will be taken in response to a nuclear incident or where there is a grave and imminent threat of causing nuclear damage. A definition of a "grave and imminent threat" is provided in the United Kingdom's NIA65 Section 11H(9)[30] and is built on REPPIR 2001 values for what constitutes a radiation emergency, e.g. a possible 5 mSv/y effective dose to a person not involved in the incident, and in emergency planning terms, the point at which an emergency would be declared.

30. See Annex 5.A2 to this Chapter.

Like many other countries, the United Kingdom uses the term "Off-Site Nuclear Emergency" to declare the point when a nuclear incident has occurred or is likely to occur. This is a key part of the emergency planning process as this declaration will trigger responding agencies to take action, as mandated by the operator and local authorities' duties to implement their emergency plans under Regulation 17 of UK REPPIR. It will also trigger actions for members of the public who will be instructed to take protective actions (preventive measures) or take action independently, such as self-evacuating. The values given in the NIA65 also describe the point at which it is deemed appropriate and proportionate for preventive measures to be taken.

Reference levels

Reference levels are an optimisation tool aimed at reducing exposures below defined threshold values. They are applied to both emergency exposures and existing exposures. The reference level will influence and prioritise what protective actions (preventive measures) are selected and it can be assumed that protective actions taken to reduce doses below this reference level are appropriate and proportionate. The EU BSSD gives clear instructions on how reference levels should be set; for example, Annex I (1) states:

> "Without prejudice to reference levels set for equivalent doses, reference levels expressed in effective doses shall be set in the range of 1 to 20 mSv per year for existing exposure situations and 20 to 100 mSv (acute or annual) for emergency exposure situations."[31]

VI. Approval of competent authorities

Like many other countries, the United Kingdom has a formal multi-agency process for developing and delivering advice on preventive measures. These are outlined in National Nuclear Emergency Planning & Response Guidance (NNEPRG), with detailed arrangements included in off-site emergency plans. The advice given by these multi-agency groups will generate the majority of protective actions (preventive measures) taken in the response to an emergency; however, it was decided that formally defining the "approval" process for preventive measures was not required in the United Kingdom; the reasons cited were the variety of preventive measures that could be taken, the range of persons by whom they could be taken, and the likely urgency of such measures.

VII. The Fukushima Daiichi experience

The Fukushima Daiichi Nuclear Power Plant accident occurred on 11 March 2011 with large amounts of radioactivity being released. A Nuclear Emergency Situation was declared during that same evening and a large number of "preventive measures" were either ordered and/or taken during the first two weeks following the accident:

- 11 March 2011
  - 20:50 Evacuation order within 2 km of the nuclear power plant issued by Fukushima prefecture
  - 21:23 Evacuation order within 3 km of the nuclear power plant issued by Fukushima prefecture (6 000 people)
- 12 March 2011
  - 5:44 Evacuation order within 10 km of the nuclear power plant issued by the government (51 000 people)
  - 18:25 Evacuation order within 20 km of the nuclear power plant issued by the government (78 000 people)

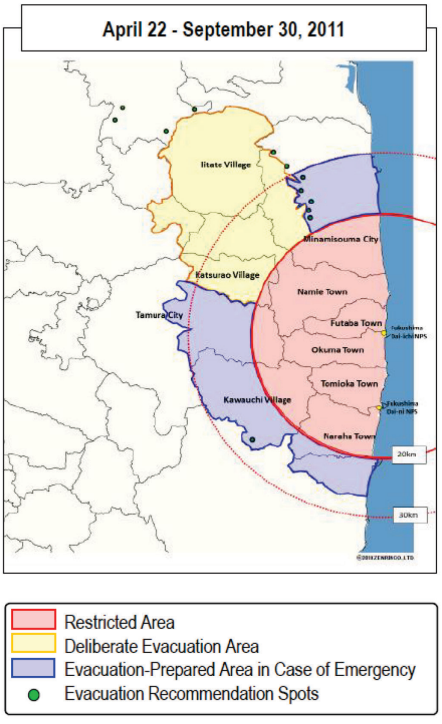
31. Council Directive 2013/59/Euratom of 5 December, *supra* note 19.

- 15 March 2011
  - 11:00 Sheltering order within 30 km of the nuclear power plant issued by the government
- 16 March 2011
  - Directed administration of stable iodine during evacuation
- 21 March 2011
  - Drinking water restriction imposed; food restriction imposed

In April, three evacuation zones were determined as shown in Figure 5.1; those people in the Warning Zone and the Planned Evacuation Zone were required to evacuate.

- Warning Zone (red): within 20 km (prohibited from entry)
- Planned Evacuation Zone (yellow): outside 20 km where annual accumulative dose was estimated at more than 20 mSv
- Emergency Evacuation Preparedness Zone (blue): between 20 km and 30 km

Figure 5.1. **Evacuation zones determined following the Fukushima Daiichi Nuclear Power Plant accident**

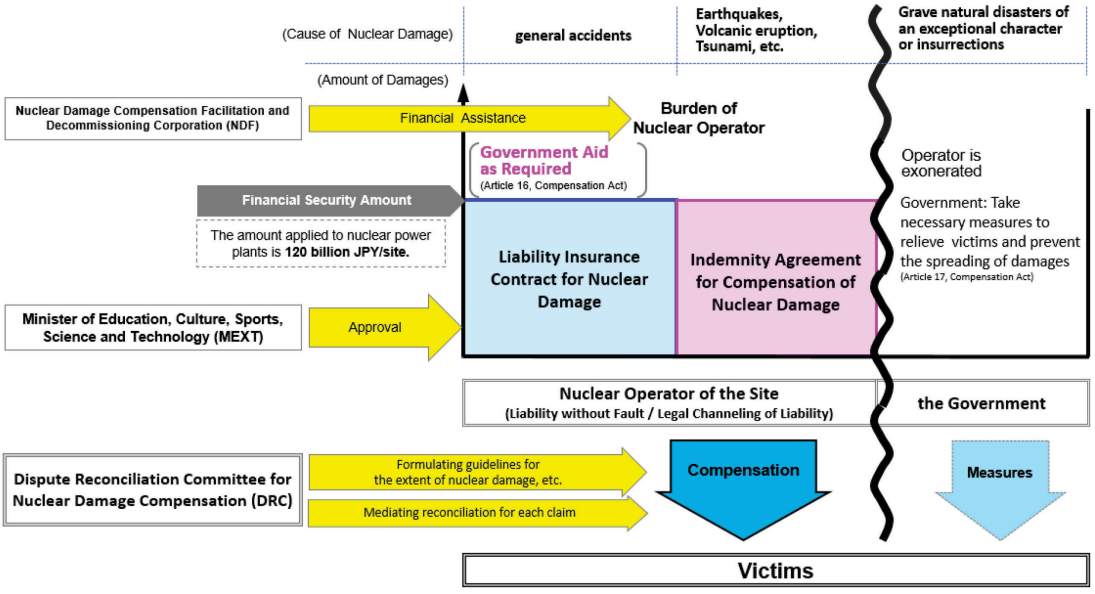


Source: Hokugo, T. (2019), "Preventive Measures in the context of Fukushima Daiichi NPP Accident", presented at the Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, Lisbon, October 2019.

Even from those areas where no evacuation was ordered, many people voluntarily evacuated. According to information from the Fukushima prefecture, the number of people evacuated at its peak was 164 865 as of May 2012. Many of those people did return to their homes but as of December 2018, some 43 000 people were still in "evacuation" status.

Following the accident, it quickly became clear that the definition of "nuclear damage" in the then applicable Japanese legislation[32] was not precise or detailed enough to permit the efficient payment of compensation to victims who suffered a wide variety of damages and losses.

Figure 5.2. **Overview of the Nuclear Liability Regime in Japan**



Source: Hokugo, T. (2019), "Preventive Measures in the context of Fukushima Daiichi NPP Accident", presented at the Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, Lisbon, October 2019.

The non-binding guidelines[33] issued by the Dispute Reconciliation Committee for Nuclear Damage Compensation (DRC) to further determine the scope of nuclear damage to be compensated included preventive measures. They were largely determined on the basis of the Interim Guidelines issued in August 2011, which, in turn, were based on the Interim Guidelines and Supplements issued in April, May and June 2011, respectively. Such guidelines are an example of what can be done following an accident to assist all the stakeholders in putting the definition of "nuclear damage" (including "preventive measures") into practice and providing prompt, fair and appropriate compensation for victims.

The guidelines describe how nuclear damage should be identified, as distinct from damage caused by the earthquake or tsunami. It is worth remembering that, when drafting the guidelines, the DRC took the view that as long as there was a legally sufficient cause between the damage and the accident then it qualified as nuclear damage (see Chapter 2, Section V.1). It was also decided that people who voluntarily evacuated were entitled to be compensated due to the lack of available information/communication regarding the nuclear incident.

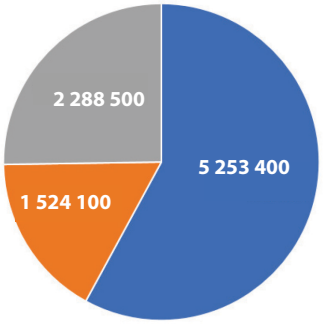
32. "Nuclear damage" is defined in the 1961 Compensation Act as any damage caused by the effects of the process of nuclear fission of nuclear fuel material, or by the radiation effects or toxic effects of nuclear fuel materials and the like. For more information concerning the 1961 Act on Compensation for Nuclear Damage, see NEA (2012), *Japan's Compensation System for Nuclear Damage as related to the TEPCO Fukushima Daiichi nuclear accident*, OECD Publishing, Paris.
33. For more information on the guidelines, see NEA (2012), *Japan's Compensation System for Nuclear Damage as related to the TEPCO Fukushima Daiichi nuclear accident*, OECD Publishing, Paris.

As an example of the types of compensable damage arising from government instructed evacuation (preventive measure), the guidelines included the following:

- examination expenses (human, products, property);
- evacuation expenses:
  - travel expenses, removal of belongings from household;
  - accommodation-related expenses;
  - increase in living expenses;
  - homecoming expenses;
- loss of income and medical expenses due to physical injury, illness or death due to evacuation;
- damage for mental anguish arising from evacuation, living as an evacuee or being forced to take shelter indoors;
- business damage (loss of profit, expenses for decontamination and disposal of assets);
- damage resulting from incapacity to work for an employer (loss of income);
- loss of, damage to or decrease in value of property (both real/immovable and personal/movable) such as contaminated buildings in the restricted zone.

Numerous other preventive measures were taken for which the DRC recommended compensation. For example, government restrictions on agricultural and marine activities, including prohibiting shipment of both agricultural and fisheries products resulted in serious loss to both industries including business losses (economic loss, incapacity to work, restart-up costs, etc.). Other industries which were severely affected were tourism and the food industry, for which the guidelines did recommend compensation as well. A number of people died during the course of the evacuation or during the period of evacuation and these are called "related deaths".[34]

Figure 5.3. **Distribution of the compensation based on the relevance to the costs of preventive measures**



	Amount (million JPY)	%
The costs of preventive measures	5 253 400	57.9
Partially related to the cost of preventive measures	1 524 100	16.8
Not relevant to the costs of preventive measures	2 288 500	25.2

Source: Hokugo, T. (2019), "Preventive Measures in the context of Fukushima Daiichi NPP Accident", presented at the Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, Lisbon, October 2019.

34. A typical example is the case of the Futaba Hospital where more than ten patients lost their lives due to inadequate medical care at the hospital or during their transportation to evacuation areas.

Key lessons learnt on implementation of protective actions (Fukushima)

- Advanced effective evacuation plans should be established, including tools to communicate with people living in the contaminated or to be contaminated areas, preparation of special facilities for medical treatment, methods of transportation of evacuees, designation of specific places where evacuees are to be transported and methods of delivery of daily necessities.[35]
- Arrangements should be established for taking precautionary urgent protective actions before a release, on the basis of plant conditions.
- Advance preparation for safe evacuation of special facilities is necessary (designation of medical teams and hospitals, methods of transportation, etc.).
- Sheltering indoors should be conducted only for a short period until either safe evacuation or termination of sheltering is possible.
- Predefined criteria based on operational intervention levels concerning relocation and other early measures are needed to ensure timely response.
- Optimise the timing and support for evacuation to reduce radiation exposure, avoid negative health effects arising from evacuation or relocation, and provide the necessary medical and psychological assistance.
- Strategies and arrangements for lifting evacuation are key to reduce human health effects.

VIII. The nuclear insurance industry perspective

For the nuclear insurance industry, the most important issue is determining what is and what is not covered under the nuclear liability policy. To determine that coverage, one must be as clear as possible about the meaning of "preventive measures". To this end there needs to be as clear a definition as possible of that term in the national legislation (or case law) of the country whose courts will have jurisdiction to hear and determine nuclear damage claims.

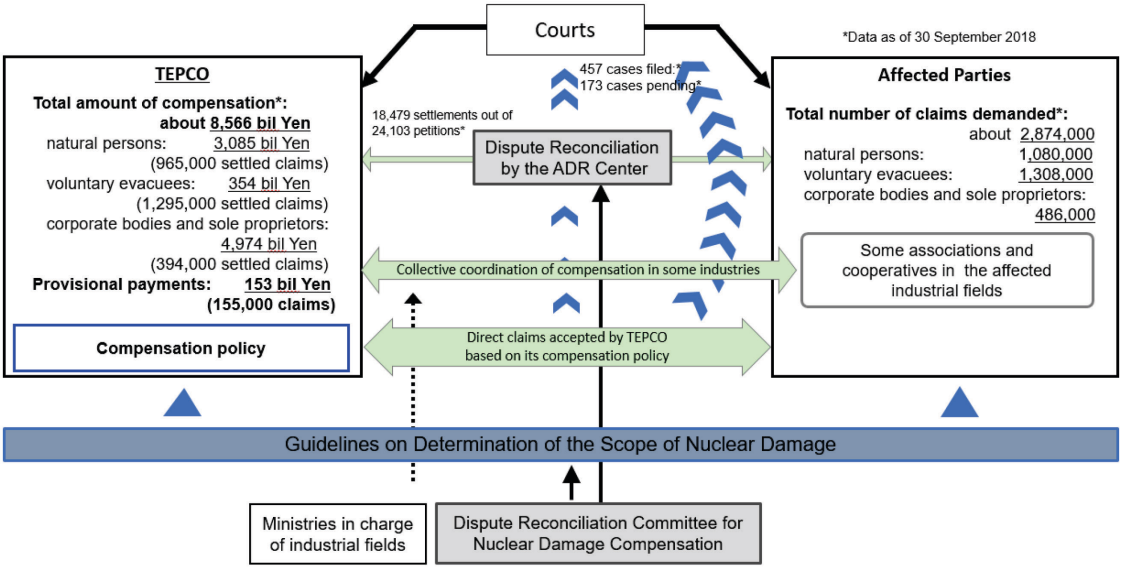
In addition to, or perhaps as an alternative to, legally binding definitions, the development of non-legally binding codes of practice or other forms of guidance document, such as the IAEA GSR7 or the guidelines issued by the Japanese DRC could be extremely helpful.

Insurers want to know what their exposure is before a nuclear incident or event creating a grave and imminent threat of nuclear damage occurs, but this is often difficult to determine simply because of the way the Conventions leave it up to the courts or other quasi-judicial bodies to determine whether the justification for taking such preventive measures is valid; with the current wording, compensation can only be finally determined through a judicial or quasi-judicial process after the incident or event takes place.

However, one should not overlook the fact that in connection with the Fukushima Daiichi accident, the DRC guidelines were designed to help the operator (TEPCO) settle disputes with damage claimants on the basis of a voluntary settlement; in addition, the DRC was empowered to mediate reconciliation of any dispute arising in connection with the compensation of nuclear damage.

35. In Japan, it is the responsibility of local governments to establish evacuation plans.

Figure 5.4. **Structure of compensation promotion for 2011 accident**



Source: Hokugo, T. (2019), "Preventive Measures in the context of Fukushima Daiichi NPP Accident", presented at the Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, Lisbon, October 2019.

As the DRC was unable itself to handle a large volume of disputes, on 1 September 2011 it established the Nuclear Damage Reconciliation Centre as an alternative dispute resolution mechanism (ADR) for nuclear damage claims. As of December 2017, 276 mediators and 181 investigators were registered at the Centre and all of them are lawyers. The Centre provides the reconciliation service without charge. The General Committee of the Centre has set out 14 general standards for compensation to be referred to by mediators in addition to the DRC's guidelines. Furthermore, the Centre has published settlement proposals with a statement of reasons to encourage TEPCO to conduct prompt and appropriate compensation. The settlement proposal does not have legal force unless both parties accept it. The victim who receives compensation through the reconciliation process is not required to waive his/her right to sue TEPCO. Tens of thousands of disputes have been resolved by this means.[36]

There are, however, clearly examples of "preventive measures" that are not consequential upon a nuclear incident or an event creating a grave and imminent threat of nuclear damage.[37] In addition, the Revised Paris and Revised Vienna Conventions expressly include the possibility for their contracting parties to require that preventive measures be subject to the approval of the competent authorities of the state where the measures were taken. Such a requirement, in itself, would preclude the operator's (and consequently insurer's) liability for the cost of actions taken without such approval; the difference between a "false alarm" for example and a "grave and imminent threat" will not necessarily be immediately clear – thus, the identification of a state's "competent authorities" in advance as well as the manner in which they may approve of preventive measures (before and/or after the measures are taken) becomes crucial in determining the liability of the operator and thus of its insurer.

36. Osaka, Eri (2019), Current Status and Challenges in the Fukushima Nuclear Disaster Compensation Scheme: An Example of Institutional Failure? Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3318877 (accessed 24 Apr. 2024).
37. These measures may include the advance distribution of iodine pills to residents of a delimited area surrounding a nuclear installation as a precautionary measure, setting up special intervention or emergency assistance plans and teams to implement those plans, informing or training people to be prepared to evacuate, lead an evacuation or take other preventive measures in the event of an incident or threat of nuclear damage.

The insurers have also pointed out that the principle of insurance is to compensate losses or damages actually incurred; providing payments in advance, for example, to potential victims for preventive measures such as evacuation may pose problems afterwards when it comes to proving that those costs have a direct causal link to an event creating a grave and imminent threat of nuclear damage. At least in cases where the approval of the competent authorities is required before such measures are taken, this would imply that insurers would not have to compensate by way of advance payments before that approval is obtained.

Another thought, however, is whether it might be more practical to establish, in advance, a compensation amount to provide immediate funds to cover the costs of shelter/ accommodation, food, water, clothing and medical supplies as was done in the Three Mile Island Nuclear Power Plant accident. The amount could be weighted on a country-to-country basis and would be distributed to claimants who can prove that they were within a defined affected area when the "preventive measure", such as evacuation, was called for by the competent authority. This would allow funds "now" with further proof of loss required later should the claimant's claim exceed the agreed amount. While it is true that this would seem to contradict the basic insurance principle that it is necessary to provide evidence of loss, it would at least provide sufficient emergency funds to victims from the outset. Insurers could then configure models, based on population density per site of what their exposure might be.

So, for example, in the case of a nuclear incident or a grave and imminent threat of nuclear damage, potential victims will want to know immediately[38] whether or not they have been contaminated. The medical examinations needed to determine this issue may or may not be regarded as "preventive measures"; where there is only an imminent threat of nuclear damage but no nuclear incident, there will simply be no reason to examine people as there will have been no nuclear release.

However, where there is a nuclear incident and medical examinations do qualify as "preventive measures", one would need to know the geographical boundary within which victims would be entitled to have those examinations carried out, a matter that should be quickly and clearly defined by the public authorities.

Who may be compensated for the taking of preventive measures? As noted in the Explanatory Text of the 1997 Vienna Convention,[39]

> "[t]he fact that preventive measures are said to be measures taken by "any person" would seem to include measures taken by both private persons and public authorities; in the case of measures taken by public authorities, it would seem that at least the costs which would not have been incurred without the occurrence of a nuclear incident should be compensated. As for the need for a previous authorization, this clearly refers to measures taken by private persons; the fact that such measures have been authorized by a competent public authority indicates that such measures are considered, at least prima facie, to be reasonable."

However, Expert Group 5 noted that any such compensation would detract from the amounts available to other victims.

A particular problem is whether the government or other public body may claim compensation of regular expenses incurred in preventing or minimising the impact of a nuclear incident, since those costs, which may consist of salaries to their employees engaged in the taking of preventive measures, costs of maintenance of equipment used for preventive measures, and other types of fixed costs, would be incurred in any event. The current practice

38. Today, in the wireless world in which we live, potential victims will be following events in real time, using Facebook, X (formerly known as Twitter), Snapchat, etc.
39. IAEA (2020), *The 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage – Explanatory Texts*, IAEA International Law Series, No. 3 (Rev. 2), IAEA Doc. STI/PUB/1906, IAEA, Vienna (*Explanatory Texts of the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage*), Section 2.3.3.

of the International Oil Pollution Compensation Fund is to allow claims for fixed costs, but to adopt a restrictive approach when calculating claims of this sort. Only those expenses are allowed which correspond closely to the clean-up period in question and which do not include remote overhead charges.[40]

Nevertheless, one might still question whether the cost of preventive measures taken by competent public authorities are reimbursable by the operator at all or whether they are simply costs which are expected to be incurred by the government in connection with its duty to provide certain services to the public, such as protecting citizens from health hazards or protecting the environment from pollution or contamination. Since in most cases, it is the government which would implement preventive measures (distribution of iodine pills, evacuation of specified areas, delivery of life's necessities to those evacuated or confined), one might query whether these are simply costs to be borne by the government in fulfilling its public service duties or whether it would have a right of recourse against the liable operator. The same question applies when the operator is a state-owned entity but with separate legal status – can the government essentially claim a right of recourse against a state-owned corporation?

When one bears in mind, however, that the Conventions expressly exclude from their scope: (a) claims handling costs, so as to ensure that the entire amount of compensation funds available would be distributed to victims; and (b) claims for on-site property damage or loss, so as to avoid the compensation funds being depleted by claims from other actors of the nuclear industry operating on-site, it would indeed appear contradictory that the available funds be depleted through claims from government wishing to obtain reimbursement for services provided in relation to emergency management.

There are a number of other issues to address which have been raised by the insurers, most particularly in relation to how the nuclear industry, emergency management authorities and nuclear liability insurers would respond together efficiently and effectively in the event of a nuclear incident or an event creating a grave and imminent threat of nuclear damage. While this more properly falls within the "claims handling" domain there may be lessons to be learned from other disasters in other industries.[41]

One example is the wildfire that took place in Fort McMurray, Canada in May 2016 during which, at one point, the entire population of Fort McMurray (80 000 people) was evacuated. In that case, the response of insurers was swift: they immediately sent teams to staging areas located outside the affected areas to assess losses and manage both habitational as well as commercial claims. Many carriers set up temporary claims centres at evacuation centres and some insurers began issuing emergency cheques to their insureds, many of whom had to evacuate with only a few minutes' advance notice.

IX. The way forward

The Revised Paris Convention, the Revised Vienna Convention and the CSC have all included a new definition of "preventive measures" as a cost to victims which should be compensated by the liable operator. Yet despite the fact that this new definition is relatively detailed, there is still a grey area where additional guidance would be most helpful. The nature of international treaty negotiations is such that it is highly unlikely that the terms of a convention will be any more specific than what is found under the modernised liability regimes simply because individual member countries will want to implement the convention's provisions in accordance with their own laws.

40. Šoljan, Vedran (1999), "The New Definition of Nuclear Damage in the 1997 Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage", in *Reform of Civil Nuclear Liability International Symposium*, OECD Publishing, Paris, pp. 81-82.
41. Another claims handling issue is the fact that an operator may feel duty bound to compensate for more than is really necessary under the law as interpreted by insurers, given the operator's concern for its reputation and the pressure of it being closer to the victims, their employees, employees' families and the local community.

Expert Group 5 has reviewed other international civil liability conventions and the experience of Japan during the Fukushima Daiichi accident. From this it is clear that:

- There would be considerable value in clarifying, to the greatest possible extent, the scope and nature of preventive measures prior to any actions needing to be taken. This should reduce the necessity of resorting to legal processes before any compensation can be paid.
- Defining the competent authority for taking actions would help to establish criteria for taking preventive measures and allow better communication with members of the public.
- For all radiological measures, the alignment of "preventive measures" with the IAEA and ICRP "protective actions" would help reduce the uncertainty regarding the triggers for taking action and the type of actions that would be taken.
- Issues such as the definition of a "grave and imminent threat" and whether governments can access compensation will need further discussion.

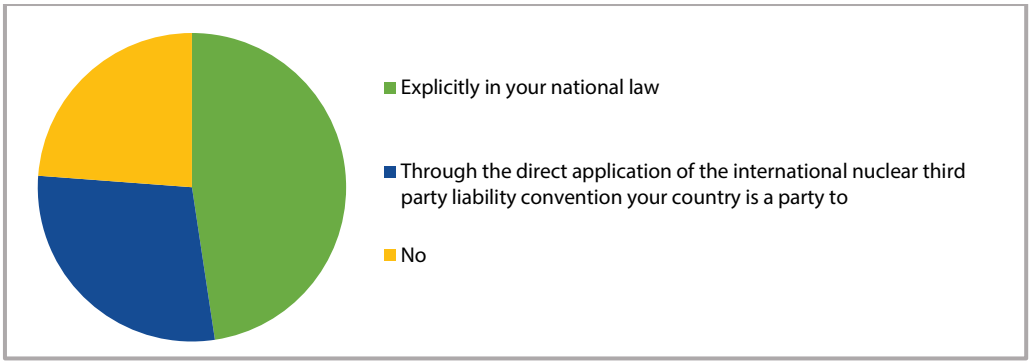
Hence, supplementing the definition of "preventive measures" with non-legally binding guidance documents, such as codes of practice or general requirements, as the IAEA has done with some of its international conventions, would significantly help to define and clarify these grey areas. Clearly further work needs to be done; as mentioned above, a first step could be obtaining agreement about the correlation between "preventive measures" under the Conventions and "protective actions" under the IAEA GSR7. Additional clarifications could follow, addressing such issues as who is a "person" entitled to be compensated for taking preventive measures.

To this end, the members of Expert Group 5 recommend that the NEA take the initiative in trying to reduce, if not eliminate, the grey areas by producing guidance documents or codes of practice which would help provide greater certainty in defining what are precisely "the cost of preventive measures" and under what circumstances should they be compensated. The Nuclear Law Committee or a working group/party thereof could be the ideal mechanism for accomplishing such a task.

Annex 5.A1. **Compilation of responses to Questionnaire**[1]

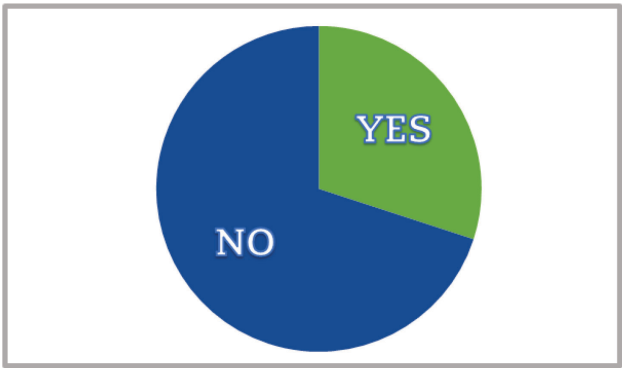
Question 7.a.

Do your national legislation, regulations and/or case law provide for this type of damage (i.e. preventive measures) in the context of a nuclear damage?



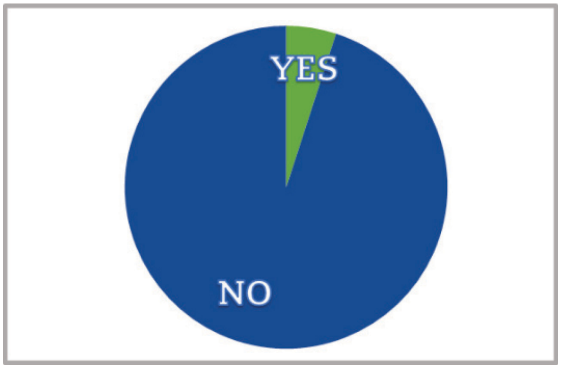
Question 7.b.

Do your national legislation, regulations and/or case law provide for a specific definition of and/or process to apply "preventive measures"?



Question 7.c.

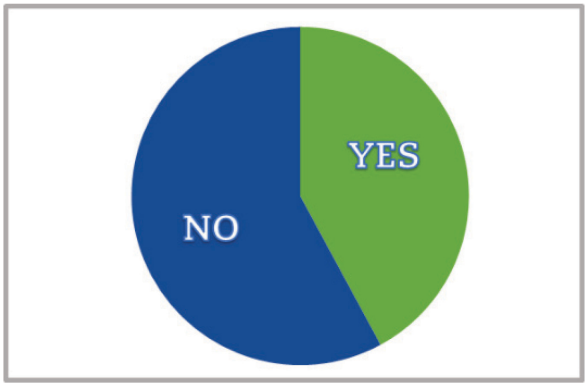
Do your national legislation, regulations and/or case law provide for a specific definition of "grave and imminent threat"?



1 The charts included in the present Annex 5.A1 provide an overview of the answers to the questions relating to the Expert Group 5 topic "Costs of preventive measures".

Question 7.d.

Do your national legislation, regulations and/or case law already define the competent authorities which would approve the preventive measures?



Annex 5.A2. **Extracts from the country responses to the Questionnaire**

1. Extracts from the French response to the Questionnaire

(b) Do your national legislation, regulations and/or case law provide for a specific definition of and/or process to apply "preventive measures"?

Yes.

Pursuant to Article 1251 of the Civil Code "expenses incurred to prevent the imminent occurrence of harm, to avoid its getting worse or to reduce its consequences constitute compensable damage" in terms of environmental damage defined as "a not insignificant violation of ecosystem elements or functions, or to the collective benefit gained by man from the environment".

Proceedings to obtain compensation for such damage can be taken by any entity upon proof of capacity and interest, such as the state, the French Agency for Biodiversity, territorial authorities and their interest groups, as well as public establishments or associations that have been established or accredited for at least five years at the time of entering a claim with a view to protecting nature and the environment (Article 1248 of the Civil Code).

(c) Do your national legislation, regulations and/or case law provide for a specific definition of "grave and imminent threat"?

Yes.

There does not exist under French law a definition of "grave and imminent threat" that is specific to nuclear damage. However, provisions on environmental liability in Article L. 161-1 of the Environmental Code define "imminent threat of damage to the environment" as "a sufficient probability that such damage take place in the near future". No indication is given as to the manner in which such sufficient probability would be assessed. According to legal doctrine, one may consider however that it could be demonstrated in the case of scientific consensus (rather than unanimous opinion) that such risk exists, and that the consequences of its occurrence can be assessed.

(d) Do your national legislation, regulations and/or case law already define the competent authorities which would approve the preventive measures?

Yes.

It should be noted that, in the event of an emergency, the Prefect (*Préfet*) of the department where the installation is located takes decisions necessary to ensure the protection of the public and the environment. Such decision-making takes place within the Emergency Response Plan (*Plan Particulier d'Intervention* – PPI) and the ORSEC Plan (French generic emergency plan) defined in Articles L. 741-1 to L. 741-8 and R. 741-38 of the Internal Security Code. On this basis, the Prefect is responsible for the co-ordination of the various means (public, private, material and human) involved in the PPI. They also ensure that the public and the mayors remain informed. The Nuclear Safety Authority (ASN) assists the Prefect with the management of these situations as set out in Articles L. 592-32 et seq. of the Environmental Code.

2. Extracts from the Hungarian response to the Questionnaire

(b) Do your national legislation, regulations and/or case law provide for a specific definition of and/or process to apply "preventive measures"?

Article 2, paragraph 23 of Act CXV1 of 1996:

23. "… nuclear damage: loss of human life, all non-material loss due to damage to physical integrity and health of persons, all damage to property, the costs of reasonable recovery of all environmental damage occurring together with these, the costs of reasonable and necessary measures actually implemented to mitigate or eliminate the non-material loss and the damage, if they are caused by an extraordinary event with nuclear fuel, radioactive product or waste in a nuclear facility, or nuclear material originating from, transported from or sent to a nuclear facility within the nuclear facility or during transport."

(c) Do your national legislation, regulations and/or case law provide for a specific definition of "grave and imminent threat"?

Article 3, paragraph 9 and paragraph 16 of Act CXXVIII of 2011 on disaster management:

9. Disaster hazard: a process or condition that may lead to a reasonable expectation of a disaster, thereby endangering human health, the environment, and the security of life and property.

16. Prevention: the application of any activity or prescription that eliminates or minimises the causes of a disaster and minimises the likelihood of damaging effects.

3. Extract from the United Kingdom Nuclear Installations Act 1965 (as amended)

11H "Cost of preventive measures"

(1) Where there is a breach of a duty imposed by section 7, 7B, 8, 9 or 10, a claim may be made for compensation under this Act in respect of the reasonable cost of preventive measures reasonably taken after the breach of duty.

(2) Subject to subsections (3) and (4), where there is a breach of a duty imposed by section 7, 7B, 8, 9 or 10, a claim may be made for compensation under this Act in respect of injury to a person or damage to property caused by—

(a) preventive measures reasonably taken after the breach of duty by a person other than the person whose breach of duty it is, or

(b) preventive measures taken after the breach of duty by the person whose breach of duty it is.

(3) The compensation that may be claimed under subsection (2)(a) does not include compensation in respect of so much of any injury or damage as is caused by an act or omission done maliciously or negligently.

(4) The compensation that may be claimed under subsection (2) does not include compensation in respect of damage to property where the property is such that damage to it would not constitute damage in breach of a duty imposed by—

(a) Section 7 (see section 7(1A)(b), (IC)(b), (3) and (3A))

(b) Section 7B (see section 7(1A)(b), (IC)(b), 3 and (3A) as applied by section 7B)

(c) Section 8 (see section 7(1A)(b), (IC)(b), 3 and (3A) as applied by section 8)

(d) Section 9 (see section 7(1A)(b), (IC)(b), 3 and (3A) as applied by section 9)

(e) Section10 (see section 10(1)(b)),

as the case may be.

(5) The payment of compensation in respect of injury to a person or damage to property otherwise than under this Act by or on behalf of a person who takes preventive measures does not prevent the making of a claim under subsection (2) (subject to the exceptions in subsections (3) and (4)) if and to the extent that that payment does not make full compensation in respect of the injury or damage in question.

(6) A reference in subsection (1) or (2) to a preventive measure reasonably taken after a breach of duty includes a reference to such part of a preventive measure as is so taken.

(7) A preventive measure is a measure taken in order to minimise or prevent—

(a) injury to a person or damage to property constituting a breach of a duty imposed by section 7, 7B, 8, 9 or 10, or

(b) significant impairment of the environment occasioning costs or losses in respect of which a claim under section 11A(1) or 11G(1) or paragraph 1 of Schedule 1A may be made.

(8) A preventive measure is reasonably taken for the purposes of this section if taking that measure is appropriate and proportionate in the circumstances.

(9) Where the breach of a duty under section 7(1E), 7B, 8, 9 or 10(1A) consists of an event that creates a grave and imminent threat of a breach of another duty under section 7, 7B, 8, 9 or 10, no preventive measure may be considered appropriate and proportionate unless it is possible for there to be at least one person, not being a person involved in the event, whose likely exposure if the threatened breach of duty were to happen would be in excess of one of the following—

(a) an effective dose of 5 mSv in the period of one year beginning with the day on which the threatened breach of duty happens or begins to happen;

(b) an equivalent dose for the lens of the eye of 15 mSv in that period;

(c) an equivalent dose for the skin of 50 mSv in that period over 1 cm^2 area of skin, regardless of the area exposed.

(10) In quantifying a person's likely exposure for the purposes of subsection (9), the effect of preventive measures taken to protect the person's health within 24 hours of the time when the event first creates the grave and imminent threat is to be disregarded.

(11) In subsection (9)—

(a) an effective dose is the sum of the effective dose to the whole body from external radiation and the committed effective dose from internal radiation;

(b) an equivalent dose for a particular human tissue or organ includes the committed equivalent dose to that tissue or organ from internal radiation;

(c) "external radiation", in relation to a person, means ionising radiation coming from outside the body of that person;

(d) "internal radiation", in relation to a person, means ionising radiation coming from inside the body of that person.

(12) Subsection (9) does not apply in the case of—

(a) preventive measures taken as regards a person involved in the event;

(b) preventive measures relating to the food supply.

(13) For the purposes of subsections (9) and (12), a person is involved in such an event if—

(a) where the event relates to a threatened breach of duty on a licensed site, the person is on the licensed site at any time when the event is happening,

(b) where the event relates to a threatened breach of duty involving nuclear matter in the course of carriage, the person is concerned with that carriage of nuclear matter at any time when the event is happening,

(c) where the event relates to a threatened breach of duty on a licensed site, the person is, after the event happens, on the licensed site for the purpose of taking preventive measures or taking part in an emergency response to the event, or

(d) where the event relates to a threatened breach of duty involving nuclear matter in the course of carriage, the person is at the place where the event is happening or has happened for the purpose of taking preventive measures or taking part in an emergency response to the event.

Annex 5.A3. **How various terms are defined elsewhere**

(a) How are "preventive measures" defined elsewhere?

- International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, 2010 (HNS):

  "'Preventive measures' means any reasonable measures taken by any person after an incident has occurred to prevent or minimise damage."[1]

- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal – Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal (Basel Protocol):

  "'Preventive measures' means any reasonable measures taken by any person in response to an incident, to prevent, minimise, or mitigate loss or damage, or to effect environmental clean-up."[2]

- Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment, Lugano 21.VI.1993 ("Lugano"):

  "'Preventive measures' means any reasonable measures taken by any person, after an incident has occurred to prevent or minimise loss or damage as referred to in paragraph 7, sub-paragraphs (a) to (c) of this article."[3]

- Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with Regard to the Prevention and Remedying of Environmental Damage ("EU Directive on Environmental Liability"):

  "'Preventive measures' means any measures taken in response to an event, act or omission that has created an imminent threat of environmental damage, with a view to preventing or minimising that damage."[4]

1. International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, 1996, as amended by the Protocol of 2010 (2010), not in force, available at: www.hnsconvention.org/wp-content/uploads/2018/08/2010-HNS-Convention-Consolidated-text_e.pdf (accessed 24 Apr. 2024).
2. United Nations Environment Programme (UNEP) (1999), "Basel Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal", UN Doc. UNEP/CHW.1/WG/1/9/2, not yet in force, available at: https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-3-b&chapter=27&clang=_en (accessed 24 Apr. 2024).
3. Council of Europe (1993), Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment (Lugano, 21 June 1993), European Treaty Series (ETS) - No. 150, not yet in force.
   Article 2, paragraph 7, sub-paragraphs (a) to (c) read as follows:
   'Damage' means:
   (a) loss of life or personal injury;
   (b) loss of or damage to property other than to the installation itself or property held under the control of the operator, at the site of the dangerous activity;
   (c) loss or damage by impairment of the environment in so far as this is not considered to be damage within the meaning of sub-paragraphs (a) or (b) above …
4. Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on Environmental Liability with Regard to the Prevention and Remedying of Environmental Damage, *Official Journal of the European Union* (OJ) L 143, 30 Apr. 2004, pp. 56-75 (EU Directive on Environmental Liability).

(b) How are "reasonable measures" defined elsewhere?

- The International Law Commission (UN) states in its report for the fifty-eighth session, (2006, chapter V, p. 68) that it is generally understood that the reference to "reasonable" is to indicate that the costs of such measures should not be excessively disproportionate to the usefulness resulting from the measure. This conclusion results from cases such as *Commonwealth of Puerto Rico v. SS Zoe Colocotroni* handled by the US Court of Appeals (1981) pertaining to oil pollution, in which it held:

> *[Recoverable costs are costs] reasonably to be incurred … to restore or rehabilitate the environment in the affected area to its pre-existing condition, or as close thereto as is possible without grossly disproportionate expenditures. The focus in determining such a remedy should be the steps a reasonable and prudent sovereign or agency would take to mitigate the harm done by the pollution, with attention to such factors as technical feasibility, harmful side effects, compatibility with or duplication of such regeneration as is naturally to be expected, and the extent to which efforts beyond a certain point would become either redundant or disproportionately expensive.*[5]

- F4 Claims (Environmental Damage) Reports and Recommendations of the Panel of Commissioners of the UN Compensation Commission held that monitoring and assessment (M&A) activities were "reasonable" whenever there was a plausible risk of environmental harm, even if the monitoring results eventually established that no damage had been caused.[6]

(c) How are "grave and imminent threat (of damage)" defined elsewhere?

International case law has some relevance to this point, in particular the case of: Gabcikovo-Nagymaros Project (Hungary/Slovakia) in which it is stated:

> *… 'Imminence' is synonymous with 'immediacy' or 'proximity' and goes far beyond the concept of 'possibility'. As the International Law Commission emphasized in its commentary, the 'extremely, grave and imminent' peril must 'have been a threat to the interest at the actual time'[7]. That does not exclude, in the view of the Court, that a 'peril' appearing in the long term might be held to be imminent as soon as it is established, at the relevant point in time, that the realization of that peril, however far off it might be, is not thereby any less certain and inevitable.*[8]

(d) How are "appropriate and proportionate" defined elsewhere?

Only the EU Directive on Environmental Liability noted above contains provisions of interest:

> *Notwithstanding the rules set out in section 1.3.2. and in accordance with Article 7(3), the competent authority is entitled to decide that no further remedial measures should be taken if:*
>
> *(a) the remedial measures already taken secure that there is no longer any significant risk of adversely affecting human health, water or protected species and natural habitats, and*
>
> *(b) the cost of the remedial measures that should be taken to reach baseline condition or similar level would be disproportionate to the environmental benefits to be obtained.*[9]

5. Commonwealth of Puerto Rico v. SS Zoe Colocotroni, 628 F.2d 652 (1st Circ. 1980).
6. United Nations Compensation Commission (UNCC) (2003), Report and recommendations made by the Panel of Commissioners concerning the 3rd instalment of "F4" claims, UN Doc. S/AC.26/2003/R.54, 14 Jul. 2003.
7. Yearbook of the International Law Commission, 1980, Vol. II, Part 2, p. 49, para. 33. (Footnote in text).
8. Case concerning the Gabcikovo-Nagymaros Project (Hungary/Slovakia), Judgment of 25 September 1997, *ICJ Reports 1997*, p. 42.
9. EU Directive on Environmental Liability, *supra* note 4.

Annex 5.A4. **Supplementary information taken from the responses to the Questionnaire**

1. Definition of/process to apply "preventive measures"

Belgium

See Article 106 of the Law of 4 April 2014 in relation to insurance. The notion of preventive measures is sustained by the jurisprudence and the national legislation related to insurance and, based on this, will be indemnified by the insurers.

France

Pursuant to Article 1251 of the Civil Code "expenses incurred to prevent the imminent occurrence of harm, to avoid its getting worse or to reduce its consequences constitute compensable damage" in terms of environmental damage defined as "a not insignificant violation of ecosystem elements or functions, or to the collective benefit gained by man from the environment".

See also Article 1248 of the Civil Code. Proceedings to obtain compensation for such damage can be taken by any entity upon proof of capacity and interest, such as the state, the French Agency for Biodiversity, territorial authorities and their interest groups, as well as public establishments or associations that have been established or accredited for at least five years at the time of entering a claim with a view to protecting nature and the environment.

Hungary

See Act CXXVIII of 2011, Article 3, paragraph 16 on disaster management:

> "16. Prevention: the application of any activity or prescription that eliminates or minimises the causes of a disaster and minimises the likelihood of damaging effects";
>
> See Act of CXVI of 1996, Article 2, paragraph 23: "necessary measures implemented to prevent or mitigate damages".

Slovenia

Act on Liability for Nuclear Damage, Article 2/5 which makes reference to the Act governing the protection against natural and other disasters.

Spain

Article 3.1 h) 6° of Act 12/2011 of 27 May on third party liability for nuclear damage or produced by radioactive materials: "all reasonable measures taken by any person, after a nuclear accident or an event that creates a serious and imminent threat of nuclear damage, to prevent or minimise the nuclear damage referred to in subparagraphs h) 1.° to 5, subject to the approval of the competent authorities as established in the regulation of these measures by the current environmental liability regulations."

United Kingdom

A description of what comprises a "preventive measure" is set out in section 11H(7) of the NIA65. This does not specify what the measures are, but describes what the measures aim to achieve.

> "11H (7) A preventive measure is a measure taken in order to minimise or prevent—
>
> (a) Injury to a person or damage to property constituting a breach of a duty imposed by section 7, 7B, 8, 9 or 10, or
>
> (b) Significant impairment of the environment occasioning costs or losses in respect of which a claim under section 11A (1) or 11G (1) or paragraph 1 of Schedule 1A may be made."

2. Definition of "grave and imminent threat"

France

There does not exist, under French law, a definition of "grave and imminent threat" that is specific to nuclear damage. However, provisions on environmental liability at Article L. 161-1 of the Environmental Code define "imminent threat of damage to the environment" as a "sufficient probability that such damage takes place in the near future". No indication is given as to the manner in which such sufficient probability would be assessed. According to legal doctrine, one may consider however that it could be demonstrated in the case of scientific consensus (rather than unanimous opinion) that such risk exists, and that the consequences of its occurrence can be assessed.

Hungary

See Act CXXVIII of 2011, Article 3, paragraph 9 on disaster management:

> "Disaster hazard: a process or condition that may lead to a reasonable expectation of a disaster, thereby endangering human health, the environment, and the security of life and property".

United Kingdom

While not setting out a specific definition for "grave and imminent threat", sections 11H (9)-(11) of the Nuclear Installations Act, 1965 (as amended):

> "11H(9) Where a breach of a duty under section 7(1E), 7B, 8, 9, or 10(1A) consists of an event that creates a grave and imminent threat of a breach of another duty under section 7, 7B, 8, 9 or 10, no preventive measure may be considered appropriate and proportionate unless it is possible for there to be at least one person, not being a person involved in the event, whose likely exposure if the threatened breach of duty were to happen would be in excess of one of the following—
>
> (a) An effective dose of 5 mSv in the period of one year beginning with the day on which the threatened breach of duty happens or begins to happen;
>
> (b) An equivalent dose for the lens of the eye of 15 mSv in that period;
>
> (c) An equivalent dose for the skin of 50 mSv in that period over 1 cm^2 area of skin, regardless of the area exposed.
>
> (10) In quantifying a person's likely exposure for the purposes of subsection (9), the effect of preventive measures taken to protect the person's health within 24 hours of the time when the event first creates the grave and imminent threat is to be disregarded.
>
> (11) In subsection (9)—

(a) an effective dose is the sum of the effective dose to the whole body from external radiation and the committed effective dose from internal radiation;

(b) an equivalent dose for a particular human tissue or organ includes the committed equivalent dose to that tissue or organ from internal radiation;

(c) 'external radiation', in relation to a person, means ionising radiation coming from outside the body of that person;

(d) 'internal radiation', in relation to a person, means ionising radiation coming from inside the body of that person."

3. Definition of "competent authorities"

Canada

See Section 20 of the Nuclear Liability and Compensation Act. Section 20 broadly defines competent authorities as those acting under a nuclear emergency scheme established under federal or provincial legislation.

Czech Republic

See Act No. 263/2016 Coll., the Atomic Act, Sections 102 and 158.

Section 102(1): "The State Office for Nuclear Safety may, by means of a general measure, take measures to regulate exposure in existing exposure situations resulting from an emergency exposure situation or a discontinued activity in a planned exposure situation (hereinafter 'lasting exposure'), where a significant increase in health detriment to members of the public following exposure could occur unless an intervention is made."

Section 102(2): "Lasting exposure shall be regulated by the State Office for Nuclear Safety in accordance with paragraph 1 by fixing reference levels for the average effective dose to the representative person per calendar year within the range of 1 to 20 mSv. Radioactive contamination of foodstuffs, feedingstuffs or water shall also be regulated by the Office by fixing maximum permissible levels of radioactive contamination for the relevant existing exposure situation."

Section 158(2): "The State Office for Nuclear Safety shall provide proposals for implementation, clarification or recall of remedial actions related to a contaminated area and member of the public within a management of a contaminated area under (section) 102(4) to ensure remedial action after a radiation accident in the area, or part of the area, affected by the radiation accident."

France

It should be noted that, in the event of an emergency, the Prefect (*Préfet*) of the department where the installation is located takes decisions necessary to ensure the protection of the public and the environment. Such decision-making takes place within the Emergency Response Plan (*Plan Particulier d'Intervention* – PPI) and the ORSEC Plan (French generic emergency plan) defined at Articles L. 741-1 to L. 741-8 and R. 741-38 of the Internal Security Code. On this basis, the Prefect is responsible for the co-ordination of the various means (public, private, material and human) involved in the PPI. He/she also ensures that the public and the mayors remain informed. The Nuclear Safety Authority (ASN) assists the Prefect with the management of these situations as set out in Articles L. 592-32 et seq. of the Environmental Code.

Hungary

See Decree No. 167 of 2010 (V.11) of the Government on the National Nuclear Emergency Response System, Article 1. "The National Nuclear Emergency Response System (hereinafter referred to as the ONER) shall provide for the preparation for the elimination of radiological, nuclear events occurring during the peaceful use of nuclear energy and for the reduction and elimination of the consequences of the incident. The ONER is a set of central, sectoral, territorial and local bodies and organisations involved in the prevention of events causing unintended exposure of the population, and reducing and eliminating the consequences of such an event, as listed in Annex 1."

Slovenia

See Article 2/5 of the Act on Liability for Nuclear Damage – the Civil Protection Commander of the State.

Spain

See Article 11.3 of Act 12/2011, of 27 May on third party liability for nuclear damage or produced by radioactive materials. "The Government may, at any time, apply repair or preventive measures for damage to the environment that affect or may affect publicly owned places or property to the extent that this is considered necessary, with charge to the General Budgets of the State."

Sweden

The Swedish Radiation Safety Authority.

Switzerland

See Article 3, paragraph 4 of the Swiss Federal Nuclear Energy Liability Act (13 June 2008) which provides that the costs for preventive measures and losses or damage due to such measures are only reimbursed if the Swiss Federal Office of Energy (SFOE) has ordered the preventive measures or has subsequently approved the latter.

Chapter 6. **Transboundary claims handling**

Conclusions from the Workshop

Twelve main claims handling challenges

1. **Time-preparedness** – Verify the level of your claims handling capability.
2. **Co-ordination of stakeholders –** Plan how operators/financial security providers/state(s) work together.
3. **Claims committee** – Organise your own Claims Committee to manage the claims process.
4. **Centralisation** – Establish a "one-stop shop" claims response.
5. **IT system** – Deal with the challenge of storage over a period of 30 years.
6. **Multilingual** – Ensure the entire claims procedure is available in different languages.
7. **Communication plan** – Set up your communication strategy in advance.
8. **Distribution of funds rules** – Consider priority rules and reciprocity principle, if applicable.
9. **Claims monitoring** – Think about how to monitor and report the consolidated claims position.
10. **Resilience** – Be prepared to tackle emerging issues (e.g. Internet disruption, bankruptcy of the operator, insurance not triggered due to an exemption of operator liability, uncertainty about priority rules, government policy change).
11. **Payments** – Clarify who will issue the payments and in which way. Do not forget emergency payments.
12. **Exercising** – Organise nuclear scenario tests involving claims handling.

I. Introduction to transboundary claims handling

The 2011 Fukushima Daiichi accident[1] plainly showed the significance of having an efficient claims handling procedure to address the large numbers of compensation claims that may arise after such large events.[2] It demonstrated that the establishment of a claims handling procedure requires the participation and co-ordination of numerous stakeholders and important investments in equipment and human resources in order to ensure an efficient compensation system. Even though the accident did not cause transboundary nuclear damage, TEPCO, the operator of the Fukushima Daiichi Nuclear Power Plant, had to handle almost 3 million applications[3] in eight years. Operationally, their response involved managing approximately 10 000 staff (at its peak) located within different offices and call centres spread throughout the Fukushima Prefecture and other sites in Japan, such as Tokyo. At the time of the Lisbon Workshop, its bilingual website was still available to provide the public with information on the process to receive compensation (the notification period was exceptionally extended by law in December 2013 until March 2021 for victims of the Fukushima Daiichi accident).

In spite of its importance, the claims handling issue has not been extensively explored in international fora until now. None of the international nuclear liability conventions describe or address claims handling. Responses to the questionnaire of the 3rd International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, held in Bratislava in 2017[4] (Bratislava Workshop questionnaire), show that almost half of the 24 countries that replied provide for a national claims handling procedure. Responses to the Lisbon Workshop Questionnaire confirmed the trend already identified within the responses to the Bratislava Workshop questionnaire, which is that very few countries have national legislation specifically addressing transboundary claims handling operations.[5]

At an international level, voices are progressively raising the matter and initiating a discussion around the need to establish appropriate claims handling procedures. In 2011, the European Commission, in its effort to explore "common ground amongst the stakeholders on the areas that could be improved at the European Union level in the field of nuclear third party liability", instituted an informal working group that discussed, among other issues, transboundary claims handling. The final deliverable, presented at an international workshop on nuclear liability in January 2014, included a set of seven recommendations covering the entire process. This was divided into three parts: 1) claims registration; 2) claims handling; and 3) claims settlement, involving, among other matters, the establishment of a "one-stop shop" for claims registration and recording and a "one single desk" at a national level for claims handling. Communication, assessment of insurers' capacities, bearing of the procedural costs and advance payments were also tackled in the recommendations of the working group.[6] These recommendations were drafted as non-"regime-dependent" and aspired, consequently, to be applicable irrespective of the nuclear liability regime that applies in each country. In a similar vein, the present Chapter echoes these recommendations and considerations along its Sections.

1. To avoid adding another layer of complexity related to the determination of the competent court and the applicable national law under the nuclear liability conventions, this Chapter will focus solely on nuclear incidents occurring at a land-based nuclear installation, excluding nuclear transport.
2. For more information, see NEA (2012), *Japan's Compensation System for Nuclear Damage as related to the TEPCO Fukushima Daiichi nuclear accident*, OECD Publishing, Paris.
3. Numbers as of August 2019. Source: Records of Applications and Payouts for compensation of Nuclear Damage, posted on TEPCO's website. Latest status available at: www.tepco.co.jp/en/hd/responsibility/revitalization/pdf/comp_result-e.pdf (accessed 24 Apr. 2024).
4. NEA (2024), *Third International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident – Workshop Proceedings*, Bratislava, Slovak Republic, 18-20 October 2017, OECD Publishing, Paris.
5. For more information on the responses to the Lisbon Workshop Questionnaire, please see Annexes 6.A1 and 6.A2 to this Chapter.
6. For more information on the recommendations elaborated by this working group and on the topics presented during the international workshop on nuclear liability, co-organised by the EC (DG ENERGY), the European Economic and Social Committee (EESC) and the Brussels Nuclear Law Association (BNLA) in Brussels on 20-21 January 2014, see https://energy.ec.europa.eu/publications/international-workshop-nuclear-liability-files_en (accessed 24 Apr. 2024).

The question of claims handling in general and, more particularly, of transboundary claims handling was discussed within the framework of the Bratislava Workshop. The debate concluded that the national legislations are a patchwork with regard to the entity in charge of claims procedures with very few bilateral agreements on transboundary claims handling. It was also highlighted that co-ordination and communication, not only with the public but also among the different stakeholders, are deemed necessary, especially taking into account the potential participation of multiple financial security providers in the claims handling. Finally, it was pointed out that a more harmonised framework ensuring pre-defined procedures dealing with language barriers, registration processes and communication would be desirable.

Given that an overarching guidance framework has been lacking until this point, Expert Group 6 activities leading up to the Lisbon Workshop focused on defining the key operational components of a transboundary liability claims capability. The members of the Expert Group shared their understanding in the structure of a claims handling procedure and reviewed available literature. The Expert Group's findings were delivered via a live role-play, scripted and acted out by the group's members, where a Claims Committee was activated and responded to a nuclear emergency.

The purpose of this Chapter is to:

- share the conclusions of the Expert Group's session at the Lisbon Workshop in the form of "Twelve Main Claims Handling Challenges";
- document the key operational components of a resilient transboundary claims handling identified by the Expert Group.

The Chapter is structured in three Sections. Section II explains how claims handling is currently addressed within the international conventions. Section III goes on to discuss preparedness actions to be considered before the activation of transboundary claims handling procedures. Section IV then discusses response and recovery actions to be considered after the activation of transboundary claims handling procedures.

The Chapter concludes with a summary of the recurring topics and challenges that the Expert Group has observed in establishing a solid claims capability, as a contribution towards the establishment of nuclear damage related claims handling guidelines.

II. Claims handling and international conventions

Few provisions are relevant to claims handling within the nuclear liability conventions. They should however be taken into account when setting up a claims handling procedure. For example:

- the principle of non-discrimination, pursuant to which all victims compensated under the scope of the Conventions should be treated without any discrimination based upon nationality, domicile or residence;
- the principle pursuant to which the law of the competent court will be the one governing the nature, form and extent of the compensation, as well as the equal distribution thereof;
- the prescription period, which requires that the process be quick in order to allow victims to claim for compensation before they lose their right to do so.

The principles established under the Convention(s) to which the installation state is a party apply to all victims who are located in its territory and in the territory of those states which are parties to the same Convention(s) or to an international instrument that establishes treaty relations between the two states. In case the installation state and the affected state do not have treaty relations or a bilateral agreement, the nuclear third party liability regime will not apply and the victims of the affected state shall have to process their claims under general tort law, where conflicts of law and jurisdiction may come into play. They may not be certain to benefit from the principles cited above.

Even though the modernised Conventions allow their parties to provide for unlimited liability of the operator in their national legislation, most countries have a capped amount, which requires monitoring the sums paid to compensate the victims. In addition, two conventions (BSC and the CSC) require that their state parties provide additional public funds and establish an international fund that will provide additional amounts in view of compensating the victims. These schemes not only require monitoring of the payments to know when to trigger additional funds, but also require co-ordination with the relevant governmental authorities in charge of providing such amounts.

It is interesting to note that "transboundary damage" is not explicitly defined in any of the nuclear liability conventions. A useful description may be found in the commentaries of the Draft Principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities as adopted by the UN International Law Commission (ILC). Accordingly, transboundary damage is "damage occurring in one State because of an accident or incident involving hazardous activity with effect in another State." [7] This concept "refers to damage caused in the territory or in other places outside the territory but under the jurisdiction or control of a State other than the State in the territory or otherwise under the jurisdiction or control of which the hazardous activities are carried out. It does not matter whether or not the States in question share a common border."[8]

During the Bratislava Workshop, it was pointed out that claims handling procedures are not a source of concern for the nuclear industry alone. Several activities may cause large volumes of liability claims (e.g. health claims, claims arising out of a natural disaster or major industrial accidents) and some industrial activities (such as those of the oil and chemical industries) may experience transboundary damage.

As there has been a very limited number of precedents in the nuclear sector, one could look at other industrial sectors for reference. An interesting example is the International Oil Pollution Compensation Funds (IOPC Funds), which are two intergovernmental organisations (the 1992 Fund and the Supplementary Fund) which provide compensation for oil pollution damage resulting from spills of persistent oil from tankers. As explained on their website:

> The framework for the regime was the 1969 International Convention on Civil Liability for Oil Pollution Damage (1969 Civil Liability Convention) and the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution (1971 Fund Convention). Over time, it became clear that the amount of compensation available for major incidents needed to be increased and the scope of the regime widened. This resulted in two further instruments, known as the 1992 Civil Liability Convention and the 1992 Fund Convention. Following the 1999 Erika (France) and 2002 Prestige (Spain) incidents, a third instrument, the Protocol to the 1992 Fund Convention (Supplementary Fund Protocol), was adopted in 2003, providing additional compensation over and above that available under the 1992 Fund Convention for pollution damage in the States that become Parties to the Protocol.[9]

Within this framework, the IOPC Funds must pay compensation to victims of oil pollution in the terms provided under the relevant conventions. To deal with such claims, a claims handling procedure (Claims Manual) [10] has been set up, requiring the co-operation of the insurers, ship owners and the experts of the IOPC Funds for the purpose of verifying the claims and proceeding to their settlement. This is an example of a claims handling procedure that has been established to handle major disasters. Some of the features of this process are as follows:

7. See Principle 2(e) of the International Law Commission (ILC) Draft Principles on the allocation of loss in the case of transboundary harm arising out of hazardous activities, 2006, para. 26, available at: http://legal.un.org/ilc/texts/instruments/english/commentaries/9_10_2006.pdf (accessed 24 Apr. 2024).
8. *Ibid*.
9. For more information, see https://iopcfunds.org/about-us/ (accessed 24 Apr. 2024).
10. For more information, see IOPC Funds (2019) Claims Manual, available at https://iopcfunds.org/wp-content/uploads/2018/12/2019-Claims-Manual_e-2.pdf (accessed 24 Apr. 2024).

provisional payments are available under certain conditions; assessment of claims is subject to a specific time framework, according to which it is desirable that the compensation be agreed between the IOPC Funds and the victims in the period of one month; the Funds may restrict compensation payments to a percentage of the losses to ensure that all claimants are given equal treatment. The establishment of local offices in the case of a large number of claims is encouraged, whilst arrangements to keep informed the claimants over the status of advance of their claims assessments are also part of the plan.

III. Potential actions to be considered before the activation of transboundary claims handling procedure

According to the nuclear liability conventions, operators are solely and exclusively liable for any nuclear damage suffered by third parties due to a nuclear incident occurring at one of their nuclear installations. This would therefore mean that they are responsible for an efficient claims handling process. However, in practice, an arrangement may be put in place for compensation claims to be managed by a third party, such as the insurers. One of the lessons learnt from the Fukushima Daiichi accident is the need to be prepared to face such an important challenge. A bill to amend the Japanese Nuclear Damage Compensation Act[11] was adopted in December 2018 which, among other improvements, requires nuclear operators to publish their policy for the execution of nuclear damage compensation, including the claims handling process, the financial security coverage and the dispute resolution mechanism [Article 17(2)].[12]

In view of the variety of national legal frameworks and conditions agreed between the operators, on the one hand, and their insurers and financial security providers, on the other hand, a multiplicity of claims handling mechanisms may be envisaged. The purpose of this Chapter is not to determine a one-size-fits-all solution, but to identify some of the challenges that may arise and which should be taken into consideration by each country when envisaging to set up a claims handling framework.

1. Nuclear emergency and response: taking into account the compensation aspects

States have been addressing international emergency and response issues for a long time within the IAEA and the NEA. Both institutions constantly encourage the improvement of the international aspects of nuclear incidents' emergency planning, preparedness and management. The international framework on preparedness is based upon the Convention on Early Notification of a Nuclear Accident (Early Notification Convention),[13] together with the Convention on Assistance in the Event of a Nuclear Accident or Radiological Emergency.[14] IAEA Safety Standards assist in building a sound system of emergency preparedness and response through guidelines, recommendations and good practices, whilst operational tools have been conceived in an effort to facilitate the implementation of the above-mentioned conventions and Safety Standards.

Drawing from the numerous publications prepared by the IAEA and the NEA in this field, one could retain the following main messages for the purpose of this Chapter: governments must ensure an integrated and co-ordinated emergency management system for preparedness and response for a nuclear or radiological emergency, and must ensure that roles and responsibilities for preparedness and response for a nuclear or radiological emergency are clearly specified and

11. For more information concerning the 1961 Act on Compensation for Nuclear Damage, see NEA (2012), *Japan's Compensation System for Nuclear Damage as related to the TEPCO Fukushima Daiichi nuclear accident*, OECD Publishing, Paris.
12. Act No. 90 of December 12, 2018 to partially amend the 1961 Act on Compensation for Nuclear Damage.
13. Convention on Early Notification of a Nuclear Accident (1986), IAEA Doc. INFCIRC/335, 1439 UNTS 276, entered into force 27 Oct. 1986 (Early Notification Convention).
14. Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1986), IAEA Doc. INFCIRC/336, 1457 UNTS 134, entered into force 26 Feb. 1987 (Assistance Convention).

assigned. In order to strengthen international co-operation and co-ordination of the response at a transboundary level, international institutions have long established emergency preparedness exercises, such as the NEA's International Nuclear Emergency Exercises (INEX) or the IAEA's Conventions Exercises (ConvEx). In the context of these exercises, the effectiveness of existing nuclear emergency response plans and procedures is regularly tested, though the compensation aspect is seldom included.

Notwithstanding the fact that under the nuclear liability regime the operator is solely and exclusively liable for any nuclear damage, one of the IAEA Safety Standards states that "the government shall ensure that arrangements are in place for effectively governing the provision of prompt and adequate compensation of victims for damage due to a nuclear or radiological emergency".[15]

During the discussions within the Expert Group, it was pointed out that emergency preparedness and response experts, together with the stakeholders involved in the claims handling process (mainly the government, the operator, the insurers and other financial security providers) should be invited to work together to address at national and international levels (in case of transboundary damage) some of the challenges linked to claims handling in the aftermath of a major nuclear incident in order to be ready to respond in the most efficient manner. Among other claims handling aspects, on the occasion of these exercises, the activation of claims capabilities, including offices, call centres and information centres intended to receive the population affected by the accident could be tested, as well as the IT system to register and manage claims and mechanisms to keep the claimants informed of the status of their claims.

2. Identifying the stakeholders who will be involved

The stakeholders involved in the claims handling process may differ from one country to another. Those whose involvement is necessary will be reviewed here.

The operator

As mentioned above, under the nuclear liability conventions, the operator is solely and exclusively liable for any nuclear damage suffered by third parties, meaning that they must have in place an efficient claims handling process. They could do it by themselves or delegate such obligations to a third party, while taking the lead and ensuring that the dedicated mechanism in place works, i.e.:

- an insurer or any other financial security provider (especially if the premium paid to an insurer by the operator includes claims handling services), a separate service agreement with a third party administrator (TPA); or
- an internal management organisation (e.g. setting up a claims handling management committee); and/or
- state authorities depending on where the nuclear incident occurred and the extent to which their participation is required under national legislation and/or any agreement between the installation state and the operator.

The operator should have a crisis management process that could be easily activated if a nuclear incident were to occur, including a pre-agreed agenda of the issues to be immediately tackled after the occurrence of the nuclear incident.

15. IAEA (2015), *Preparedness and Response for a Nuclear or Radiological Emergency*, IAEA Safety Standards Series, General Safety Requirements, No. GSR Part 7 (Rev. 1), IAEA, Vienna, Part 4 "General Requirements", para. 46.

Insurers and/or financial security providers

The Conventions allow operators to have "insurance or other financial security … of such type and terms as the competent public authority shall specify."[16] In addition, they require that the installation state provide the necessary funds to the operator if insurance or other financial security is not available or sufficient to satisfy nuclear damage claims, up to the operator's nuclear liability amount.

Therefore, the operator may have a variety of financial securities in addition to insurance (such as mutuals, and state insurance/re-insurance/guarantees), among which co-ordination should be clarified beforehand in order to align the claims handling process once activated. Not only must the operator ensure how and when all the different funds will be provided, but also who will monitor the receipt of such funds and the payments to the victims.

It is important to note that nuclear insurance pools may address transboundary claims handling either bilaterally (for some of them) or within the Nuclear Pools' Forum, but they are not the decision makers when implementing claims handling, they are a service provider (as is the case for the other financial securities providers). Therefore, they need the operator's and the government's instructions on certain matters.

The government: identifying the relevant authorities

A number of issues need to be addressed by the government, such as intergovernmental relations with the affected states, the supervision of the whole process and the interpretation or application of the relevant nuclear liability convention.

Pursuant to the Early Notification Convention and the Assistance Convention, as well as other international conventions, bilateral agreements, and non-binding instruments (such as a number of safety standards) and practical arrangements and mechanisms, the installation state must notify the details of the accident (its nature, time of occurrence and exact location) to the IAEA and to the states that are or may be physically affected, either directly or through the IAEA. It must also promptly provide them with specified information relevant to minimising the radiological consequences in those states. In this context, specific reference should be made to the IAEA's Incident and Emergency Centre (IEC), which "maintains a list of emergency contact points in Member States, States parties to the Early Notification Convention and on Assistance in the Case of a Nuclear Accident or Radiological Emergency, and in other relevant international organizations."[17] Through this channel of communication and its website of Unified System for Information Exchange in Incidents and Emergencies (USIE), it is possible for states to communicate an emergency and follow-up on such situations.

At the EU level, the European Community Urgent Radiological Information Exchange (ECURIE) was established to enable prompt notification and information exchange in the event of a radiological or nuclear emergency.[18] All EU member states as well as Switzerland, Norway, Montenegro, the Republic of North Macedonia and the United Kingdom participate in the ECURIE system. They are required to promptly notify the EC if they opt to implement measures to protect their population in the event of an emergency. The Commission must then make this notification available to all other members.

16. See, for example, Article 10(a) of the Revised Paris Convention.
17. For more information on the IAEA Emergency notification and reporting system, see www.iaea.org/topics/notification-and-reporting#:~:text=The%20IAEA%27s%20Incident%20and%20Emergency,in%20other%20relevant%20international%20organizations (accessed 24 Apr. 2024).
18. For more information on ECURIE, see Council Decision 87/600/Euratom of 14 December 1987 on Community arrangements for the early exchange of information in the event of a radiological emergency, *Official Journal of the European Union (OJ)* L 371/76 (30 Dec. 1987) and Agreement between the European Atomic Energy Community (Euratom) and non-member States of the European Union on the participation of the latter in the Community arrangements for the early exchange of information in the event of radiological emergency (Ecurie) in *Official Journal of the European Union (OJ)* C 102 (29 Apr. 2003).

The EU member states in treaty relations with regard to nuclear liability could establish a similar system to inform each other of the contact points in their respective countries, or may independently do so by bilateral agreements. Another possibility would be to assess whether the contact points already established under the Early Notification Convention and the ECURIE systems may be used for nuclear liability issues. The installation state will manage co-ordination with the affected or potentially affected states, keeping informed as necessary the operator and other stakeholders involved in the claims handling process.

As mentioned above, governments must ensure an integrated and co-ordinated emergency management system for preparedness and response for a nuclear or radiological emergency, and must ensure that roles and responsibilities in the event of a nuclear or radiological emergency are clearly specified and clearly assigned. Therefore, each government must identify the authorities involved and their respective roles in the claims handling process to comply with such expectations.

With regard to the interpretation or application of the nuclear liability conventions, it is important to note that they provide for dispute resolution mechanisms in case the states party to those Conventions disagree on their interpretation or application. Therefore, it is up to the states to discuss and agree on matters such as the scope of application of the Conventions, the practical implementation of the principle of reciprocity or priority rules (which are explicitly provided only under the Revised Vienna Convention). Therefore, if the operator or the entity in charge of the claims handling has any query on the interpretation or application of a convention, they will need to refer to a government entity. Going through the mechanisms provided under the Conventions or going before the national courts will take too long with regard to the immediate need of the victims to be compensated. The settlement of dispute by negotiation or by any other peaceful mean is preferable given the circumstances.

In addition, the Conventions provide that certain decisions regarding nuclear damage will need to be taken by a governmental authority, such as the competent authorities that will need to approve measures of reinstatement of impaired environment. Such authorities would need to be identified in advance in order to ensure that decisions with regard to the implementation of the definition of nuclear damage have been taken by the relevant authority swiftly.

3. Setting up some practical aspects of the claims handling process

In addition to identifying the entities that will be involved in the claims handling process and in organising a crisis management process within the operator's organisation, linking it also with the claims, the operator and the relevant stakeholders should jointly consider establishing a comprehensive claims solution, considering the people, processes, technology and policies required to deliver an effective and scalable performance.

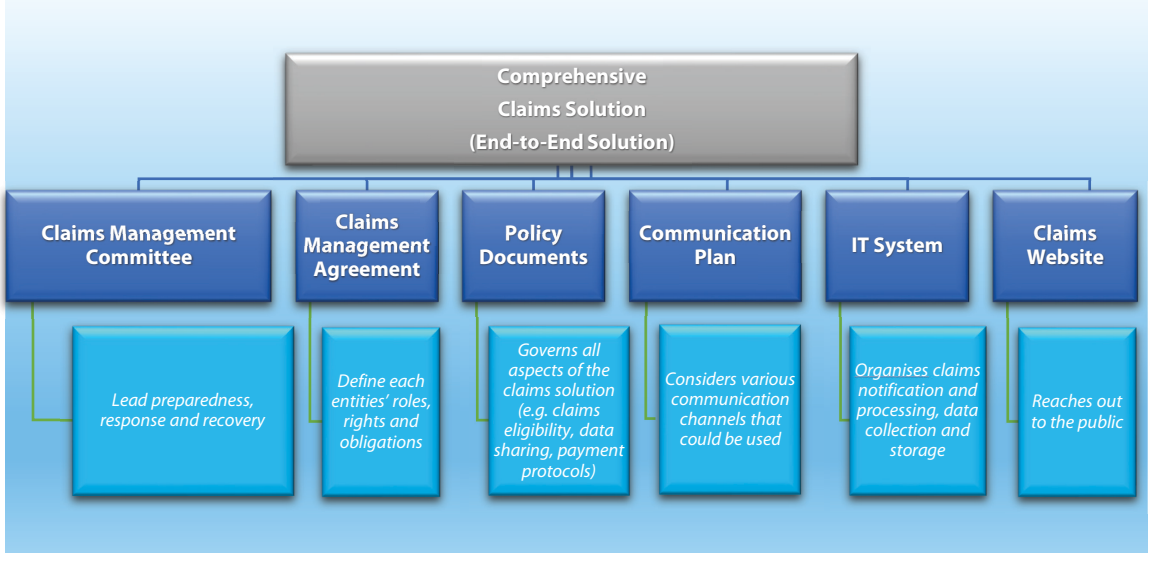
It seems necessary that a communication channel be established with the national authorities via the claims committee instituted by the installation state (see Section IV.3) with the purpose of clarifying whether the one-stop shop solution will be centrally decided and implemented. This one-stop shop organisation rests upon the idea of a decentralised provision of services as close to the claimants/victims as possible. More precisely, the one-stop shop solution represents, on the one hand, a centralisation of the decision making and gathering of information and, on the other hand, it guarantees a decentralisation in terms of activities laid down in the field. This element is all the more important in the context of transboundary nuclear damage affecting several countries. Schematically, claimants would introduce in the system the necessary requested information (centralisation of the data), which then would be released to another stakeholder involved in the process of the claims with different skills and different tasks (decentralised use of the data). Within this framework, attention should be paid to the presence of translators to facilitate communication with claimants/victims speaking various foreign languages.

Such a one-stop shop solution may include (see Figure 6.1 below), at least:

- A claims compensation request form template to be completed by victims.
- An IT system for claims notification, data collection/storage, claims processing, monitoring and reporting and potentially issuing payments.
- A dedicated website to reach out to the public (a multilingual website may be considered).
- A sound communication plan, considering the various channels that may be used including phone, Internet, television, radio, social media, including pre-prepared messages, ready to be issued.
- A policy document governing all aspects of the claims solution (e.g. claims eligibility, data sharing, payment protocols). This document is expected to ensure that all parties are clear about their respective roles and responsibilities and can be held accountable; it mitigates key person dependencies; and provides a basis for the claims capability to be audited, exercised and subject to continuous improvement as operational practices advance and evolve over time and industry-wide learnings are shared.
- A claims management agreement with all the entities involved in the claims handling process defining each entity's roles, rights and obligations. Depending on how claims are administered, this may include insurers, claims handling adjusters, TPAs and legal teams.
- Such agreement should also consider the establishment of a Claims Management Committee as well as the management and distribution of funds to be provided by the installation state (as the financial security provider and under the BSC and the CSC) or other states (for the international tier under the BSC and the CSC).

The state, on its side, should consider how to address priority rules and, with regard to other states, the reciprocity principle, if relevant. It may also need to share this understanding with the financial security providers well in advance of a nuclear emergency.

Figure 6.1. **One-stop-shop solution elements**



Source: NEA.

4. Running exercises to stress test the claims management capability

Exercising helps verify that the documented claims plan will work in practice, and not just in theory. It is particularly important in the case of nuclear claims, because events are infrequent and potential complexities are numerous.

There are a number of ways in which exercises may be completed, ranging from table-top activities to a role-play or a live scenario. Exercising may be conducted for the claims process alone, or included as part of wider emergency preparedness exercises organised by different stakeholders (e.g. from the operator up to the government or even intergovernmental level).

Exercising presents a valuable opportunity for operators to conduct a range of stress tests including:

- demonstrating that their claims function is fit-for-purpose;
- developing solutions for specific operational complexities (e.g. where multiple insurance tiers are in place covered by different insurers, each with their own claims management capability);
- refreshing claims staff training;
- identifying bottlenecks and breaking points;
- ensuring that the Claims Management Committee members gain valuable experience in their roles and are comfortable dealing with the types of difficult issues that would inevitably emerge in a live situation;
- confirming that channels with authorities are open and functioning effectively;
- testing how draft policies might respond (e.g. for reciprocity or priority rules).

Exercising is followed by a debrief that provides critical feedback and learnings on operations processes and areas for improvement that can be addressed by the Claims Management Committee and integrated into claims management plans.

IV. Response and recovery actions to be considered after activation of the transboundary claims handling procedure

This Section discusses the main steps and relevant considerations concerning transboundary claims handling processes once the response has been activated after notification of the accident to the stakeholders involved.

1. Nuclear emergency measures

Upon the occurrence of a nuclear incident, emergency measures will be taken immediately by the operator and the relevant national authorities in the installation state, and in the affected or potentially affected states. All actions undertaken as emergency measures will have an impact on the compensation process, as they will cause “nuclear damage” entitling third parties to claim compensation. Those actions may be as follows, depending on the extent of the accident:

- definition of the perimeter of the affected areas and the issuance of orders to evacuate or take shelter;
- restriction orders on transportation by road, sea, air and waterways, and prohibition to harvest or plant agricultural products;
- sanitary measures, such as intake of iodine tablets and restriction or prohibition of human and cattle consumption of a variety of food and beverages;
- decontamination of the population, buildings, goods and the environment;
- restrictions on trade of certain products.

Even though such measures are taken to protect the population, sometimes at any cost, it is important to note that their magnitude will have an impact on the capacity of the operator to indemnify the victims adequately. That is why under the international nuclear liability conventions, it is stressed that preventive measures and measures of reinstatement of an impaired environment need to be "reasonable". It has been put forth that, under certain circumstances, evacuation would seem to be the most reasonable course of action to follow at the event of a nuclear emergency. In such a case, a claims website and phone number linking to the call centre have to be already established, whilst prepared evacuation sites should receive the affected population providing claimants with the necessary infrastructure (e.g. laptops, tablets) to enter their claims data on the website. Should this website be directly connected to the claims teams, claimants could be contacted by claims adjustors shortly after registration and thus have the processing of their claim started.

Evacuees may be provided with emergency payments to cover immediate and urgent needs, such as accommodation or medical expenses. If they are not directly paid by the operator, such payments will have to be reimbursed by the latter to the entity disbursing, as they can be considered as compensation for nuclear damage, being potentially qualified as preventive measures. The urgent character of such measures (e.g. payments to be available the very day of the nuclear incident covering food provisions or shelter) requires that stakeholders managing different aspects of the emergency liaise between them. Such matters should be taken into consideration, settled and, if possible, tested before any nuclear incident occurs. Past experience with nuclear incidents (e.g. Three Mile Island accident) has shown that efficient co-ordination and preparation could result in the physical presence of the entity in charge of the emergency payments on the spot, making payments within the first 24 hours after the accident and helping to alleviate the anguish of those who were evacuated.

2. Communication plan

Particular attention should be paid to the development in advance of a communication plan. Effective communication in the context of a nuclear incident with transboundary effects could face multiple challenges related to the way the message is conveyed, the appropriate use of communication channels, the focus on being heard instead of listening and on the risk of fake news and rumours. The extent of such challenges is also associated with various social factors possibly affecting the efficiency of the communication plan (e.g. nationality, culture, social class, education).

In addition, it is recommended that communication be based upon the issuance of one clear message, requiring co-ordination among all the parties involved, especially national authorities, which have to be consulted prior to the laying down of such a plan. It is suggested that a communication plan should develop in at least two steps:

- Use standard media (i.e. radio, tv channels, newspapers) as well as social media (e.g. Facebook, X (formerly known as Twitter)). Similarly to the development of a dedicated website, a special phone line may have to be operational in order to assist claimants. It should be available in different languages, when necessary. It was further suggested that an easily memorised name would enhance its use by the claimants.
- Identify, reach and directly communicate with stakeholders so as to accurately perceive, understand and anticipate public reaction to the message spread.

Rumours, fake news or fraud incidents related to the claims handling cannot be excluded. It is proposed that a special task force dealing with these issues be created. In this context, it has been suggested that a communication plan might need to enable speedy reaction (e.g. alert on potential fraud practices, deny fake news or rumours). Reactivity in communication becomes even more important in the current context, in which social media have the power to spread communication material (e.g. photos, videos) in an extremely short period of time. In this regard, a social media network integrating all stakeholders involved in the claims handling might prove helpful. Information shared this way could reach and then be shared with other stakeholders, ensuring accurate information without compromising its quality. However, it is necessary that

such mechanisms undergo a thorough and regular testing to confirm and update their capacities. It has also been pointed out that even though information needs to be quickly retransmitted, several questions related to the claims handling procedure (e.g. whether a claimant is entitled to compensation, which heads of damage could be compensated) might not be simple to answer and, as such, might not be accurately described in a message intended to be relayed through social media but instead through a question and answer section on the website.

3. Co-ordination measures

For all the reasons explained above, co-ordination between the different stakeholders involved in the claims handling process is key, as well as co-ordination with the authorities in charge of the nuclear emergency measures.

The first recommendation issued by the working group on nuclear liability, instituted by the EC,[19] insisted on installation states ensuring that entities providing financial securities have and maintain an appropriate claims management system. Similarly, in Section III.3 of the present Chapter, it is highlighted that the claims management agreement between the operator and the entities involved in the claims handling should also institute a Claims Management Committee.

During the discussions within the Expert Group, it was pointed out that it would be important to understand how the Claims Management Committee that the operator may have put in place is activated and whether the existence of a formalised trigger and legal approval protocol for activation should be required. Accordingly, the entity responsible for its activation and the terms of its triggering should be designated prior to the occurrence of an accident.

The experts also considered the possibility of having two committees simultaneously established upon the occurrence of an accident:

- One committee established by the installation state that would include various stakeholders involved in the strategic management of the accident (i.e. foreign government authorities, representatives of the operator, representatives of the nuclear insurance industry, mutuals included, and claims handlers). Its main purpose would be to focus on implementing strategies for assisting the victims and overseeing the claims handling process in case public funds are needed (i.e. if the BSC and the CSC international tiers are triggered), ensuring the fairness of the indemnification system.
- A Claims Management Committee, established by the operator, the insurers, the mutuals and TPAs to manage the claims response. This second committee would be in charge of all the operational aspects of the claims handling at least insofar as the operator's tier is concerned (i.e. setting up the claims handling registration procedure, determination of compensation amounts, ensuring the monitoring of the amounts paid, determining advance payments). The state may also decide to delegate responsibility for managing the public funds to the operator-led claims process.

In such a case, in order to co-ordinate between these two committees, a Steering Claims Committee with the participation of members of the two committees could be envisaged. It is reminded that in some countries, best practice is to use the operator as a liaison between all the stakeholders. The state must ensure that the mechanism in place ensures a high level of co-ordination between all the stakeholders involved in the claims handling process to ensure that victims are adequately and timely compensated, whether they are in the installation state or in an affected state. Given the urgency of the situation, it is important to stress again that this should be thought of in advance of a nuclear incident.

19. See *supra* note 6.

4. Determination of the beneficiaries of nuclear damage compensation

The eligibility of victims to claim compensation for nuclear damage depends on the determination of the applicable scope of the relevant nuclear liability regime (national law and, if relevant, the international instrument the installation state is a party to) and on the definition of nuclear damage under the law of the competent court, i.e. the court of the installation state.

Each nuclear liability convention provide for its scope of application. However, it is sometimes necessary to clarify such scope, as the wording may sometimes be ambiguous. In addition, the national law may provide a larger scope than the convention to which the installation state is party. Therefore, the entity in charge of the claims handling must take into account both the applicable international instrument(s) and the national law.

It was therefore suggested within the Expert Group that the government should be responsible for defining the geographical scope of application of the nuclear liability regime with regard to the region(s) affected by the nuclear incident. There should be a continuous assessment of the affected region(s) and population.

5. Determination of the nuclear damage to be compensated and of the amounts to be paid

As provided in the international nuclear liability conventions, the nature, form and extent of compensation, within the limits of the Conventions, will be governed by the installation state's national law. However, it is sometimes necessary to clarify which heads of damage will in practice be compensated, taking into account the wording of the insurance policy.

In addition, the insurers in charge of handling the claims may determine the corresponding compensation amounts for each head of damage in conjunction with the operator, based, as relevant in each country, on the national laws and regulations, decisions of government authorities and/or jurisprudence. Similarly, an estimation of the different tiers to be called upon, if applicable, may be carried out upon activation of the claims handling procedure.

Mechanisms to specify the type of damage to be compensated, taking into account the specificities of the accident, may be necessary to avoid opening judicial proceedings for that purpose, which would delay the payment of compensation to victims. In Japan, a set of non-binding guidelines was issued by an independent committee of experts to determine the heads of damage to be compensated and the compensation to be paid (usually specified in the form of a lump sum, which was an estimate based on objective criteria, such as statistical data). In this regard, setting up a claims template with a list of questions aiming at verifying whether the claimant is covered or not by the policy subscribed, along with the establishment of standard cases setting fast track responses, would contribute to an accelerated processing of claims. At the Lisbon Workshop, participants were also reminded that a mechanism to determine the increasing amounts to be progressively paid throughout a process would need to be confirmed and developed, involving various levels of knowledge and expertise. Whilst easily qualified damage would be indemnified rather swiftly, intricate or difficult-to-assess damage or injury may take years of processing before getting indemnified.

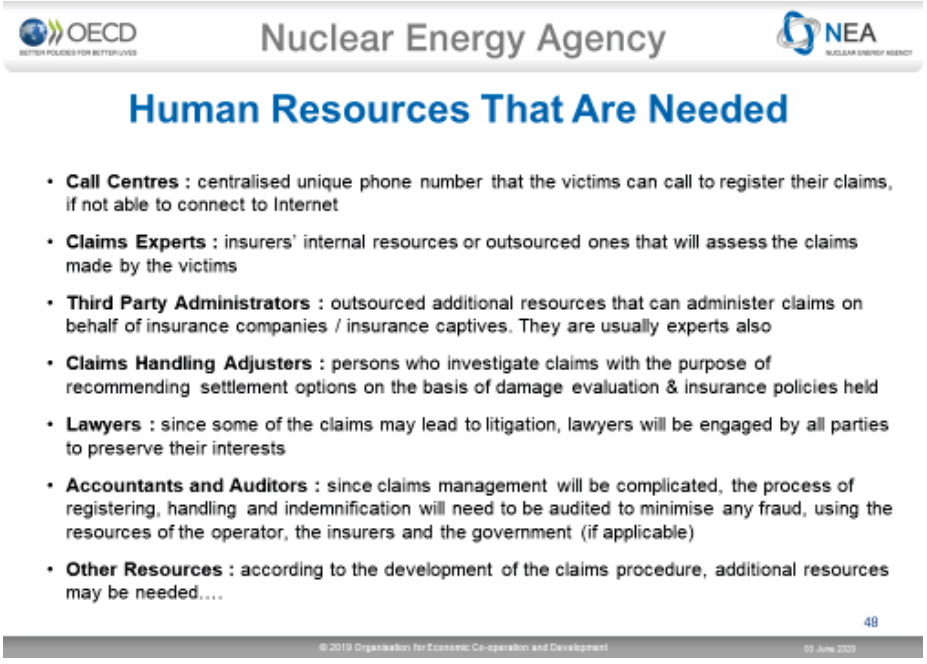
With regard to the determination of the compensation amounts, a first question to be answered concerns the entity that would conduct the evaluation of the damage. Insurance experts (i.e. claims adjusters and experts) will be in charge of defining a reserve for the maximum foreseeable loss and ensuring the first relevant assessment with regard to claims handling through expertise operations (i.e. an assessment of the heads of claim, their quantum and insurability with regard to the insurance policy). To do so, they need to quickly form a good idea of the affected region(s), which may be complicated if for safety reasons there is no access to the impacted area. In this case, alternative sources of evidence such as remote sensing aerial imagery and national records may have to be consulted. On the basis of the information provided to the insurers, experts and actuaries, the amount of reserves will be defined. This information will have to be shared with the public authorities in order to monitor their potential commitment in case of exhaustion of the operator's tier, if and where applicable.

A further question that was raised within the Expert Group concerns the nature of the guidance required from the public authorities on the eligibility of claims and the determination of the compensation amounts. It remains to be resolved whether the scope of a claims handling procedure would be best served by a "simple" guidance with no binding effect or by an instrument of a binding nature as per a regulation. For example, in the case of claims for compensation for the cost of measures of reinstatement of an impaired environment, their "reasonable" character may be subject to very different interpretations. It is suggested that the type of instrument to be chosen should best serve the purpose and the aim of the claims handling procedure. This may be all the more important in view of the fact that assessment of the claims and, in consequence, interpretation of the applicable law will be under the responsibility of different third party claims handlers (e.g. TPAs).

6. Transboundary claims registration procedure

One of the main outcomes of the work of this Expert Group is the belief that the procedure related to the registration of transboundary claims should be established in advance. The entity in charge of claims handling should outline the process and prepare a draft compensation request form prior to the nuclear incident. The procedure needs to be a common and concerted one between the stakeholders involved. The period until the first claims start being filed should be estimated and taken into account in the preparation of the registration system and staffing plans. Furthermore, likely human resource requirements over time for both claims notification and processing (see Figure 6.2) should be modelled along with the languages to be used in the communication with the public. Worst-case scenarios (e.g. Internet or phone lines going down, electrical failure) should also be assessed and contingency plans developed.

Figure 6.2. **Human resource requirements for claims management**



Source: Presentation of Expert Group 6, "Transboundary Claims Handling", presented at the Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident, Lisbon, October 2019.

Where multiple entities provide for insurance or financial security, it will be important to define who among the TPAs appointed by the insurers or the operator (depending on the entity responsible for claims handling) or the internal resources of the insurers will be responsible for

managing the claims process up to the limits of their respective liability, and under which terms and conditions. The experts that will assess the claims that have been registered should be appointed by the insurers and/or the TPAs. Periodic stress tests and exercises undertaken as part of preparedness activities should ensure that this division of responsibility is already well understood and merely requires confirmation.

Another relevant question concerns the entity that will provide the resources to handle the claims. It is suggested that the insurers, the TPAs and any other party appointed on an ad hoc basis provide such resources. As has already been indicated, the procedure for claims assessment needs to be already in place and active, going through periodic stress tests and exercises in order to be properly updated. All concerned stakeholders should be involved in such exercises.

Logistically, the claims registration procedure should confirm that other key elements (e.g. setting up of relevant offices and hiring necessary staff) are in place and functioning correctly, including:

- The registration should be ideally done via a common IT system for all the stakeholders involved in the claims handling process (including the victims), and available in several languages. It should also ensure continuity in the process without any risk of losing data, which should be safely stored for the very long term. During the discussions of the Expert Group it was agreed that this one-IT system approach would help provide a consolidated view of all the claims and files registered, all the payments done in the different countries as well as of the exhaustion of the different layers. Additionally, a unified IT system could simplify the relationship between co-insurers.
- Resources should be available for insurers to deploy (i.e. claims handling teams) alone or together with the operator and/or government to manage claims relating to the insured tiers, the TPAs, the call centre staff, claims adjusters, legal experts and any other specific resources engaged to reinforce the team registering the claims in the IT system (see Figure 6.2). The staff will need to be quickly trained or have its previous training refreshed, enabling them to duly perform their duties.
- The entities involved in setting up the registration procedure should consider preparing in advance and regularly updating a user-friendly manual of instructions for the staff registering and processing the claims. More specifically, it was stressed that the staff in charge of handling the claims should be aware of the nuclear third party liability policy in force at the date of the nuclear incident.

Victims may file compensation claims directly to insurers, TPAs or the operator, in accordance with the mechanism in place. This can be done in various ways:

- directly, via a dedicated website;
- through call centres, TPAs, experts or any other entity in charge of receiving applications. In this respect, all resources should remain available to ensure good quality in the process and the answering of such call centres; and
- using paper documents for registration in dedicated locations (e.g. town halls, one-stop shop or evacuation centres in the designated shelter zone).[20]

20. At the Lisbon Workshop, the insurance experience in the context of a specific country, Canada, in respect of claims handling organisation was briefly described. Insurers have contracted with TPAs (i.e. independent experts that are licensed in the Canadian jurisdiction). Within the framework of this contract, TPAs have developed a front-end website for claims administration, which all victims can access to introduce their contact information and get a registration number. Within 48 hours, they are supposed to be contacted by a TPA representative or they will be given a phone number that they can use to reach the TPA themselves. The data introduced into such a system should be immediately accessible to the TPA's claims management system, facilitating monitoring and reporting on the claims received. The centralised management of this information was highlighted as crucial as, otherwise, keeping track of the evolution of payments and amounts would be particularly challenging.

With regard to establishing external communication with the public within the framework of the claims registration procedure, it was suggested within the Expert Group that communication on the nuclear incident should be centralised at the level of the government, the liable operator or the financial security providers in charge of the claims handling. Communication on the process of indemnification and the contact points (e.g. free phone number to call, Internet websites, offices) must be defined together by these stakeholders. The message must be issued to the population by all stakeholders using their websites and any other communication media.

Within this framework, the relevant action plan should be monitored and take into account potential complaints (e.g. relating to the length or complexity of process). It was suggested that, in response to such complaints, the communication strategy should be multi-step and try to reach influential persons to help convey to the rest of the public the key information on how to seek compensation.

Moreover, it is understood that a centralised website should be activated for claims registration. This website should be accessible in several languages with a specific dedicated address. At first, few compulsory data should be included, which must not refer to fields that are country-specific.

The following should nevertheless be clear:

- Who the person or entity is that authorises the activation of the website and what would happen in the event several websites are set up by different involved stakeholders (i.e. operator, insurers and public authorities) in order to co-ordinate the whole process.
- What kind of information relating to the event needs to be added to the website, if any.
- Who shall be in charge of the maintenance of the claims website, taking into account that it may have to remain active for a very long period of time (i.e. until the end of the prescription period, which could last up to 30 years). This means that the IT system would need to be frequently updated to ensure access to and security of the data registered thereon. Sensitive information (e.g. medical records, social security data) would require careful handling and protection. Moreover, in view of the long prescription period, it is noted that the operation of the phone lines established at the initial phase of the claims handling procedure could see progressively less activity. It should be ensured nonetheless that they remain operational in case requests and claims suddenly increase again.

The Expert Group suggests that prior to the activation of the website, its resilience should be stress-tested for a scenario in which a large number of people visit and use it to file a claim during a very short period of time. The sustainability of technical aspects (e.g. back-up process) should equally be ensured.

Once the claimants' information is gathered, it should be entered into the registration system. This is when their identity is verified. In the case of a nuclear incident causing transboundary damage, this will probably require access to different countries' databases, and as such must consider relevant applicable data protection regulations. Similarly, the personal information required for their claim to be registered may be subject to different verification procedures and data privacy regulations. Consequently, the claims handling system should take into account the variety of ways to identify a person at a national level, and ensure that their nationality and place of residence can be easily identified. This is important as all victims must be treated equally with regard to nuclear damage compensation, in accordance with the principle of non-discrimination provided in the international conventions. Installation states applying the reciprocity principle will have to be able to easily identify the nationality and place of residence of the victims in order to be able to implement the principle. Another concern that is frequently voiced in terms of identity verification is identity theft, especially when access is going to be given to a wide range of persons. In this case, securing the IT system through the request of identification would seem desirable.

In addition, it is recommended that the data, evidence or supporting documentation needed for the evaluation of claims should be established and tested ahead of time so they can be clearly described. This is even more important when data requirements vary from one country to another. In this regard, it is put forth that the IT system could be endowed with a mechanism providing for an automatic analysis of data into it, in view of enhancing the processing efficiency of the claims introduced in the system. As previously mentioned, it is suggested that states opt for the centralisation of the registration procedure, considering the establishment of a "one-stop shop" for claims registration and record. Such a procedure would ensure that the registration of all the claims presented complies with the principle of non-discrimination.

A recurring question relates to the extent to which this system should be accessible to the various stakeholders. It has already been clearly admitted that, depending on the organisation of claims handling, access might be allowed to a wide range of persons and entities (e.g. operator, victims, insurers, TPAs, national authorities, legal representatives). The functions and tasks of each of these stakeholders would define the ring-fencing of their access rights to the information available on this system, as concerns were expressed over the availability of the totality of the information to all stakeholders indistinctively.

7. Monitoring and reporting on the transboundary claims paid

The entity in charge of claims handling may be under the regulatory obligation to monitor and report on financial security limits as well as on the compensation amounts reserved for the heads of nuclear damage, which are to be indemnified in priority.

During the Expert Group 6's session at the Lisbon Workshop, participants discussed the claims prioritisation process, considering whether the total claims cost would be made up from: i) paid claims; ii) claims received but not paid; and iii) incurred but not reported (IBNR) claims. It was stressed that the answer to this question remains open, with concurring approaches set forth (e.g. based on the hypothetical nature of all but paid claims or the threshold reached beyond which the triggering of the second or third tier should occur, when applicable). Further, it was pointed out that, unless otherwise agreed, it would be the insurance contract which would determine the entity in charge of gathering the total finance review and reporting of the claims amounts (e.g. the TPAs, if involved, or, at least, the operator, as it is they who would have a general overview of the claims and the corresponding amounts).

It is important to note that the evolution of claims reserves and payments also has to be reported to the government in order for the latter to be informed of the potential exhaustion of the first tier (i.e. the funds provided by the operator), which would therefore trigger the supplementary funds of the BSC or the CSC. In case the BSC third tier is called upon, for example, the installation state would have to advance the amount required under the relevant convention's provisions and the rest of the contracting parties would have to provide the installation state with the amount corresponding to their obligations.[21] It is suggested that the information to be transmitted to the public authorities contain the consolidated reserves made according to the claims paid, reserved and IBNR. Those entrusted with the obligation to communicate these data to the public authorities could be the insurers, the nuclear operator or the TPAs in accordance with the policy chosen. This information might play a significant role not only in the legal/financial aspect of the claims handling procedure (i.e. calling for available supplementary), but also in the political management of the emergency.

The Expert Group indicated that the operator should ensure there is in place an IT system available at any time to issue a periodic claims report, including for the purpose of monitoring the exhaustion of financial securities limits, the detailed cost of processing claims, as well as the interest and costs incurred by the operator in addition to the losses covered by insurance. The report should also be able to convert the claims in appropriate currency. It is desirable that the stakeholder bearing the claims handling costs and the related amount be clearly designated. This

21. Article 3(2)(3) of the Brussels Supplementary Convention, Article 3(b)(iii) of the Revised Brussels Supplementary Convention.

being said, it is acknowledged that the amounts made available under the different nuclear liability conventions are fully reserved to the victims: claims handling costs, as well as interest and costs awarded by a court in actions for compensation, shall not be considered to be compensation for nuclear damage, and shall be covered by the operator (or its insurer if included within the terms of the contract) in addition to the nuclear liability amount it is liable for.[22]

In the case of various fund providers, their co-ordinated action is necessary in order for the distribution of funds to be clear (i.e. whether and who will receive the entire fund and whether it will be directly distributed to victims). In addition to the claims management agreement mentioned in Section III.3, another agreement between the entity in charge of claims handling and public authorities may be necessary to manage and distribute the funds of the second and third tiers, if the entity in charge of managing the first tier under the claims management agreement does not do it.

The monitoring of the payments is also crucial to ensure that priority rules are duly respected. During the Bratislava Workshop, a presentation was given on priority rules under the nuclear liability conventions and various national legislations. Regarding the impact of such rules on the claims handling procedure, it was pointed out that "having priority rules in place should trigger the introduction in the national legislation of a mechanism of damage assessment to determine whether the damage will or is likely to exceed the amounts available."[23] During the discussions of the Expert Group, members noted that such rules may vary according to the applicable national legislation. It is important that the installation states provide well in advance for a mechanism to implement the priority rules. Subsequently, if the application of priority rules needs an assessment and/or a decision by the competent authorities, such measures should be taken as early and openly as possible. Accordingly, the funds specifically reserved for the heads of damage to be compensated in priority (i.e. loss of life or personal injury) will need to be secured throughout the whole prescription period, which may last up to 30 years under the Revised Paris Convention and the Revised Vienna Convention. It remains to be answered what happens to these funds and whether their nominal value may fluctuate or not in view of the long-term character of such a financial placement. It is important to note that in case of a major nuclear incident, the available funds could be exhausted quickly, which may raise concerns for certain victims if priority rules apply: why would some of them not be compensated for immediate and tangible damage (such as damage to property or loss of income) to save funds for others that may potentially (but with great uncertainty) suffer loss of life or personal injury in the distant future? The government might have to provide explanations to the public in this case. In particular, in the case that available funds are exhausted, the relevance for the installation state of approving a "fixed tariff" to spread the impact or issuing regulations to deal with the insufficient compensation is frequently debated. It has been put forward that taking such measures by relevant regulations or law could possibly lead to litigation over the legality of such measures by victims feeling deprived of their rights. The solution to this complicated question would depend on the policy chosen, but remains a question that merits further discussion.

8. Payment of transboundary claims

During the Bratislava Workshop, on the matter of the claims payments, it was highlighted that "[t]he experience gained from the past major nuclear incidents demonstrate[d] that the available nuclear coverage may not be sufficient to compensate all the claims. Therefore, the way of sharing the insurance payments needs to be established beforehand (e.g. priority rules

22. Article 7(h) of the Revised Paris Convention, Article V.2 of the Vienna Convention, Article V A of the Revised Vienna Convention, Article 8.1 of the CSC Annex. See also Recommendation 7 of the Working Group 1 "Claims handling and related matters"; elaborated by the informal expert group on nuclear liability instituted by the EC in 2011. For more information on the Recommendation, see the international workshop on nuclear liability, co-organised by the EC (DG ENERGY), the European Economic and Social Committee (EESC) and the Brussels Nuclear Law Association (BNLA) in Brussels on 20-21 January 2014, *supra* note 6.
23. NEA (2024), *Third International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident – Workshop Proceedings*, Session 7 "Amounts available", p. 168, *supra* note 4.

to distribute compensation) with a decision-maker clearly identified, and a common understanding of how to manage settlement beyond the liability limits […]".[24]

At the Lisbon Workshop, discussions touched upon the question of whether all claims could be indemnified. It was suggested that several possibilities may remain open depending on the insurance policy in force and/or the government and judicial policy followed.

Another issue that may be raised within the framework of claims payment would concern the settlement of claims if the principle "first come, first served" applies. In this case, there is a risk that the available funds are exhausted before all the victims get compensated due to the potentially huge number of claimants.

One must also take into account that distribution rules are provided under the BSC and the CSC:

- Under the BSC, the funds provided by the second and third tiers can only benefit victims of states parties to the BSC (i.e. they will not benefit Paris Convention states that are not parties to the BSC, nor Vienna and Revised Vienna Conventions states party to the Joint Protocol).
- Under the CSC, the public funds only benefit CSC states, but in addition, its Article XI provides for a distribution rule that allocates funds between the installation state and other CSC states. In connection to this issue, a recurring topic in the discussions within the Expert Group related to the calculation method to be followed in view of the activation of the second and third tier, where applicable.

In addition, in case of transboundary nuclear damage, the principle of reciprocity may apply, affecting payments. Installation states will need to define well in advance a mechanism to implement such reciprocity, i.e. how it should apply with regard to victims of states that are entitled to claim compensation and how to monitor payments to ensure that the relevant amounts paid to a specific country do not exceed a certain cap. Reciprocity may play a procedural role, operating as a guide for the allocation of the available funds, even though it is likely that its application could create additional complexities to the compensation process in practice. In respect of this issue, the issue of the distribution of funds in light of the reciprocity principle is regularly brought forward. The distribution of those funds allocated to the victims in a country to which reciprocity applies might prove complicated. Further, the interrelation between the principle of reciprocity and the equal treatment of victims would be an important consideration in terms of compensation payments. A clear position on which of these two principles takes precedence may not be simple. Whilst the equal treatment of all the victims is one of the basic principles of international nuclear law, it is often argued that the different liability amounts observed among various states could be a fundamental cause of (potentially) unequal treatment. It has, nevertheless, been underpinned that in the event that a state decides to step in to compensate the victims beyond the currently applicable legal framework, the complications raised by the implementation of the reciprocity principle could possibly be attenuated.

It is important to note that the international nuclear liability conventions provide that compensation for nuclear damage, insurance and reinsurance premiums, sums provided as insurance, reinsurance or other financial security, as well as interest and costs, shall be freely transferable between the monetary areas of states with treaty relations (e.g. parties to the same international nuclear liability convention).[25]

In the discussions of the Expert Group, members noted that, with regard to the payment of claims that have been accepted, it should be clear who will issue the payments and in which way. It has been suggested that for the entity in charge of providing compensation, the answer will depend on the financial policies, operational situation and processes that have been put in place. It may be the financial security providers, the insurers, the operator or the TPAs acting on behalf of the different parties.

24. *Ibid*, Session 5 « Claims handling », p.112.
25. Article 7(h) of the Revised Paris Convention, Article XV of the Vienna Convention, Article XV of the Revised Vienna Convention, Article 8.2 of the CSC Annex.

Operationally, it is unclear whether electronic payment systems will continue to operate in case of a nuclear incident, posing the potential challenge that victims are unable to access funds online or via automatic teller machines (ATMs). The scenario where alternative methods (such as a pre-paid credit card or coupons) are required for a period of time, should be considered.

The payment method could be harmonised between insurers and/or the TPAs to whom delegation of payment may be granted by the governments, insurers, operators and/or financial security providers. This being said, exceptional cases (i.e. victims that do not have a bank account) should also be taken into consideration. It has been also pointed out that although it would be possible to have an inclusive IT system allowing for claims payments, realistically the number of stakeholders involved might represent a security threat. Instead, as has been indicated previously, each national system could include gates to allow restricted access to stakeholders in charge of executing payments. In any case, the most critical point is for all involved parties to have continuous access to consolidated information at any time of the indemnification process to ensure that accurate payments are made and tracked.

Finally, with regard to advance payments,[26] the opinion was expressed within the Expert Group that they have to be specified on the basis of the national legislation of the installation state, in order for those responsible for the payments to know to which type of damage each payment corresponds. The insurance policies will only cover damage as defined in the international nuclear liability conventions and/or the laws implementing them in the national legal order, otherwise they will remain outside of the process of advance payments. On the other hand, if the head(s) of damage fall under the definition included in the national law of the installation state, the insurers and the financial security providers will be involved, requiring rapid co-operation between all concerned stakeholders involved (e.g. local authorities who may be operationally managing the evacuation process). In any event, the amounts paid will need to be monitored and registered in the IT system in order to monitor progress towards the exhaustion of the available funds for each layer in all countries where advance payments are made. The IT system will play a crucial role in this aspect.

IV. Conclusions

Throughout the Expert Group's work and meetings, a number of topics and challenges to be addressed before and after the activation of transboundary claims handling procedures were regularly brought to the discussion. As a preliminary note, it is acknowledged that the solution to these challenges within each state's legal and regulatory framework may not be the same as different approaches may be put forward.

It is suggested that, prior to the occurrence of a nuclear incident, all stakeholders involved reach an efficient level of preparation, which is key for transboundary claims handling. Key considerations to be addressed may include:

- A Claims Management Committee is fundamental for co-ordinating preparedness, response and recovery activities. Whilst its composition may vary depending on the crisis response, recognition of the roles and responsibilities of the different participating stakeholders is critical.
- The government policy, human resources that may need to be mobilised, pre-established processes to be followed and the technology to be employed should be taken into consideration.

26. See also Recommendation 6 of the Working Group 1 "Claims handling and related matters", elaborated by the informal expert group on nuclear liability instituted by the EC in 2011. For more information on the Recommendation, see the international workshop on nuclear liability, co-organised by the EC (DG ENERGY), the European Economic and Social Committee (EESC) and the Brussels Nuclear Law Association (BNLA) in Brussels on 20-21 January 2014, *supra* note 6.

This aspect acquires particular importance insofar as the activation of the established claims handling procedure should take place on the basis of agreed triggering criteria rather than speculation.

- A pre-agreed agenda of the issues to be immediately tackled after the occurrence of a nuclear incident should be set up.
- As soon as the nuclear incident occurs and the transboundary claims handling is activated, it is suggested that:
- An initial impact assessment be conducted to determine the nuclear damage to be compensated and the amounts to be paid.
- A well-developed transboundary claims handling consider reciprocity rules, if and where applicable.
- Collaboration and teamwork be fostered among Claims Management Committee members, especially to be prepared to efficiently cover unexpected situations and issues.
- An end to end claims capability involving a "one-stop shop" claims IT system be established as central to the transboundary claims handling.
- Communications be tightly managed to minimise reputational risk.

In view of the above-mentioned challenges, it is clear that the response should rely on the interlinked impact of people, processes, technologies and policies.

For a schematic representation of such challenges, see the box below.

Executive summary

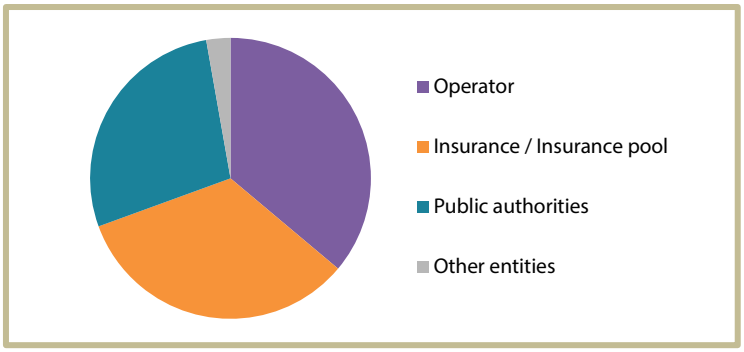
List of main challenges

1. Time-preparedness as an overarching principle for the operation of a claims handling procedure including transboundary effects.
2. Participation in bilateral, regional and international nuclear emergency exercises and the organisation of regular national preparedness exercises with the participation of all relevant stakeholders (i.e. nuclear operators, nuclear insurers, financial security providers, state authorities).
3. Centralisation of the claims handling procedure deemed as essential to ensure the efficiency of the mechanism put in place, especially in the event of a nuclear incident causing transboundary nuclear damage. Suggestion for the creation of a single point of contact or "one-stop shop", through which registration of the claims and supervision of their claims handling will be possible in the long run, regardless of the financial capacity provider(s) involved (i.e. insurers, capacity providers, governments).
4. Availability of the entire procedure in different languages, notably in the case of transboundary nuclear damage. Need for co-ordination between the state authorities of surrounding countries.
5. Designation of the entity to be in charge of communication with the public. A communication strategy should be set up prior to the occurrence of the accident.
6. The data included in the claim applications filed by the victims should be securely stored and available in the long run, which means over a period of 30 years at minimum. Need to reconcile data protection requirements with the necessity to preserve information during a long period and the requirement to share it between multiple financial security providers, without obliging the victim to enter a new claim.
7. Claims reporting should be mandatory, with consolidated figures available at any time and on a timely basis.
8. Consideration of priority rules and the reciprocity principle, where applicable.
9. Co-ordination between the operators/financial security providers and state authorities regarding the management of the claims handling system after the exhaustion of the respective financial security limits.
10. Coping with unexpected issues. What if insurance is not triggered and the response must be led by the nuclear operator? What other issues are created? What if the nuclear operator or financial providers declare bankruptcy due to the losses?

Annex 6.A1. **Compilation of responses to Questionnaire**[1]

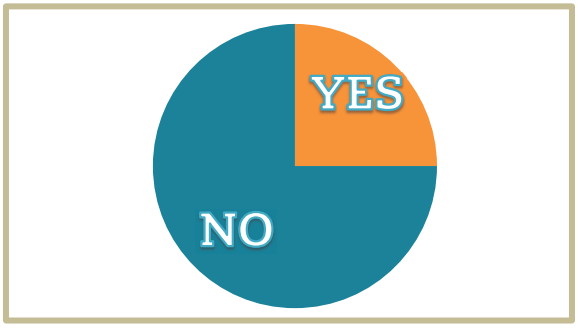
Question 9.a.

In accordance with your national legislation, who is (are) responsible for handling compensation claims for nuclear damage?



Question 9.b.

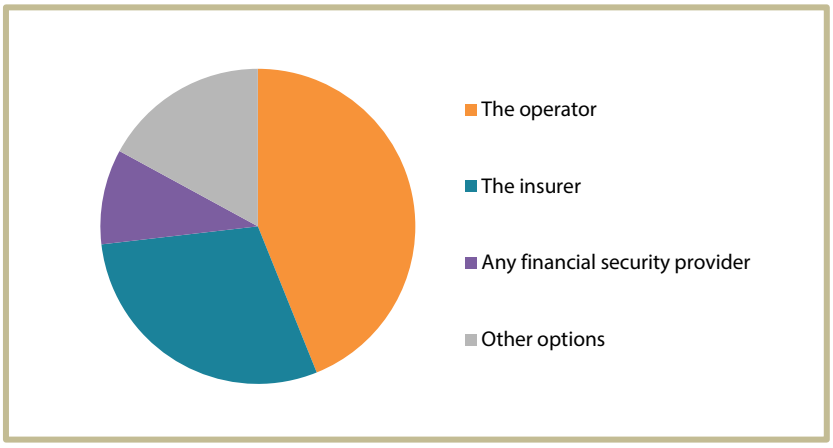
In case different entities are providing financial security(ies) to the liable operator, are there any principles/rules to co-ordinate between these different financial security providers?



1. The charts included in the present Annex 6.A1 provide an overview of the answers to the questions relating to the Expert Group 6 topic "Transboundary claims handling".

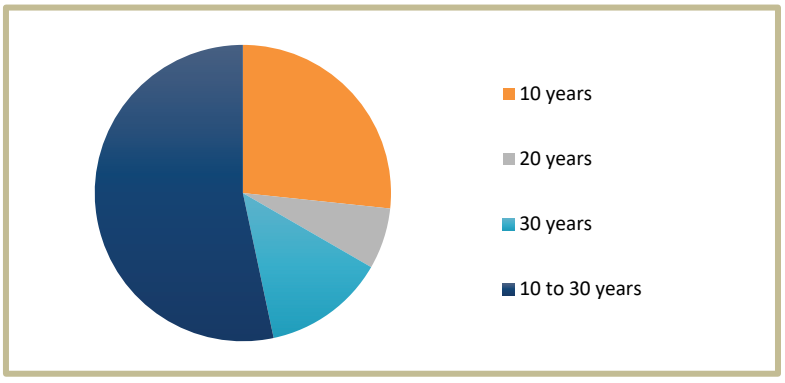
Question 9.c.

Under your national law, against whom can the victims directly claim compensation?



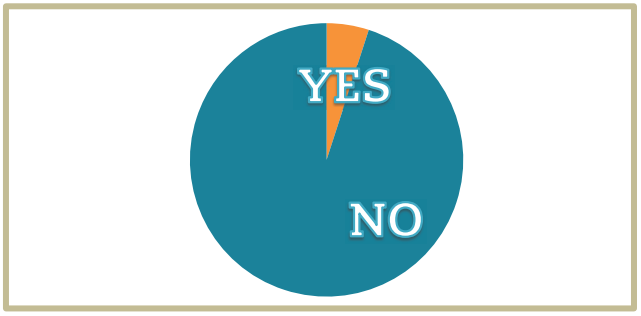
Question 9.d.

What is the applicable time limitation for bringing compensation claims?



Question 9.e.

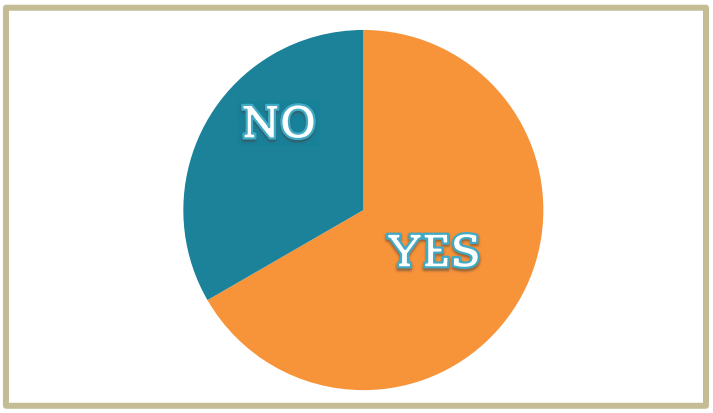
Does your country provide for a claims handling procedure that would apply to transboundary claims in case of a nuclear incident?



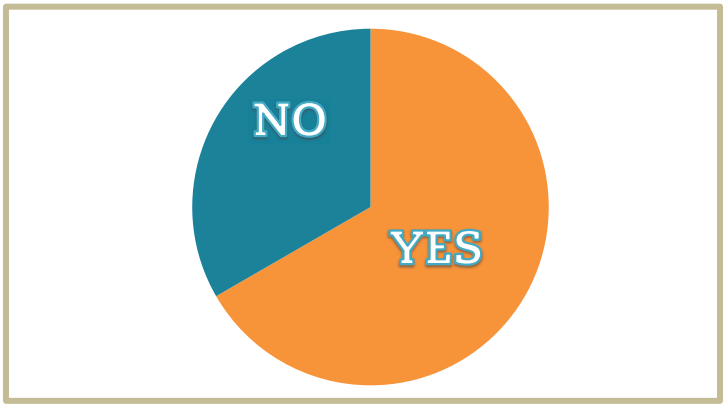
Question 9.f.

Is the entity responsible for handling compensation claims mentioned in question (a) the same entity that will carry out

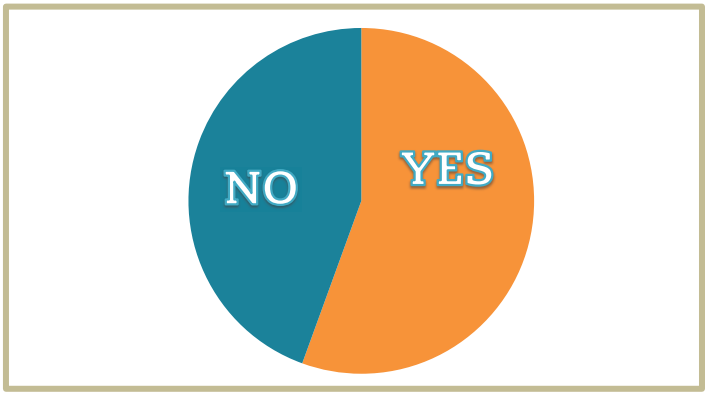
i. registering transboundary claims



ii. administering/handling transboundary claims

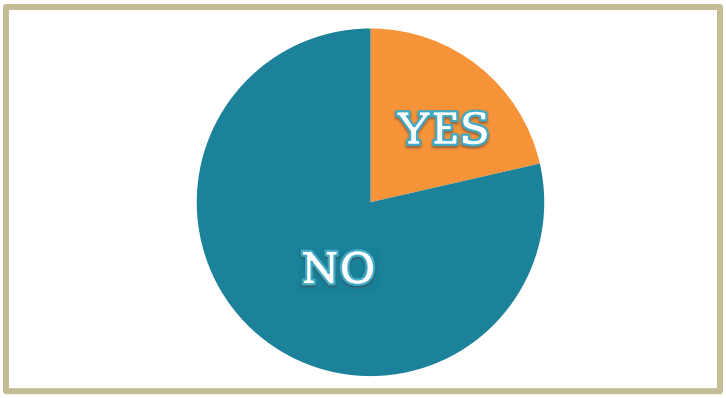


iii. paying/settling transboundary claims



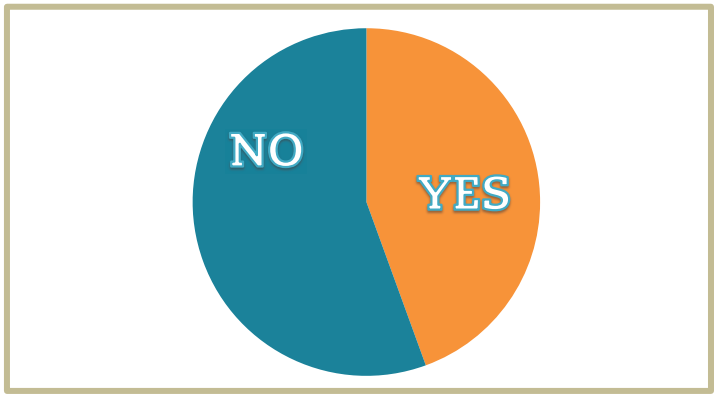
Question 9.g.

Is there a process to ensure that the entity responsible for handling compensation claims has the capacity to fulfil its role?



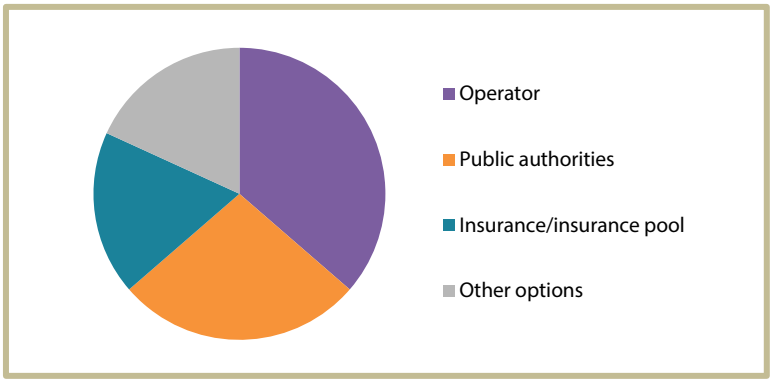
Question 9.h.

Is the entity responsible for handling compensation claims mentioned in question (a) the same entity that will be in charge of the communication towards the public?



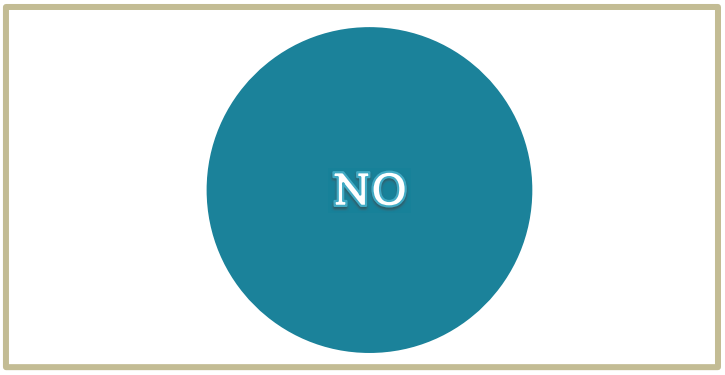
Question 9.i.

Which entity shall bear the transboundary claims handling costs?



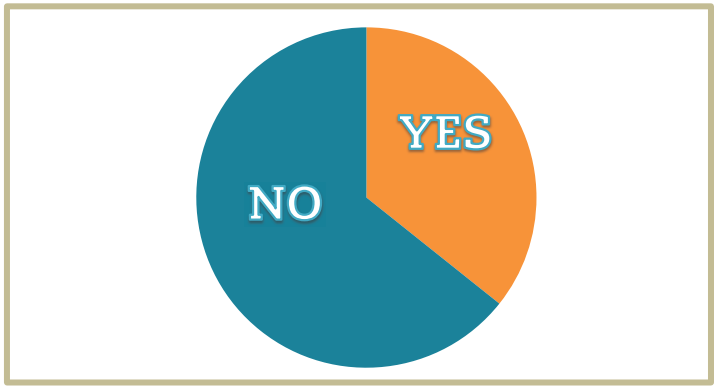
Question 9.j.

Does your country have a co-operation mechanism with neighbouring countries to manage transboundary claims in case of a nuclear incident?



Question 9.k.

Does your country provide for the public (whether nationals or foreigners) to have access to the information provided by the system set up to manage transboundary claims mentioned in question (e) above in order to follow the claim as it is being processed?



Annex 6.A2. **Responses to the Lisbon Questionnaire**

Section 9 – Transboundary claims handling

Summary

The responses to the Questionnaire circulated within the framework of the Lisbon Workshop that the Secretariat received up to this point clearly demonstrate a trend throughout national legislations to share the responsibility for handling compensation claims among different actors. In particular, these actors may be operators, insurers and public authorities, depending on whether national legislation allows insurers to handle compensation claims or whether the terms of the insurance policy to which the operator subscribes provides for such possibility. It was also pointed out in several responses received that if a distinction is made in the sources of compensation (i.e. Revised Brussels Supplementary Convention or the CSC), there should also be a differentiation in the responsible entity. Whilst the role of insurers is expected to be significant in the claims handling, operators or even public authorities may also participate in the claims handling. This being said, very few countries have established principles of co-ordination between financial security providers. It has been suggested that in the event of multiple sources of financial security for the operator, the insurance policies or contractual agreement with the latter will have to tackle this question.

Whilst only a few countries replied that victims will not be able to directly claim compensation against the operator, but instead either against the insurers only or bring their claims before the competent courts. The rest of the responses received clearly show a trend where victims may claim compensation against a multitude of actors. Operators, potentially along with insurers and/or public authorities, will be the entities against whom the victims may claim compensation. National legislation imposes certain prescription periods concerning compensation for nuclear damage. It has been previously noted that nuclear liability conventions contain specific rules on the prescription periods.[1] Some countries replied to the Questionnaire that they follow the rules concerning the prescription period, depending on the international regime to which they adhere. Some other countries instituted specific prescription periods or, in the absence of national legislation in terms of nuclear liability, apply the general provisions of their Civil Code.

It is important to note that out of all the countries that replied to the Questionnaire, only one said that its national legislation provides for a transboundary claims handling procedure. National legislation in some countries covers specific issues related to the claims handling (e.g. submission of the claims or diffusion of information to the victims). For the one country that provides for a transboundary claims handling procedure, it is a centralised procedure covering the registering, administering and settling of the claim.

The majority of the replies stated that the entity responsible for registering, administering and settling claims is the same as the one responsible for claims handling. Furthermore, only a few countries answered that there are provisions in their legislation ensuring that the entity responsible for the claims handling disposes of the capacity to fulfil its role.

1. See Article 8 of the Revised Paris Convention, Article VI of the 1963 Vienna Convention, Article VI of the Revised Vienna Convention, Article 9 of the CSC Annex.

Another essential point for the claims handling procedure, as it is discussed in Chapter 6, is communication towards the public. A little under half of the countries that responded to this question pointed out that the entity responsible for the claims handling procedure will be in charge of communication with the public, whilst a slight majority replied that a different entity would take the lead in communication with the public. It has been noted that there are different levels of communication in a claims handling procedure that can be covered by different actors. To a related question regarding access for the public to the information provided by the system managing transboundary claims in order to follow the claim as it is being processed, a minority of the responding countries answered in the affirmative. The majority responded that no such provision exists under their legislation.

With regard to the costs related to the claims handling procedure, several countries replied that it would be up to the operator to cover them. For some countries, insurers should bear these costs. Several other countries replied that public authorities would bear such costs. In a specific case, a country party to the Revised Paris Convention and Revised Brussels Supplementary Convention replied that for the first tier, the operator will be responsible for bearing the costs, whilst for the second and third tiers it would be the state. Finally, no responding countries stated that under their legislation no provision exists on co-operation with surrounding countries in the case of transboundary claims handling.

Conclusion

I. Part I Conclusion: Sessions 1-5

At the end of the second day of the Workshop, a panel discussion took place between the Chairs of Sessions 1-5, to underline the main takeaways from their sessions. Each Chair gave a brief overview of their session, outlining the main issues and potential recommendations before opening the floor for discussion between the panellists and the audience.

1. Session 1, "Loss of life or personal injury"

Session 1 focused on loss of life and personal injury and the panellists discussed the extent to which compensation can be awarded under this head of damage as well as the challenges associated with both defining "personal injury" and the extension of the prescription period from 10 to 30 years. The discussions held in Session 1 revealed that at the time of the Workshop most countries had not adequately addressed the amount of compensation victims could receive for loss of life or personal injury resulting from a nuclear incident and there was no clear guidance on how this would be decided in national courts. The Chair of Session 1 addressed these issues and discussed the outcomes of the session.

The need for a relevant group of experts

A group of experts consisting of lawyers, doctors, pathologists, epidemiologists and radiological protection experts among others should be convened to develop comprehensive guidance on what constitutes "loss of life" and "personal injury" according to the Conventions and national legislation. This group should also address the amount of compensation that can be awarded for such damage.

Physical injury

Countries should determine what can be considered "personal injury" and more specifically, what falls under "physical injury" as it can be difficult to establish causality for damage related to stochastic effects. It is easier to establish causality for damage resulting from deterministic effects (i.e. damage arising from exposure to high levels of radiation) and, therefore, easier to compensate victims accurately and appropriately. Compensation is more challenging when it requires an assessment of the damage resulting from stochastic effects (i.e. damage resulting from low doses of radiation) as such damage usually occurs far in the future when other factors may have influenced the resulting injury. There are currently no set criteria used among countries that participated in the Workshop to determine causality in damage related to stochastics effects and it often requires the interpretation of epidemiologists, pathologists and radiological protection experts.

Mental anguish

Mental anguish should be included under this head of damage and countries should provide guidelines regarding types of mental anguish to be compensated. While some countries already provide for mental anguish in their definition of personal injury, most countries do not have a clear definition of what types of mental anguish can be compensated, if it is mentioned at all. Though the growing trend is to compensate mental anguish, it poses many challenges. Some countries try to limit the extent to which compensation can be awarded by requiring that

mental anguish be accompanied by a physical injury, while others acknowledge that mental anguish can indeed cause physical ailments, which adds further complexity. Other challenges include addressing the possibility of pre-existing conditions that may have affected the development of post-accident mental anguish, as well as the duration of compensation as victims may suffer mental anguish for extended periods of time.

Indirect loss of life

Another issue that has attracted increasing attention is the concept of "indirect loss of life". This concept includes any non-radiation related loss of life that has not been directly caused by the nuclear incident such as fire, limited access to the necessary medication during evacuation and suicide. Suicide is particularly challenging in this regard as often, pre-existing conditions can be contributing factors and reactions to despair and hopelessness are often culturally conditioned, making causality difficult to establish.

Evacuation conditions

Poorly planned and executed evacuations can increase the number of physical injury and loss of life claims. They should be taken into consideration in the emergency planning phase and preventive measures should be taken to mitigate any potential impact these conditions may have on evacuees.

Challenges posed by the prescription period and priority rules

The extension of the prescription period from 10 to 30 years by some countries is challenging in relation to awarding compensation. The causal link becomes increasingly difficult to establish after 10 years, which poses a problem for courts when awarding compensation; with no clear guidance provided by the Conventions on the subject, it is left to the discretion of national courts. The 30-year prescription period also presents challenges for insurers who are hesitant to provide coverage for such an extended period of time, particularly where causality is difficult to determine and compensation claims can accumulate to an extraordinary amount, leading to coverage issues for operators. Additionally, medical advances and the evolution of case law can present unforeseen challenges that may further complicate compensation down the line. The existence of priority rules favouring damage resulting in loss of life or personal injury in some countries exacerbates this issue as it may require holding onto available funds for potential future claimants to the detriment of current claimants.

Criteria and calculation method

Criteria and calculation methods should be established to determine the circumstances in which compensation can be awarded as well as how causality is established and how much victims should receive based on the type of loss of life or personal injury. The guidelines used in the compensation scheme for the Fukushima accident could be a valuable resource for other countries to review when establishing their own guidelines on the matter. Without establishing guidelines and making them available in anticipation of a nuclear incident, victims will be faced with long court procedures before they are compensated.

2. Session 2, "Loss of or damage to property"

"Loss of or damage to property" is one of the "original" heads of damage and has remained relatively unchanged in the modernised Conventions. However, like the other heads of damage, there is also no clear definition of "loss of or damage to property", which, in some cases, has led to difficulties when compensate victims. Session 2 sought to address the issues relating to compensating "loss of or damage to property", namely, the absence of definition of the terms and the risk of overlap with other heads of damage, which could potentially result in awarding double compensation. The Chair of Session 2 discussed the session's recommendations to improve the compensation of victims and their main conclusions.

Absence of definition of "loss of or damage to property"

There is no clear and explicit definition of "loss of or damage to property" in any of the Conventions, which has led to a variety of legal approaches among countries, even those that are party to the same convention. Full discretion is given to the courts of each country to determine what can be considered "loss of or damage to property" and the amount of compensation available. This can be challenging when accidents occur in a transboundary context as different countries may have different definitions of "loss of or damage to property" and different amounts of compensation available, particularly if reciprocity rules must also be considered.

Exclusion of damage to the on-site property

While the Conventions exclude damage claims relating to the property on-site where the nuclear incident occurred, this does not affect the rights of parties to indemnify the owners of the property through commercial contracts.

Potential overlap of compensation

Claims for "loss of or damage to property" have the potential to overlap with other heads of damage (such as "costs of measures of reinstatement of the impaired environment") which, depending on the interpretation of the competent courts, can result in victims receiving double payments or receiving more compensation than they should, thereby diminishing the funds that are available for other claimants.

Lessons learned from the Fukushima accident

States need to be prepared for the occurrence of a nuclear incident by establishing a clear and comprehensive framework for compensation as early as possible. These guidelines should make clear what types of loss or damage to property will be covered, what evidence is needed, how victims can file a claim and how much they can claim for.

Development of a specific definition of "damage to or loss of property"

States must develop their own comprehensive definitions of "loss of or damage to property" (or, in lieu of a definition, provide clear guidelines on how to determine damage) and establish the criteria needed to calculate compensation at the national level. This will protect victims of nuclear incidents by ensuring adequate and timely indemnification.

3. Session 3, "Economic loss"

Economic loss was first covered under a catch-all clause in the Vienna Convention. For the Paris Convention, this loss was only to be compensated if the competent courts included it in either "loss of life or personal injury" or "loss of or damage to property". This definition has since evolved and economic loss has become a specific head of damage under the Revised Paris Convention, the CSC and the Revised Vienna Convention. With the entry into force of the Revised Paris Convention on 1 January 2022, the Vienna Convention is the only nuclear liability convention that does not explicitly cover "economic loss", however, it is still provided for under the catch-all clause in its definition of "nuclear damage". The Chair of Session 3 presented the conclusions and recommendations of the group in the concluding panel session.

Potential overlapping of compensation

Similar to "loss of or damage to property", "economic loss" has the potential to overlap with other heads of damage. Consequential economic loss and loss caused by preventive measures or damage to the environment can overlap with similar heads of damage, which may lead to double compensation. Awarding compensation in excess has a direct impact on the funds available for distribution to the remaining claimants and, therefore, should be examined in detail by the competent court when making an assessment to avoid any injustices.

Pure economic loss

"Pure economic loss" can be awarded to persons who have not suffered any physical, personal or property damage under the catch-all clause found in the Vienna Conventions and the CSC. However, claimants must still establish a causal link to be compensated and the loss must be unrelated to any economic interest in the use or enjoyment of the environment.

Scope

While the Conventions do provide some guidance on what is covered under "economic loss", courts should be provided with clear guidance. Until such guidelines are provided, courts can use traditional concepts such as "duty of care", "remoteness" and "foreseeability" to determine what falls under this head of damage. The guidelines issued after the Fukushima Daiichi accident could be a valuable resource for countries when developing such guidelines.

Timing constraints

As economic loss can be harder to prove than other heads of damage such as "loss of life or personal injury", claimants must be given a sufficient amount of time to gather evidence in support of their claim before the statute of limitations/prescription period expires. Given that these cases may take a considerable amount of time, courts may also need to award provisional payments to victims before the case has been decided. There must be an appropriate mechanism in place to determine if and when such provisional payments will be awarded to victims and if so, how much can be awarded.

The need for clear guidance on the scope of economic loss

As stated above, there must be clear guidance on what is actually covered under this head of damage. Based on previous experience in similar events, courts will want to compensate widely but will be constrained by the amount of available funds and any priority rules that may have to be taken into account. With a limited amount of funds available, even in countries with unlimited liability, courts need clear guidance on what is covered to avoid over compensating economic loss claims and leaving other victims at risk of not being compensated.

4. Session 4, "Cost of measures of reinstatement of impaired environment"

Measures of reinstatement of impaired environment aim to reduce human exposure to radiation from contaminated environment. Such measures include the costs associated with decontaminating the affected environment as well as restricting access to the affected environment, dealing with affected fauna and preventing radionuclide migration and contamination of other areas. The definition of the "environment" in national legislation has expanded dramatically over the last decade and its inclusion as a head of damage in the modernised nuclear liability conventions reflects the shift in mentality towards environmental issues that has been taking place, largely since the Chernobyl accident. The Chair of Session 4 addressed this most recent head of damage and the challenges it poses for nuclear third party liability regimes as it is less likely to be claimed by individuals but, rather, governmental bodies or non-governmental organisations.

Optimisation of reinstatement measures

There should be a thorough assessment of how best to address and implement reinstatement measures. This assessment should include a cost-benefit analysis and a review of the most current and relevant technologies to ensure effective and efficient measures of reinstatement, as well as consider social factors when deciding upon such measures.

Procedural aspects

Clear legal frameworks at the national level are necessary to determine both the competent authorities that will approve the proposed measures of reinstatement as well as the bodies that

will then implement such measures. This issue is particularly pertinent in the transboundary context and in such a case, states should work together to establish a clear legal framework for transboundary reinstatement measures.

Co-ordination between competent authorities

Co-ordination between competent authorities is necessary to determine which measures are appropriate to reinstate the impaired environment and which ones should be approved. This co-ordination would help determine what would be considered a reasonable measure of reinstatement and a reasonable cost estimate for such measures. As these measures tend to be on a larger scale than those associated with damage to property, it is crucial to determine whether the measures are reasonable as well as their estimated cost. This co-ordination must begin as early as possible to facilitate the compensation of these measures.

Potential overlapping of compensation

The overlap of "loss of damage to property" and "cost of measures of reinstatement of impaired environment", as well as that of any other, similar heads of damage should be considered by the competent courts when assessing compensation to avoid double compensation.

5. Session 5, "Costs of preventive measures"

Preventive measures are crucial in preventing or mitigating other heads of damage. While not explicitly mentioned in the original Conventions, they are listed as a specific head of damage in the three modernised Conventions (the Revised Paris Convention, the Revised Vienna Convention and the CSC). Preventive measures are any reasonable measures that are taken to mitigate the impact of a nuclear incident and must be taken as quickly as possible after a nuclear incident or in the event creating a grave and imminent threat of nuclear damage; however, they pose a unique problem as the compensation is awarded before any damage has even occurred. Session 5 sought to address this unique problem and the Chair outlined the group's conclusions and recommendations.

Definitions of "preventive measures"

The definition of preventive measures in the Conventions remains too vague for those that need to make use of them. The terms "reasonable", "appropriate and proportionate" and "grave and imminent threat" are not sufficiently defined and give the competent courts wide discretion when awarding compensation.

The scope and nature of preventive measures should be clarified prior to taking action

As preventive measures must be implemented quickly to mitigate damage from a nuclear incident, it is critical that the scope and nature of such measures be clarified prior to taking action, ideally as soon as possible, to anticipate a nuclear incident. The competent authority tasked with establishing criteria for preventive measures and approving them should also be designated as soon as possible.

Alignment of "preventive measures" with the IAEA's "protective actions"

Countries should consider aligning their guidelines on "preventive measures" with the IAEA's and ICRP's "protective actions". This may clarify the appropriate actions to be taken and when to take them.

Lessons learnt from the Fukushima accident

The guidelines issued by the Japanese authorities immediately after the Fukushima accident provide a valuable example of how to assist stakeholders in implementing a compensation scheme rapidly and efficiently that will allow victims to receive fair and adequate compensation quickly. Countries should consider looking to the Japanese guidelines as an example when drafting their own guidelines prior to a nuclear incident occurring.

Development of non-legally binding codes of practice

States and relevant organisations should give strong consideration to developing international non-legally binding codes of practice or guidance to assist in determining which actions are considered preventive measures, how to compensate them and how to award claims.

6. Common themes from Sessions 1-5

While the sessions dealt with different heads of damage and each head of damage has specific criteria that must be met, there were some overarching themes. All sessions emphasised the need to establish clear guidelines or legal frameworks to facilitate the compensation process and render it as efficient as possible. As significant discretion is left to the competent courts, these guidelines will help to streamline and expedite the compensation process and relieve the victim from the burden of costly and time-consuming litigation. There was also consensus on the need for clearer, comprehensive definitions of the scope and nature of the various heads of damage to avoid any grey areas that may lead to further litigation and delay the compensation of victims. Finally, until such guidelines and comprehensive definitions have been established, most sessions emphasised the need for the competent courts to be vigilant in their assessment to avoid double compensation for heads of damage that may overlap, as funds are limited and this would reduce the amount available for other claimants.

II. Part II Conclusion: Session 6, "Transboundary Claims Handling"

In 2013, the European Union set up a group to discuss the issue of claims handling and put forward seven recommendations for the claims handling procedure. These recommendations were mentioned as part of the session on the transboundary claims handling and the expert group compared the EU recommendations with the resulting recommendations of their own session. Four of the 7 recommendations made by the EU – the need for an up-and-running claims management system, a one-stop-shop for claims registration, a single desk for claims handling and an EU-wide claims handling communication system – are similar to 6 of the 12 recommendations put forward by the expert group in Session 6 of the Lisbon Workshop.

The 12 recommendations of Expert Group Six:

- Time-preparedness. Countries should evaluate their claims handling capability in advance to ensure readiness.
- Co-ordination of stakeholders. Countries should plan ahead so that the operators, financial security providers and the state can work together quickly and efficiently to manage claims. There needs to be an organised system co-ordinating the money coming from the operator, the insurers, public funds and the international conventions.
- Claims committee. A committee should be designated to manage the claims process and its organisation. The duties and role in the management of claims handling should be clearly established.
- Centralisation. The "one-stop-shop" claims procedure is a long-established idea, but it may present challenges, such as the new rules on data protection.
- IT system. Claims handling systems must use the most up-to-date software available and should be constantly updated to keep up with advancements in the field of IT. The system must also ensure that claims and data are stored for at least 30 years.
- Multilingualism. The system has to be multilingual. The EU alone has 24 official languages. The system must take into account the various languages spoken by residents and visitors and provide them with a form that can be easily understood by those filing the claim and those processing it.

- Communication plan. A detailed communication plan should be developed to be prepared for a nuclear incident as far in advance as possible.
- Rules on the distribution of funds. Priority rules and the reciprocity rule must be considered in this regard. The Alternate Dispute Resolution system in place in Japan is a very effective example that Europe and other regions could learn from.
- Claims monitoring. Countries must consider how to accurately monitor and issue reports on claims. This is another area where data protection may be an issue.
- Resilience. Countries must be prepared for every eventuality, e.g. bankruptcy of the operator, insurance not triggered due to an exemption of the operator's liability, uncertainty over priority rules, government policy changes, etc. To prepare readiness for a nuclear incident as far in advance as possible, countries must establish reliable back-up plans and have competent personnel in place.
- Payments. Clarify who will distribute the funds and how they will do so. Emergency payments are critical to ensure the proper handling of an accident, so the distribution of funds in a timely manner must be considered.
- Emergency exercises. While it may be costly, carrying out test scenarios of the programmes and the people involved is important to ensure these methods work as effectively as possible in the event of an accident.

Implementation of the 12 recommendations made by the expert group is necessary but faces many challenges. While there are claims handling systems currently in place, they must keep up with the constant evolution of communication technology, IT, as well as national and international legislation. Moreover, the method of financing must be examined more closely by states, insurers and operators.

Annex A. Workshop programme

Organisers

The OECD Nuclear Energy Agency (NEA) is an intergovernmental agency that facilitates co-operation among countries with advanced nuclear technology infrastructures to seek excellence in nuclear safety, technology, science, environment and law. The current membership of the NEA consists of 33 countries from Europe, the Americas and the Asia Pacific region, accounting for approximately 81% of the world's installed nuclear capacity.

The *Instituto Superior Técnico* (IST) is the school of Architecture, Engineering, Science and Technology of the University of Lisbon. In 2012 IST integrated the former *Instituto Tecnológico e Nuclear* and became the operator of the Portuguese Research Reactor, the Radioactive Waste storage facility and the Radiation Protection and Safety Laboratory, providing technical support to the Portuguese government in the fields of radiation protection and nuclear safety.

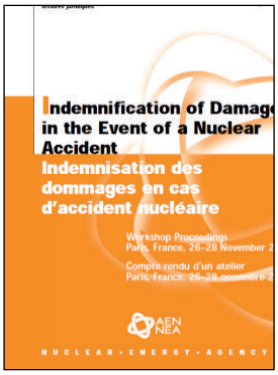
Background

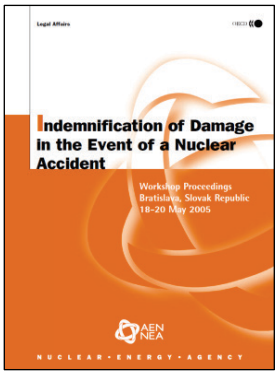
The First International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident was organised by the NEA in co-operation with the French authorities and held in November 2001 in Paris, France. Its purpose was to integrate third party liability and compensation issues into an essentially technical emergency exercise (INEX 2000, a simulated nuclear accident at the Gravelines nuclear power plant in France). The emphasis of the workshop was placed on the manner in which the Paris Convention on Third Party Liability in the Field of Nuclear Energy (Paris Convention) and the Brussels Convention Supplementary to the Paris Convention (Brussels Supplementary Convention) would apply to the indemnification of damage incurred by victims in those convention countries as a result of a nuclear accident scenario.

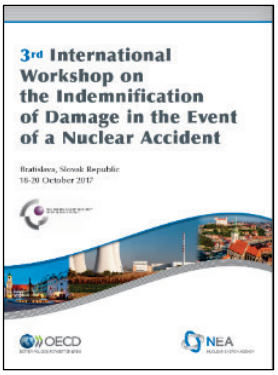
The Second International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident was held in Bratislava, Slovak Republic, in May 2005. This workshop, co-organised by the NEA and the Nuclear Regulatory Authority of the Slovak Republic, was based on two fictitious scenarios aimed to test the implementation of various third party liability regimes with a special focus on an assessment of the indemnification measures that would be taken if a nuclear accident occurred in a state party to the Vienna Convention on Civil Liability for Nuclear Damage (Vienna Convention), and more specifically a state party to both the Vienna Convention and the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (Joint Protocol).

The Third International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident was again held in Bratislava, Slovak Republic, in co-operation with the Nuclear Regulatory Authority of the Slovak Republic in October 2017. This workshop assessed the implementation of currently applicable international nuclear liability conventions in conjunction with, *inter alia*, non-convention state regimes, assuming all the modernised international nuclear liability instruments have come into force, i.e. i) the Paris Convention and the Brussels Supplementary Convention, both as amended by the 2004 Protocols; ii) the Vienna Convention and the 1997 Protocol to amend the Vienna Convention; iii) the Joint Protocol; and iv) the Convention on Supplementary Compensation for Nuclear Damage.

Past workshop proceedings







Programme

The Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident will be a unique opportunity to continue exploring the practical application of the modernised international nuclear liability conventions and national legislations, in case a nuclear incident occurred at a nuclear installation. It will address, in much more detail, topics identified by the 2017 Bratislava workshop participants for further discussion, i.e. the determination of the nuclear damage to be compensated, and transboundary claims handling, in order for the participants to understand the challenges and discuss views and options to ensure an adequate compensation of victims in case of a nuclear incident.

The determination of nuclear damage will be discussed by addressing each of the following heads of damage separately:

1. loss of life or personal injury;
2. loss of or damage to property;
3. economic loss (arising from 1 and 2, loss of income deriving from an economic interest in any use or enjoyment of the environment, loss caused by preventive measures, and any other economic loss);
4. costs of measures of reinstatement of impaired environment;
5. costs of preventive measures.

In addition, the workshop will address:

6. the administrative challenges of handling nuclear damage compensation claims.

A group of experts has been constituted for each topic mentioned above and composed of, as appropriate:

- a nuclear liability expert;
- an environmental law expert;
- an economist;
- a radiological protection expert;
- a representative of the insurance pools or mutuals;
- a representative of a nuclear operator.

These experts have prepared for each session a background note that is available at the participants restricted area on the workshop website, as well as other supporting documents. Participants are invited to read such background notes in advance of the workshop in order to prepare their questions and comments.

The below programme includes long discussion sessions after the groups of experts' presentations, in order to allow an active and collaborative discussion between the panel of experts and the participants.

Tuesday 8 October 2019

08:30 Registration

09:00 **Opening Session – Welcome Addresses**

- *Prof. Manuel Heitor, Portuguese Minister of Science, Technology and Higher Education*
- *Mr William D. Magwood, IV, Director-General, OECD Nuclear Energy Agency*
- *Prof. Arlindo Limede de Oliveira, President of Instituto Superior Técnico*
- *Prof. Pedro Romano Martinez, Director of the School of Law, University of Lisbon*
- *Dr Nuno Lacasta, President of the Portuguese Environment Agency*
- *Mr Roland Dussart-Desart, Chair of the NEA Nuclear Law Committee and Former Head of the Legal Division at the Belgian FPS Economy, SMEs, Self-employed and Energy*

10:00 **Introduction by the moderators of the workshop**

- *Dr Christian Raetzke, Independent lawyer and consultant, CONLAR – Consulting on Nuclear Law (Germany)*
- *Prof. Miguel Sousa Ferro, Professor at the Faculty of Law of the University of Lisbon and the European University of Lisbon (Portugal)*

10:10 Break and Group Photo

10:40 **Introductory session**

- Nuclear damage and claims handling in context
  Ms Ximena Vásquez-Maignan, Head of the NEA Office of Legal Counsel
- The practical challenges of determining the nuclear damage: panel of concerned stakeholders
  - Government's perspective
    Mr Roland Dussart-Desart, Chair of the NEA Nuclear Law Committee and Former Head of the Legal Division at the Belgian FPS Economy, SMEs, Self-employed and Energy
  - Operator's perspective
    Ms Fiona Geoffroy, Senior Legal Adviser, Energies Law Department, Électricité de France (EDF) (France)
  - Insurers' perspective
    Mr Peter Lodewyckx, Senior Advisor, SYBAN (Belgium)

Discussion session

12:00 Lunch

PART I – DETERMINING THE NUCLEAR DAMAGE

13:30 **Loss of life or personal injury**

Chair: *Prof. Vanda Lamm, President of the Section of Economics and Law, Hungarian Academy of Sciences and member of the NEA Nuclear Law Committee Bureau*

- Radiation and health impacts
  Mr Pedro Rosário, Head of the Division of Authorization and Nuclear Safety, Department of Emergencies and Radiation Protection, Portuguese Environment Agency (Portugal)
- Personal injury
  Ms Beata Sparażyńska, Chief Expert for EU and International Affairs, Nuclear Energy Department, Polish Ministry of Energy (Poland)
- Mental anguish
  Ms Yulia Tsegelnik, Head of Insurance Division, JSC "Rusatom Energy International" (Russian Federation)
- The concept of indirect loss of life
  Mr Jan Prášil, Senior EU Regulatory Affairs Specialist, European Affairs Department, ČEZ, a.s. (Czech Republic)
- Applicable criteria to establish the damage and calculation methods
  Prof. António Menezes Cordeiro, Professor of Civil Law, Faculty of Law, University of Lisbon (Portugal)
- Impact of the prescription period
  Mr Alain Quéré, Head Nuclear Energy Risks Swiss Re and Pool Manager SPN – Swiss Pool (Switzerland)

Discussion session

15:00 Break

15:30 **Loss of or damage to property**

Chair: *Mr Andrey Shkarbanov, International Law Adviser, Department for Legal and Corporate Affairs, State Atomic Energy Corporation ROSATOM (Russian Federation) and member of the NEA Nuclear Law Committee Bureau*

- "Loss of or damage to property" as provided under the international conventions and national legal regimes
  Ms Neža Kompare, Legal advisor, General Affairs Service, Slovenian Nuclear Safety Administration (Slovenia) and Dr Károly Gerse, Legal Director, MVM Paks NPP (Hungary)
- Radiological protection issues related to property damage
  Dr Jacqueline Garnier-Laplace, Radiation protection specialist, NEA Division of Radiological Protection and Human Aspects of Nuclear Safety (RP-HANS)
- Costs related to "loss of or damage to property"
  Mr Attila Oláh, Chairman, Hungarian Nuclear Insurance Pool (Hungary) and Mr Justin Franken, Underwriter, DKVG (Germany)
- Lessons learnt from the Fukushima Daiichi accident: damage to property in nuclear damage compensation regime in Japan
  Prof. Toyohiro Nomura, Emeritus professor at the Gakushuin University and President of the Japan Energy Law Institute (Japan)

Discussion session

17:00 End of Day 1

Wednesday 9 October 2019

09:00 **Economic loss**

Chair: *Mr Ben McRae, Assistant General Counsel at the US Department of Energy and member of the NEA Nuclear Law Committee Bureau*

- The international legal framework: the evolution and differences
  Dr Andrea Gioia, Senior Legal Officer, Nuclear Law and Treaty Section, Office of Legal Affairs, International Atomic Energy Agency (IAEA)
- Economic loss arising from loss or damage to a person or property
  Ms Anastasia Polovinkina, Director, Debt Finance and Investment, Rusatom Energy International (Russian Federation)
- Loss of income deriving from an economic interest in any use or enjoyment of the environment and further loss caused by preventive measures
  Ms Fiona Geoffroy, Senior Legal Adviser, Energies Law Department, Électricité de France (EDF) (France)
- Any other economic loss (the residual head of damage)
  Mr Ben McRae, Assistant General Counsel at the US Department of Energy and member of the NEA Nuclear Law Committee Bureau
- The rumour related damage
  Mr Tomohiro Ichiki, Director and General Manager, Japan Atomic Energy Insurance Pool (Japan)
- Economic loss from a financial perspective
  Mr Bram-Paul Jobse, Chief Financial Officer, Borssele NPP (Netherlands)

	Discussion session
10:30	Break

10:45 **Costs of measures of reinstatement of impaired environment**

Chair: *Ms Florence Touïtou-Durand, Head of Legal Affairs, French Alternative Energies and Atomic Energy Commission and member of the NEA Nuclear Law Committee Bureau*

- Practical perspectives on impairment of the environment and its remediation following a nuclear accident
  Mr Luis Portugal, Head of the Emergency Preparedness and Response Unit, Department of Emergencies and Radiation Protection, Portuguese Environment Agency (Portugal)
- Costs of measures of reinstatement of impaired environment under the revised nuclear third party liability conventions
  Ms Florence Touïtou-Durand, Head of Legal Affairs, French Alternative Energies and Atomic Energy Commission and member of the NEA Nuclear Law Committee Bureau
- Considerations on the significance threshold for environmental impairment and the reasonableness of measures of reinstatement
  Dr João Alves, Director of the Radiological Protection and Safety Department, Instituto Superior Técnico (Portugal) and Ms Maria Meruje, Legal Adviser, Instituto Superior Técnico (Portugal)
- Property damage, tort law and the compensation of environmental harm
  Prof. Monika Hinteregger, Institute of Civil Law, Foreign Private Law and Private International Law, Karl-Franzens-University of Graz (Austria)
- Perspectives from other international and national civil liability regimes for the compensation of costs of measures of reinstatement of impaired environment
  Ms Els Reynaers, Partner, MV Kini (India)

	Discussion session
12:15	Lunch

14:00 **Costs of preventive measures**

Chair: *Prof. Taro Hokugo, Director for Atomic Energy and International Affairs, Cabinet Office, Government of Japan and member of the NEA Nuclear Law Committee Bureau*

- Preventive measures in theory
  Mr Eduard Klobouček, Lawyer, Legal Division, State Office of Nuclear Safety (Czech Republic)
- Preventive measures in practice
  Mr Christopher Mogg, Radioactive Substances Regulation Advisor, Environment Agency (United Kingdom)
- The nuclear insurance industry's view
  Mr Mark Popplewell, Managing Director, Nuclear Risk Insurers (NRI) Ltd (United Kingdom)
- Preventive measures in the context of the Fukushima Daiichi accident
  Prof. Taro Hokugo, Director for Atomic Energy and International Affairs, Cabinet Office, Government of Japan and member of the NEA Nuclear Law Committee Bureau

Discussion session

15:30 Break

16:00 **Conclusion of Part I**

- **Panel of the Chairs**

Discussion session

17:00 End of Day 1

Thursday 10 October 2019

PART II – TRANSBOUNDARY CLAIMS HANDLING

09:00 **Transboundary claims handling**

Chair: *Mr Roland Dussart-Desart, Chair of the NEA Nuclear Law Committee and Former Head of the Legal Division at the Belgian FPS Economy, SMEs, Self-employed and Energy*

- Role play

11:00 Break

Discussion session

12:15 Lunch

13:45 **Conclusion of Part II**

- Panel of the Chairs

Discussion session

15:30 **Closing session**

- *Prof. Arlindo Limede de Oliveira, President of Instituto Superior Técnico*
- *Mr Roland Dussart-Desart, Chair of the NEA Nuclear Law Committee and Former Head of the Legal Division at the Belgian FPS Economy, SMEs, Self-employed and Energy*

16:00 End of workshop

Annex B. List of experts

Expert Group 1: Loss of life or personal injury

The experts of Group 1 analysed the responses received by the Secretariat to the Questionnaire and addressed the definition of personal injury, the dose threshold above which radiation can affect the human body, the concept of "mental anguish" and the possibility of compensation for an "indirect" loss of life. Finally, they discussed the prescription period to bring a claim for compensation for loss of life or personal injury.

Group Chair and Nuclear Law Committee (NLC) Bureau member	**Prof. Vanda Lamm** President of the Section of Economics and Law, Hungarian Academy of Sciences (Hungary)
NEA Secretariat	**Ms Emma Leguillon** Legal Adviser, NEA Office of Legal Counsel
Nuclear liability experts	**Prof. António Menezes Cordeiro** Professor of Civil Law, Faculty of Law of Lisbon (Portugal)
	Ms Beata Sparażyńska Chief Expert for EU and International Affairs, Nuclear Energy Department, Polish Ministry of Energy (Poland)
Economist	**Ms Yulia Tsegelnik** Head of Insurance Division, JSC "Rusatom Energy International" (Russian Federation)
Radiological protection expert	**Mr Pedro Rosário** Head of the Division of Authorization and Nuclear Safety, Department of Emergencies and Radiation Protection, Portuguese Environment Agency (Portugal)
Representative of the insurance pools	**Mr Alain Quéré** Head Nuclear Energy Risks Swiss Re and Pool Manager SPN – Swiss Pool (Switzerland)
Representative of an operator	**Mr Jan Prášil** Senior EU Regulatory Affairs Specialist, European Affairs Department, ČEZ, a.s. (Czech Republic)

Expert Group 2: Loss of or damage to property

All nuclear liability conventions provide that the operator of a nuclear installation shall be liable, in accordance with the applicable convention, for "loss of or damage to property", but they leave the exact determination of the types of damage to be compensated up to the law of a competent court as it is not simple to establish uniform international rules in this regard. The scope of civil remedies is ultimately tied to the general legal concepts and traditions of each country. The purpose of this group is to identify whether a common pattern may be identified among the definitions of damage to property provided in the national laws and establish potential criteria to be used to define "loss of or damage to property" in case of a nuclear incident.

Group Chair and Nuclear Law Committee (NLC) Bureau member	**Mr Andrey Shkarbanov** International Law Adviser, Department for Legal and Corporate Affairs, State Atomic Energy Corporation ROSATOM (Russian Federation)
NEA Secretariat	**Ms Elena de Boissieu** Legal Adviser, NEA Office of Legal Counsel
Nuclear liability expert	**Prof. Toyohiro Nomura** Emeritus Professor at the Gakushuin University and President of the Japan Energy Law Institute (Japan)
Environmental expert	**Ms Neža Kompare** Legal Advisor, General Affairs Service, Slovenian Nuclear Safety Administration (Slovenia)
Economist	**Mr Justin Franken** Underwriter, DKVG (Germany)
Radiological protection expert	**Dr Jacqueline Garnier-Laplace** Radiation Protection Specialist, NEA Division of Radiological Protection and Human Aspects of Nuclear Safety (RP-HANS)
Representative of the insurance pools	**Mr Attila Oláh** Chairman, Hungarian Nuclear Insurance Pool (Hungary)
Representative of an operator	**Dr Károly Gerse** Legal Director, MVM Paks NPP (Hungary)

Expert Group 3: Economic loss

Following the 1986 Chernobyl nuclear accident, the Revised Vienna Convention, the Convention on Supplementary Compensation for Nuclear Damage and the revised Paris Convention (the modernised Conventions) introduced in the definition of "nuclear damage" an economic aspect that led to the inclusion of new heads of damage to cover economic losses, including those due to preventive measures and measures for reinstating an impaired environment. The purpose of this group has been to identify the type of economic losses that could be taken into account, to the extent determined by the law of the competent court.

Group Chair and Nuclear Law Committee (NLC) Bureau member	**Mr Ben McRae** Assistant General Counsel, Department of Energy (United States)
NEA Secretariat	**Ms Ximena Vásquez-Maignan** Head, NEA Office of Legal Counsel
International Atomic Energy Agency (IAEA)	**Dr Andrea Gioia** Senior Legal Officer, Nuclear Law and Treaty Section, Office of Legal Affairs, International Atomic Energy Agency (IAEA)
Nuclear liability expert	**Ms Fiona Geoffroy** Senior Legal Adviser, EDF (France)
Economist	**Ms Anastasia Polovinkina** Director, Debt Finance and Investment, Rusatom Energy International (Russian Federation)
Representative of the insurance pools	**Mr Tomohiro Ichiki** Director and General Manager, Japan Atomic Energy Insurance Pool (Japan)
Representative of an operator	**Mr Bram-Paul Jobse** Chief Financial Officer, Borssele NPP (Netherlands)

Expert Group 4: Costs of measures of reinstatement of impaired environment

The modernised Conventions provide for the mandatory compensation of the "cost of measures of reinstatement of impaired environment" in the event of a nuclear incident causing nuclear damage. However, this head of damage is only covered to the extent determined by the law of the competent court, and insofar as not already covered as loss of, or damage to property. The purpose of this group has been to identify and, where possible, address the practical challenges related to the implementation of this head of damage, taking into account relevant national legislations and other international law instruments in the field of civil liability for environmental damage.

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Expert Group 5: Costs of preventive measures

In the modernised Conventions, the definition of "nuclear damage" has been extensively revised. Included in all of the new definitions are the concepts of the "costs of preventive measures" and of "further loss or damage caused by such measures". Expert Group 5 attempted to interpret what is meant by those terms, particularly in light of how they have been defined or interpreted in other international or regional liability instruments; how they relate to the various forms of protective actions described in the IAEA's Generic Safety Requirements and elsewhere; the difficulty in attempting to differentiate between this particular head of damage and others, such as "loss or damage to property"; and how the uncertainty surrounding these terms impacts the operators' ability to obtain adequate financial security to cover their liability.

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Expert Group 6: Administrative challenges of handling nuclear damage compensation claims (claims handling)

The Fukushima Daiichi accident revealed the importance for a state with nuclear installations of establishing a sound legal framework to ensure an effective process to pay compensation to the victims of a nuclear incident. The complexity surrounding the creation of such a legal framework becomes even more obvious in the event of a nuclear incident causing transboundary damage affecting neighbouring states. The purpose of this group is to delineate the various administrative challenges associated to a transboundary claims handling, examining the different stages of the claims handling and the level of co-ordination that is required between all the stakeholders involved from the definition of the nuclear damage to be compensated to the management of the claims filed and their payment.

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Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident

The Fourth International Workshop on the Indemnification of Damage in the Event of a Nuclear Accident took place in Lisbon, Portugal in October 2019. It was organised in collaboration with the Instituto Superior Técnico and the Faculty of Law of the University of Lisbon (Portugal). This workshop focused on topics identified during an earlier workshop, held in Bratislava, Slovak Republic in 2017, as fit for further discussion: the determination of the nuclear damage to be compensated and transboundary claims handling. The workshop was attended by more than 150 participants from 29 countries.

This report summarises the work that took place during the workshop on the following topics: loss of life or personal injury; loss of or damage to property; economic loss; costs of measures of reinstatement of impaired environment; costs of preventive measures; and the administrative challenges of handling nuclear damage compensation claims.

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