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Denise Gonçalves Branco **Uma Abordagem Integral à Tradução e Interpretação para a Transferência de Conhecimento Colaborativo e Capacitação de Especialistas /An Integral Approach to Translation and Interpretation for Collaborative Knowledge Transfer and Specialist Capacity Building**



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Tese apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Doutor em Tradução e Terminologia, realizada sob a orientação científica da Doutora Maria Teresa Costa Gomes Roberto Cruz, Professora Auxiliar do Departamento de Línguas e Culturas da Universidade de Aveiro, e a co-orientação técnica do Senhor Eric V. Alderson.

To my Son and to all our adventures up the Enchanted and Magical Tree of Inquiry.
In memory of my Husband who always encouraged my pursual of the *Why?*

o júri

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palavras-chave

modelo integral (ou AQAL Map); avaliação da qualidade da tradução; avaliação da qualidade da interpretação; modelo de diálogo dinâmico (DDM); compreensão mútua; transferência de conhecimento; educação e formação; representação do conhecimento

resumo

O presente trabalho propõe-se estudar a potencialmente positiva aplicação da Teoria Integral à Tradução e Interpretação em ambientes multilíngues, multiculturais e técnicos; estuda ainda o contributo que estas duas áreas podem dar à transferência de conhecimento e capacitação de recursos humanos em comunidades e organizações de especialidade.

Propomos e testamos um enquadramento teórico e conceptual baseado na Teoria Integral de Wilber (ou no Mapa AQAL), uma meta-teoria capaz de incorporar a interação, abordagens, perspetivas, teorias e metodologias multidisciplinares no sentido de tratar os complexos fenómenos que caracterizam o mundo global no qual vivemos. Ao aplicar e explorar o potencial do Mapa AQAL (todos os quadrantes, todos os níveis, todas as linhas, todos os estados, todos os tipos e todas as zonas), este estudo fornece uma visão compreensiva do fenómeno da comunicação e identifica áreas potencialmente vulneráveis que exigem uma intervenção específica em organizações multilíngues e multiculturais. No sentido de propor soluções para algumas das vulnerabilidades identificadas, este estudo recorre às áreas da tradução e interpretação, linguística, sócio-pragmatismo, análise crítica do discurso, comunicação intercultural, terminologia, e teorias do desenvolvimento e do diálogo.

O enquadramento teórico proposto é testado através de um caso de estudo para o qual foi escolhida a Agência Internacional de Energia Atómica (IAEA) nas suas interações com os seus 175 (a partir de 2 março de 2022) Estados Membros, em seis línguas oficiais: Árabe, Chinês, Espanhol, Francês, Inglês e Russo, assim como os resultados desta comunicação na realidade local dos Estados-Membros, nomeadamente no caso do Brasil, Moçambique e Portugal. A fim de garantir que o estudo é realista e eficaz nos seus propósitos, focar-nos-emos na noção de *colaboração e preparação*, no modo como a língua é utilizada para o efeito e aquilo que nos pode dizer sobre a construção de consenso, macro-políticas e regulamentos que orientam, mas simultaneamente evitam comprometer a soberania dos estados parceiros. Este estudo recorre à metodologia do Pluralismo Metodológico Integral, uma parte importante da Teoria Integral que integra métodos e perspetivas diferentes no intuito de dar respostas holísticas às motivações e perguntas subjacentes a este estudo. É o caso do extensos estudos e análises de corpus, recurso a questionários, juntamente com outros métodos empíricos para a recolha de dados a respeito da tradução e interpretação como principais agentes criadores de um Terceiro Espaço, ou terreno comum, onde línguas e culturas se juntam para atingir objetivos partilhados, e ainda como podem contribuir diretamente para abordagens sustentáveis à comunicação intercultural.

keywords

Integral model (or AQAL Map); translation quality assessment; interpretation quality assessment; dynamic dialogue model (DDM); education and training; common ground (assumed, core and emergent); intercultural communication; knowledge representation; knowledge transfer; human capacity- building; socio-pragmatics; critical discourse analysis

abstract

This research focuses on the study of the applicability and potentially positive outcome of adopting an integral approach to the practices of translation and interpretation in multicultural, multilingual and technical environments and also on the contribution that these two fields can bring to knowledge transfer and human capacity building in specialist communities and organizations.

I propose and test a theoretical and conceptual framework based on Wilber's Integral Theory (or AQAL Map), a meta-theory capable of incorporating multidisciplinary interaction, approaches, perspectives, theories and methodologies to address the complexity of the phenomena that characterize the global community we live in. By applying and exploring the potential of the AQAL map (all quadrants, all levels, all lines, all states, all types, all zones), this research provides a comprehensive vision of the communication phenomena and identifies potentially vulnerable areas that require specific intervention in highly technical multilingual and multicultural organizations. To propose solutions for some of the vulnerabilities identified, I draw on research and studies from the fields of translation and interpretation, linguistics, socio-pragmatics, critical discourse analysis, intercultural communication, terminology, dialogue and developmental theories.

The proposed framework is tested through my case-study of the communication patterns and routines of the International Atomic Energy Agency (IAEA) in its interaction with 175 (as of 2 March 2022) Member-States using six official languages: Arabic, Chinese, English, French, Russian and Spanish and the outcome of this communication in local member state realities, namely in the case of Brazil, Mozambique and Portugal. To guarantee the research is manageable and effective in its goals, I will focus on the aspect of *collaboration* and how language is used and what it can tell us about the construction of consensual outcomes and of macro-policies and regulations that guide, yet avoid encroaching on, sovereign partner nations. The research uses Integral Methodological Pluralism, an important part of the Integral Theory, and incorporates different methods and perspectives in order to provide comprehensive and more holistic answers to my research questions. Examples are extensive corpus analysis, surveys, interviews, along with other targeted empirical data collection methods in order to gain a better understanding of what the practices of translation and interpretation entail as active creators of a Third Space, or common ground, where different languages and cultures commune to achieve shared goals and how they can directly contribute to more sustainable approaches to intercultural communication.

List of Abbreviations

4EA Cognition – Embodied, Embedded, Extended, Enacted, Affective Cognition

ABDAN – Associação Brasileira de Desenvolvimento de Energia Nuclear (Brazilian Association for the Development of Nuclear Activities)

AI – Artificial Intelligence

ANEA – Associação Nacional de Energia Atómica – Mozambique (National Association of Atomic Energy)

APA – Agência Portuguesa do Ambiente (Portuguese Environmental Agency)

AQAL – All quadrants, all levels, all lines, all states, all types

CDA – Critical Discourse Analysis

CDC – Centers for Disease Control and Prevention

CL – Cognitive Linguistics

CMT - Conceptual Metaphor Theory

CNEN – Comissão Nacional de Energia Nuclear – Brasil (National Nuclear Energy Commission)

CPLP – Community of Portuguese Language Countries

CS – Cognitive Semantics

CSCP – Culture specific conceptual properties

CT – Crisis Translation

DMM – Dynamic Model of Meaning

DRRM – Disaster Risk Reduction Management

ECP – Emergency Communication Plan

GPMD – Global Preparedness Board

HCO – Highly Credible Organizations

IAEA – International Atomic Energy Agency

ICT – Information and Communication Technology

IL – Integrational Linguistics

IMP – Integral Methodological Pluralism

INES – International Nuclear Event Scale

INSAG – International Nuclear Advisory Safety Group

IS – Integral Semantics

IT – Integral Theory

MT – Machine Translation

NNWS - Non-Nuclear Weapons States
NPT – Treaty on the Non-Proliferation of Nuclear Weapons
NRC – U.S. Nuclear Regulatory Commission
NSG – Nuclear Suppliers Group
NWS – Nuclear Weapon States
PHEIC – Public Health Emergency of International Concern
PIO – Public Information Officer
PSA – Probabilistic Safety Analysis
RA – Regulatory Authority
R&D&I – Research, Development and Innovation
SDGs – Sustainable Development Goals
T&I – Translation and Interpretation
TIM – translation Integration Model
TIS – Translation and Interpretation Studies
TWB – Translators Without Borders
UN – United Nations
UNESCO - United Nations Educational, Scientific and Cultural Organization
WHO – World Health Organization

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“Durante bilhões de anos, ou talvez mais, a vida teve tendência para invadir tudo. Os primeiros objectos que podemos considerar como vivos foram certamente formas bacterianas muito simples – anaeróbicos-, aparecidas bastante cedo durante o pré-câmbrico. (...) Este conjunto vivo continua a existir; está separado do meio exterior por uma membrana selectiva que isola o indivíduo e cuja superfície -sabemo-lo atualmente-está dotado de receptores específicos, que são sensíveis a certos sinais e insensíveis a outros. É, portanto, a membrana que ao mesmo tempo isola e liga o ser vivo ao mundo que o cerca. É através dela que se realizam as trocas com o meio ambiente, que a informação «dialoga» com o meio.”

(Sournia & Ruffie, 1984, p. 9)

Preface

This work of research has been a personal journey. If its value lays only in what it has brought to my perspective of the world, the research has served its purpose and the journey has been worthwhile.

I started out with a fixed set of ideas, believing that what I thought was right, although naturally prone to questions and diverging opinions. I was wrong. This work led me to question my paradigms as a researcher, as a professional and as an individual. My readings took me along paths only comparable to what a character from Enid Blyton's books may have felt when daring to take a trip into the enchanted forest and up the magic faraway tree.

I have been forced to rethink. To abandon a comfort zone which has the weight of over two thousand years of legacy and to dare to think otherwise. To question. To question again. To ask *What if...?* I have allowed myself to step out of proclaimed certainty and dared myself to think otherwise; to experience the anxiety of not knowing where a new approach might lead. If, for some reason, the divergence proposed is not accepted by academia, I have had the unique experience of applying my wonderings to a world where the traditional paradigm doubted achievement. And I achieved. I have unharnessed within myself the indescribable pleasure of *taking pleasure* in just knowing and feeling that that is sometimes enough; enough to cause change, to nurture further knowledge and to perceive any challenge as a new learning experience which we may choose to participate in and grow with. Or remain where we are.

I chose to continue despite the connections which failed to appear; a void that seemed to exist just because a passage had not been forged. I chose a learning experience. I chose to forge a path. I chose to question. I chose to ask *Why not...?*

This is my invite to you:

What if we could make translation and interpretation the passage to transformative approaches and practices to national and international policy making?

What if along the way we could touch the individual in a way that not only valued, but motivated growth, by perceiving uniqueness as the missing variable in the tools and strategies which honour and embrace differences as a passage to co-constructed transformative knowledge?

What if the variable of *Unknown* were to be integrated as part of an approach, allowing the ecosystem of a theory to continue to grow with the unknown instead of being Right or Wrong?

Introduction

A. Motivation for the study

The global ecosystem has witnessed the increase of conflict, of natural and man-made crises and disasters, as stated in the Sendai Framework for Disaster Reduction 2015-2030 (2015, p. 10):

Disasters, many of which are exacerbated by climate change and which are increasing in frequency and intensity, significantly impede progress towards sustainable development. Evidence indicates that exposure of persons and assets in all countries has increased faster than vulnerability has decreased, thus generating new risks and a steady rise in disaster-related losses, with a significant economic, social, health, cultural and environmental impact in the short, medium and long term, especially at the local and community levels.

The complex nature of disasters and their outcomes led to the requirement to broaden the scope of disaster reduction needs to:

“(...) focus both on natural and man-made hazards and related environmental, technological and biological hazards and risks.” (Sendai Framework, 2015, p. 5)

One of the observable challenges resulting from the broadening of disaster reduction needs, specifically in the case of technological and biological hazards, resides in the importance of communicating risks. Events such as the 2011 Fukushima Daiichi incident, the 2020 SARS-COVID 19 health pandemic, among others, have brought greater visibility to the impacts of the circulation of risk and emergency information and translation. The accelerated dissemination of information via social media as a result of the constant evolution of Information and Communication Technology (ICT), has placed the control of the information that circulates out of the control of governments, response organizations and risk-related entities. The challenges arising from this fact evince that risk and crisis communication can benefit from more tailored approaches that combine and optimize attention to cultural and societal diversity to respond to local and global challenges.

Translation and interpretation studies, more specifically the emerging field of Crisis Translation (CT), with the inherently multidisciplinary nature of the field, has the potential to make valuable contributions. The more immediate contributions already being given optimize technology-based tools and platforms that assist in information retrieval, organization and dissemination of knowledge, with new and exciting possibilities being generated by the use of Artificial Intelligence. Additionally, and from the viewpoint of this work, Crisis Translation can bring

relevant contributions with theories and models that focus on less tangible areas of risk and crisis communication and management. By problematizing aspects such as the gap between information suppliers and receivers in the 2011 Great East Japan Earthquake, Cadwell (n.d., p.1) concluded that studies conducted on the communication during the disaster only:

“(…) focus on the supply side of disaster information, and the consumers of such information, (…) are largely absent from these studies.”

Complementing the need to encourage more participatory approaches for the dissemination of information in disaster contexts, Federici & O’Brien (2019, 2020) and O’Brien et al. (2018) propose concrete policy recommendations and a rights-based framework, the 4-A Framework, which analyse and problematize the implications of treating information in the population’s language as an inalienable right. Consequently, instances where information in the population’s language is presented as a right, namely in the Universal Declaration of Human Rights, “as well as other international instruments relating to human rights and international law.” (Agenda for Sustainable Development, 2015, p. 10), require additional action from public policies at a local, national and international level:

“(…) the right to translated information as a part of managing disasters must be part of ‘living policy and planning documents’ that guide public agency actions to ensure that the potential fluidity of language requirements in a disaster can be met.” (O’Brien et al., 2018, p. 36)

The inclusion of technological and biological hazards in the mitigation efforts of disasters, alongside the right to access accurate information in order “to enable people at risk to take informed decisions to protect themselves and their loved ones.” (World Health Organization [WHO], n.d.) creates the expectation that such concerns and priorities will be reflected in the recommendations, standards, and other instances of national and international public and private organizations and entities. Todorova (2018) discusses the challenges and risks of this international guidance, based on a Western perspective of the world, namely the translation obstacles that arise in settings that “do not only engage in linguistic exchange but also in political debate and the modification of ideas.” (Todorova, 2018, p. 354). Baker (2010), through the exploration of narrative theory, draws attention to the perils of an acritical acceptance of the prevailing narrative of translation as a ‘good’ bridge between cultures and as an enabler of dialogue between different cultures and societies. Translation is:

(...) repeatedly portrayed as a force of good, a means of enabling dialogue to take place between different cultures, and therefore (the logic goes) improving the ability of members of these different cultures to understand each other. Thus, communication, dialogue, understanding, and indeed knowledge are assumed to be 'good' in a moral sense. They lead -unproblematically- to justice, peace, tolerance, progress.

Narrative theory contributes to the analysis of the outcomes for risk and emergency communication that result, for example, from the portrayal of the public as being potentially unable to access and understand complex topics such as nuclear energy and nuclear technologies:

"Members of the public usually have incomplete knowledge and a great deal of uncertainty regarding any issue involving nuclear and radiation safety because of the complexity of the topic." (IAEA, 2017, p. 1)

Another example of risk narratives are instances that frame different cultures in ways that disempower global participation for global risk and emergency response. Disempowering narratives that overlook the potential for co-created knowledge perpetuate the belief that there is "a" truth that lays with a specific viewpoint or world view. For example, the emphasis placed on "developing countries" in international policy-making in the field of risk and crisis communication removes the focus from other "hidden costs and challenges" which "all countries" face when impacted by disasters, as the recent COVID-19 health pandemic demonstrated:

"All countries – especially developing countries, where the mortality and economic losses from disasters are disproportionately higher – are faced with increasing levels of possible hidden costs and challenges in order to meet financial and other obligations." (Sendai Framework, 2015, p. 10)

The insights from narrative theory (Baker, 2019) have played a critical role in explicitly addressing the power of stories. Narrative theory acknowledges that "people's behaviour is ultimately guided by the stories they come to believe about the events in which they are embedded, rather than by their gender, race, colour of skin, or any other attribute." (Baker, 2019, p. 3). Narrative theory contributes to draw attention to associative meaning in translation and interpretation, as explored in this work. Associative meaning as proposed by Leech (1981) captures and acknowledges individual experience, a critical factor for risk and crisis communication because of its influence on the individual decision-making process and, consequently, on the ability to mitigate risk and make informed decisions.

With so many intersecting and valuable approaches, language, more specifically translation and interpretation, remains absent in many instances in the designing of risk, crisis and emergency planning and decision-making. These challenges are the underlying motivation for this study and for the research questions that the thesis aims to answer.

B. Objective, scope and research question

This work proposes a Translation-Integration Model (TIM) inspired by Integral Theory and the AQAL map (All quadrants, all levels, all lines, all states, all types). The choice of Integral Theory to substantiate TIM is because the integral meta-framework and meta-concepts provide an effective context for the integration and optimization of as many perspectives, models and theories as possible to inform the study of all phenomena. Integral theory argues that any topic or aspect of reality can be analyzed from four perspectives: subjective/objective and intersubjective/interobjective. The AQAL map has already been successfully applied to other fields of study, such as business, healthcare, ecology, among others. Considering the complexity of the underlying outcomes of translating technological and scientific information for risk and emergency communication purposes between specialists and non-specialists, in multicultural and multilingual environments, TIM is used in this work to analyse the recommendations and standards published by the International Atomic Energy Agency (IAEA) on the role of translation in risk and emergency communication. The model is then used to analyse how translation is approached and used in the dissemination of information to the Regulatory Authorities in three IAEA Portuguese-speaking Member-States and the implications for risk communication in culturally diverse countries, despite the fact that these three countries share Portuguese as the official language.

This thesis aims to answer the following research questions:

1. How can translation and interpretation contribute to enhance communication strategies within and across technological and scientific organizations and, in due course, with the non-specialist public?
2. How can risk, crises and emergency planning benefit from tools and models that address associative meaning?

The relevance of this research and its contribution to the fields of risk, crisis and emergency communication and management and to the fields of crisis translation and interpretation is substantiated by:

- (a) lack of case-studies which illustrate the role of translation and interpretation in the modelling and shaping of cultures of safety between risk related organizations and industries and the general public's perception of risk;
- (b) lack of language policies in national and international risk management policy documentation;
- (c) lack of specific processes and procedures which allow organizations to measure their multilingual and multicultural response capabilities.

The particularity of this work resides in its contribution with a specific model to the evolving field of crisis translation. To date, and to the knowledge of the author of this work, no other study has been developed which compares how technological and scientific information and knowledge stemming from national and international policies on nuclear energy and technologies and their peaceful applications address associative meaning between cultures that share the same official language. The languages analysed in this thesis are English and Portuguese.

C. Thesis structure

To address the research questions presented in the previous sections, this thesis is divided into three parts, comprised of five chapters.

Part I includes **Chapter 1** which contextualizes the relevance of this research by describing the research problem in the light of risk management, by discussing and interrelating the topics of risk perception, storytelling, developments in the field of technology-based communication solutions -namely artificial intelligence and automatic translation solutions- and their direct relationship with technological and scientific knowledge generation, development, and dissemination from the specialist and expert to the non-specialist and general public. The relationship between translation and interpretation, and the uniqueness of technological risk, crisis and emergency communication is clarified, highlighting the important insights translation and interpretation studies can bring to crisis and emergency preparedness.

Part II addresses the theoretical and conceptual framework, which supports the proposal of the AQAL-based Translation-Integration Model (TIM). **Chapter 2** defines the theoretical and conceptual framework that lays out a meta-framework and meta-concepts that encourage the combination of multiple theories and models to simultaneously be used to design more complex solutions. The emerging field of crisis translation demonstrates the complex nature of communicating in contexts of unexpected disruption. A discussion of the state-of-the art of crisis

translation and of models and frameworks such as the 4-A Framework (O'Brien et al., 2018) are, along with this study, the first to focus on national approaches to crisis translation, demonstrating the benefits of incorporating translation at the level of policy-making and crisis and emergency communication planning. **Chapter 3** the Translation-Integration Model is presented as a tool based on the meta-framework and meta-concepts of Integral Theory. TIM's potential to create observable, definable and measurable instruments, models and other tools is discussed along with its ability to bridge the gap between the intention to address multilingual and multicultural communication challenges and the concrete measures which can be taken to ensure that technological and scientific information is not only transferred, but also rendered useful for purposes of crisis and emergency response. The perspective of translation as an end-of-line service is refuted in this work.

Chapter 4 presents the methodology used in this research. Considering the challenge of an integral endeavour, part of the research exercise lay in devising a methodology capable of addressing the TIM outlook while simultaneously guaranteeing that the results obtained were representative and that TIM could be presented as a valid tool for technological and scientific risk related organizations (TSO).

Part III is dedicated to presentation of a case-study defined to assess the applicability of the Translation-Integration Model and the findings that were expected to surface through an integral approach. The field of expertise selected for this purpose was radiological and nuclear energy due to its controversial nature, to the need to regulate its (peaceful) uses at the national and international levels. Also, the fact that multilingual and multicultural technological and scientific knowledge and information are generated in infinitely diverse settings, require conceptual meaning to be integrated and accommodated within different local and national realities. Using a corpus-based approach and TIM, **Chapter 5** analyses the applicability and potential positive insights of including TIM as of the initial stages of risk communication design. IAEA publications on communication are analysed along with data provided by the Regulatory Authorities (RAs) from Brazil, Mozambique and Portugal, three Portuguese-speaking countries. TIM is used to bring greater clarity to the complexity of communicating risk, crisis and emergency information and knowledge. By employing different theoretical approaches, the expectation is that TIM will provide technical and scientific organizations with a model that is capable of addressing complexity and integrating complementary perspectives that situate the phenomena in an ecosystem, treating it as a whole entity, making languages, i.e., translation and interpretation more tangible.

**Part I – Risk Communication and Risk Management: the role
of risk and crisis communication**

Chapter 1 - Contextualization and relevance of research

A safe culture is an informed culture, one that knows where the 'edge' is without necessarily having to fall over it. The 'edge' lies between relative safety and unacceptable danger. In many industries, proximity to the 'edge' is the zone of greatest peril and also of greatest profit. (Reason, 2000, p. 3)

Introduction

This Chapter contextualizes the relevance of this research, discusses the notion of culture for safety and relates it to risk communication and risk management and the challenges for crisis and emergency communication. The intricacies of industry responsibility and accountability versus the right to information in order to make the right decision at the right time is problematized considering the tense relationship between expert perception of risk, public perception of risk and governance. Translation and interpretation are here presented in a preliminary manner, and discussed in greater detail in Chapter 2 of the thesis, as a collaborative and integration tool with the potential to inform strategies to overcome the limitations of a traditionally operational approach to communication and contribute towards integrated risk, crisis and emergency communication with the potential to draw on complementary systems of knowledge to enhance more efficient translation response in extreme disruptive scenarios. This relationship is illustrated by the impact of storytelling which serves numerous, and highly informative functions, already demonstrated by its use for business purposes (Johnson, 2018) and in health settings to connect with patients and explain complex concepts (Suzuki et al., 2018).

The proposal presented and defended is that translation and interpretation can positively inform the new trends in risk communication, potentially leading to transformative cultures of risk management. Translation and interpretation are also presented as knowledge builders and accelerators of technological and scientific transfer.

For the aims of this work, the context of analysis is the specialized field of nuclear energy and technologies. The choice of this field is based on the critical role risk communication, risk management and crisis and emergency communication play in guaranteeing the controversial equilibrium between specialist and expert perceptions of risk and the debated public acceptance

of nuclear energy and technologies for peaceful purposes, represented by the International Atomic Energy Agency (IAEA) comprised of a community of 1723 Member-States.¹

1.1 Safety culture: from corporate culture to global citizenship

The evolution of «safety culture» within the nuclear field has, over time, reflected the developments in the field of risk management.

The term «Safety Culture» was introduced by the International Nuclear Advisory Safety Group (INSAG) formed by the International Atomic Energy Agency (IAEA), after the Chernobyl disaster in 1986, in the *Summary Report on the Post-Accident Review Meeting on the Chernobyl Accident*. Published in the IAEA Safety Series No. 75-INSAG-1 (1986) and further addressed in the *Basic Safety Principle for Nuclear Power Plants*, Safety Series No. 75-INSAG-3 (1988), the attention paid to safety as an organizational culture merited significant updates reflected in IAEA publications, hereby acknowledging that “(...) sound procedures and good practices are not fully adequate if merely practiced mechanically.” (IAEA, 1991, p. 1)

Focused on organizational and industrial procedures and processes to guarantee the safe operation of nuclear plants, the 1991 IAEA *Safety Culture* report by INSAG (75-INSAG-4) was the response to the need to develop a clearer notion of safety culture which led to the expansion of the definition from the “(...) requirement to match all safety issues with appropriate perceptions and action.” (IAEA, 1991, p. 1), to a second and broader understanding which linked safety culture to individual attitudes and practices and organization styles and culture, recognizing greater complexity underlying the notion of safety culture, namely that “(...) such matters are generally intangible; that nevertheless such qualities lead to tangible manifestations; and that a principal requirement is the development of means to use the tangible manifestations to test what is underlying.” (IAEA, 1991, p. 1). The definition further developed to state that “Safety Culture requires all duties important to safety to be carried out correctly, with alertness, due thought and full knowledge, sound judgement and a proper sense of accountability.” (IAEA, 1991, p. 1).

The expansion of the IAEA definition of safety culture was a response to an international call for a broader and more defined understanding of the term by nuclear related entities. The IAEA «Safety Culture» has therefore been developed over time for the specific audience comprised of “(...) organizations and individuals engaged in nuclear power activities, and provides a basis for

¹ Number of IAEA Member-States as of 7 April 2021.

judging the effectiveness of Safety Culture in specific cases in order to identify potential improvements.” (...) and “is intended for use by governmental authorities and by the nuclear industry and its supporting organizations” (IAEA, 1991).

While IAEA publications are designed and published to meet the needs of a very specific target audience, the tangible outcomes for the generation and dissemination of nuclear information and knowledge produces, as this work demonstrates, tangible outputs in many fields, namely for the field of risk communication and risk management, both critical to the operation of nuclear facilities and national and international radiological and nuclear safety and security regulation.

Prior to Chernobyl (1986) and Fukushima (2011), the culture of safety and risk communication was mostly motivated by an internal dynamic, targeted towards organizations and its workers, as reflected by INSAG’s perception of what safety entailed (IAEA, 1991, p. 5):

- (1) Individual awareness of the importance of safety.
- (2) Knowledge and competence, conferred by training and instruction of personnel and by their self-education.
- (3) Commitment, requiring demonstration at senior management level of the high priority of safety and adoption by individuals of the common goal of safety.
- (4) Motivation, through leadership, the setting of objectives and systems of rewards and sanctions, and through individuals' self-generated attitudes.
- (5) Supervision, including audit and review practices, with readiness to respond to individuals' questioning attitudes.
- (6) Responsibility, through formal assignment and description of duties and their understanding by individuals.

Despite what today is considered a traditional and limited view of culture of safety, risk management, here understood as “a technical field applying probabilities to articulate and recommend prevention and mitigation strategies – at the technical, organizational, and individual level.” (Bourrier, 2018, p. 3) has contributed to highlight the relationship between safety culture, risk management and risk communication. Risk communication has been defined from various perspectives (health, environment, industry) with a common convergence around the understanding that communicating risk involves addressing a potential future event that requires organizational and individual decision-making capabilities in order to reduce and mitigate the outcomes of an unexpected and disruptive event: “Risk communication addresses probabilities and potential situations of harm and danger.” (Bennington, 2014, p. 32).

The IAEA, for example, provides a definition in *The Nuclear Communicator's Toolbox* where the link is established between risk management, risk assessment and risk communication:

Risk assessment and risk management intersect with the field of risk communication. Each can be considered separately:

- Risk management involves evaluating how to protect public health. Actions include scientific and technical assessments to make recommendations on how nuclear facilities and operations will proceed.
- Risk assessment is the process that determines the factors that will inform decisions. Feasibility and impacts can be assessed using fields as diverse as chemistry, physics, toxicology, epidemiology, economics and law.
- Risk communication is a field of academic study led by psychologists, sociologists and cognitive scientists. Through experiments and surveys, researchers explore how humans convey their reactions and responses to threats.”. (IAEA, n.d.a)

Despite the variations in perspectives and approaches, risk communication implies a time frame where the information and knowledge about the potential risk can be prepared and communicated over time, while crisis communication happens within a time frame where decision-making is limited and highly constrained by the occurrence or foreseeable occurrence of events, frequently associated with emergency communication:

Crisis and emergency communication [CERC] differs from pure risk communication in that a decision must be made within a narrow time constraint. The decision may be irreversible, the outcome of the decision may be uncertain, and the decision may need to be made with imperfect or incomplete information. (Centers for Disease Control and Prevention [CDC], 2014, p. 7)

The interrelation between risk and crisis communication was clearly recognized in the aftermath of crises and emergencies such as Hurricane Katrina (2004), the Fukushima Daiichi nuclear incident (2011), the 9/11 terrorist attack (2001), the Ebola Virus Disease Crisis (2015), the Idai Cyclone in Mozambique (2019), and more recently the COVID-19 health pandemic (2020), to name just a few. The idea that a culture of safety needs to be developed implies acknowledging that there are situations where the absence of safety and security poses specific risks/threats and those risks need to be communicated and managed by industries, risk managers and crisis and emergency response organizations and, ultimately, by the public.

With this being the case for general hazardous events with the potential to cause the disruption of livelihoods, the case of technological crises and emergencies poses additional

challenges to communicating risk, more so when the public acceptance of the risk determines national and international policy-making. The controversial field of nuclear energy and technologies and the communication challenges arising from the agreement on their uses for peaceful purposes, where the anteposition of «peaceful» to «nuclear» clearly highlights the clash between conceptual meaning and associative meaning (discussed in detail in Chapter 2) has concrete implications for translation and interpretation decision-making, as demonstrated in Chapter 5.

Prior to the Fukushima incident and its cascading outcomes, internal (industry) and external (public and third party stakeholders) risk communication and crisis and emergency communication has already been pushed to priority item on the agendas of international organizations, such as the World Health Organization (WHO), the United Nations (UN), and CDC, as a response to other health and natural disasters and crises previously mentioned; however, specifically in the field of nuclear energy and technologies, the International Atomic Energy Agency (IAEA) formally reviewed its approach and outlook on the implications of communicating with the public with the public and third party stakeholders in publications such as *Communication with the Public in a Nuclear or Radiological emergency* (IAEA, 2012), *Communication and Consultation with Interested Parties by the Regulatory Body* (IAEA, 2017c) and the online *Nuclear Communicator's Toolkit*, publications discussed in detail in Chapter 5, which presents a case-study. The importance of revisiting what nuclear safety entailed was further reinforced by *the Committee on Lessons Learnt from the Fukushima Nuclear Accident for Improving Safety and Security of U.S. Nuclear Plants* (2014) by acknowledging that "(...) lack of a strong nuclear safety culture was an important contributing factor to the Fukushima Daiichi accident." (National Research Council, 2014, p. 232).

With the recognition that a "nuclear safety culture" required international acceptance of common guiding principles, responsibility and accountability needed to be formally delegated onto different parties:

There is international acceptance by the nuclear power community that a strong nuclear safety culture needs to be adopted universally: by senior management of organizations operating nuclear power plants, by individuals who work in those plants, and by regulatory bodies and other organizations that set nuclear power policies. Indeed, this commitment to safety is an international priority, as evidenced by treaties such as the Convention on Nuclear Safety. (National Research Council, 2014, p. 235)

International consensus on risk communication and risk management tended towards the communication of risk from the perspective of the expert/specialist causing clear challenges to the inclusion of varying perceptions of risk stemming from a heterogeneous audience and varied

stakeholders. Risk perception, clearly defined as a subjective and less controllable area because it is based on more or less tangible variables, has been defined by several scholars, researchers and organizations, essentially acknowledging that “Risk perception is the subjective assessment of the probability of a specific type of accident happening and how concerned we are with the consequences”. (Sjöberg et al., 2004, p. 8) and “Risk perception describes how stakeholders evaluate and weigh their concerns.” (IAEA, n.d.a).

The growing awareness of the impact of risk perception, and fundamentally of its subjective nature, also became more visible in importance in IAEA publications:

One of the most difficult aspects of nuclear-related communication concerns the perception of risk. Audiences seek to understand radiation as it relates to their everyday activities. Technical experts rely on formal risk tools. A considerable mismatch between how specific authorities and the general public approach risk leads to many misunderstandings. (IAEA, n.d.a)

The outcome of the mismatch in risk perception is that:

Sometimes, an event is not considered to be an emergency to experts or responders but is perceived very differently by the general public. Communicating effectively with the public about radiation emergencies is key to successful emergency management. It will help mitigate the risks, support the implementation of protective actions, and contribute to minimizing negative psychological impacts. (IAEA, 2012, p. 1)

Risk perception linked to human-error, an issue of major concern within the nuclear safety culture, with several developments aiming to assess and quantify aspects of human performance related to safety, further stressed the complexity of matching conceptual meaning to the more societal and cultural realm of associative meaning:

Currently, probabilistic safety analysis (PSA) models human error, but is not capable of modelling effects of safety culture and other organizational factors on the frequency and of unsafe acts and the probability of latent errors. Therefore, PSA is not able to model and quantify the effects of safety culture on safety performance. If safety culture attributes could be correlated with plant safety performance indicators, such as equipment failure rates or system unavailabilities, the impact of safety culture on risk metrics could be assessed and quantified. (Bonaca & Powers, n.d., p. 2)

The evolving research in probabilistic safety analysis (PSA) contributes greatly to assess system and procedure performance and outcomes. However, it does less to contribute on how to communicate and integrate information and knowledge.

A field of opportunity remains for broader and simultaneously deeper understandings of how the needs, wants and lacks of all stakeholders involved in risk communication can be further advanced. There is a clear consensus in the field of safety management that worker attitudes toward safety make a difference. What is not clear is the mechanism by which attitudes, or safety culture, affect the safety of operations. Statistical evidence that unambiguously links safety culture or its specific attributes with the safety of operations is surprisingly rare, especially within the nuclear industry (Bonaca & Powers, n.d., p. 3).

Understanding that human error -therefore safety culture- can be compromised by knowledge and culture, allows this work to contribute with a clear proposal with a framework which is based on the acknowledgement of global risk and crisis communication complexity and that due to its global complexity, translation and interpretation need to be active participants in the response designing process.

In 2002, the IAEA had already problematized the relationship between safety and culture when stating that:

The biggest danger in trying to understand culture is to oversimplify it in our minds. It is tempting to say that culture is just “the way we do things around here”, or “our basic values”, or “our rituals”, and so on. These are all manifestations of the culture, but none is the culture at the level that culture matters. A better way to think about culture is to realize that it exists at several “levels” and that we must endeavor to understand the different levels, but especially the deeper levels (IAEA, 2002a, p. 3).

The ongoing research and desire to constantly integrate recent developments in culture by the IAEA and the nuclear community are based on risk management requirements, i.e., the procedures, standards, safeguards and regulations continue to be motivated by the need to regulate the responsibility the organization needs to manage in a specific scenario, remaining significantly organization and management oriented:

The culture of any organization in the international nuclear industry is centred on safety. This reflects human awareness of the significant destructive capability of nuclear power when control is lost, and the recognition that strict attention to safety is essential if the benefits of this form of power are to be obtained. For a nuclear organization, safety culture is the dominant aspect of the organizational culture. (IAEA, 2002a, p. 8)

In striving for the highest levels of organizational safety and security, Reason (2000, p. 4) highlights some of the safety culture paradoxes which organizations may encounter in the pursuit

of “zero accidents”. These paradoxes are also relevant to this work because they are impacted by the national cultures which influences the organizational ecosystem (Reason, 2000, p. 4):

- (1) Safety is defined and measured more by its absence than its presence
- (2) Defences, barriers and safeguards not only protect a system, they can also cause its catastrophic breakdown
- (3) Many organizations seek to limit the variability of human action, primarily to minimize error, but it is this same variability – in the form of timely adjustments to unexpected events – that maintains safety in a dynamic and changing world
- (4) An unquestioning belief in the attainability of absolute safety can seriously impede the achievement of realizable safety goals, while a preoccupation with failure can lead to high reliability.

The formal acknowledgment of the importance of moving from an internal spiral to a more externally oriented dynamics to include more stakeholders was already budding prior to the Fukushima event, as denoted by the IAEA acknowledgment and recommendation that: “Initiatives to improve safety culture need to be sensitive to the influence of national and organizational cultures; the diversity of cultures will require a variety of approaches to apply the principles of safety culture” (IAEA, 2002a, p. 1).

However, Fukushima confirmed that additional measures were required to allow national and international response planning to be successful executed:

Regulating safety is a national responsibility. However, radiation risks may transcend national borders, and international cooperation serves to promote and enhance safety globally by exchanging experience and by improving capabilities to control hazards, to prevent accidents, to respond to emergencies and to mitigate any harmful consequences. (IAEA, 2017a)

This concern was clearly stated in the IAEA publication on *Communication with the Public in a Nuclear or Radiological Emergency (2012)* which highlights that: “Experience from nuclear and radiological (radiation) emergencies highlights public communication as one of the most important challenges in emergency management.” (IAEA, 2012, p. 1).

Additionally, in 2017, in its publication on *Communication and Consultation with Interested Parties by the Regulatory Body*, the IAEA reinforced the rights-based approach to information: “The public rightly expects to have access to reliable, comprehensive and easily understandable (plain, unambiguous and jargon-free) information about safety and regulatory issues in order to form opinions and make fully informed decisions.” (IAEA, 2017a, p. 1).

The relevance of this work arises from the fact that throughout the extensive literature and publications produced on the topic of communication and culture, translation and interpretation remain absent from the discussions, procedures, standards, and safeguards, as a critical means to transfer and implement the nuclear domain. At a first glance, and from a more general overview, the multilingual and multicultural aspects related to transferring technological and scientific information and knowledge from one language and culture (predominantly organizational at its core) appears to be addressed by the accessibility through six IAEA official and working languages (Arabic, Chinese, English, French, Russian and Spanish). However, a closer look at the consequences of multilingual and multicultural challenges confirms that the:

(...) implicit assumption is typically made that safety culture experience is transferable from country to country. Safety culture is as much attitudinal as it is structural. Therefore, before lessons learned in one country can be utilized in a different country, it is important to question how and how much safety culture at any given facility is affected by the cultural characteristics of the country in which the facility is located. (Bonaca & Powers, n.d., p. 8)

Although the nuclear industry is one of the safest industries when safety is measured by its occasional absences (Reason, 2000, p. 5), it remains an area of controversy. Much like the aviation industry, well-defended systems such as commercial aviation and nuclear power generation are “victims of their own success” because they have reduced accidents to such a low level that they are left without tools and instruments that further the development towards a safer state of operation (Reason, 2000). Consequently, the industry may fall victim to its perceived level of safety and lower levels of internal and external communication robustness.

This work argues that the transferability of safety culture is directly related to translation and interpretation as processes through which international consensus is reached, technological and scientific information and knowledge is shared, disseminated, and accelerated. Translation and interpretation are also invaluable sources of information to better understand how specialized information and knowledge is shaped and modelled to allow for informed decision-making. The following section contextualizes multilingualism and multiculturalism within the scope of this research.

1.2 Multilingualism and multiculturalism – a characteristic of risk and emergency communication storytelling and the power of conceptual metaphors

“Sometimes the best conversations between strangers allow the stranger to remain a stranger.”

(Malcom Gladwell, *Talking to Strangers*, 2019, p. i)

Multilingualism, multiculturalism and translation/interpretation go hand-in-hand. Although their paths diverge with regards to the approach to the materialization of the multilingual and multicultural processes and outcomes, these fields of study share the focus on the multifaceted individual and societal relationships and interactions which arise when two or more languages, or versions of the same language(s) and culture(s), come into contact for different purposes, in diverse circumstances. As a result of the intricate interweaving of facets of human existence which arise in and through translation/interpretation, and which call for specific action and decision-making on behalf of the language professionals, multilingualism and multiculturalism, and their specific contributions to this work, require an independent discussion at this point. Only the concepts which directly inform the integrative translation and interpretation conceptualization exercise will therefore be explicitly addressed.

Multilingualism and multiculturalism, as the solid body of literature in both fields demonstrates, are notions which encapsulate highly charged conceptual and associative meanings (Discussed in detail in Chapter 2). Multilingualism broadly understood from the Western viewpoint as “an essential factor in harmonious communication among peoples” (UN) is rooted in political, ethical, social, financial, cultural values and beliefs such as tolerance, the awareness of individual and collective rights, and how such rights are materialized through forms of governance: “(...) multilingualism is of particular importance to the United Nations. By promoting tolerance, multilingualism ensures effective and increased participation of all in the Organization’s work, as well as greater effectiveness, better outcomes and more involvement.” (United Nations [UN], n.d.)

Within the European Union (EU), for example, the multilingual endeavor is a pillar in upholding the European project. In this context, multilingualism is understood as: “(...) the ability of societies, institutions, groups and individuals to engage, on a regular basis, with more than one language in their day-to-day lives.” (Commission of the European Communities, 2007, p. 6).

As multilingualism gains greater visibility through globalization, technology developments, migration, among other factors, voices from other multilingual settings are budding and reframing -and questioning- the predominant Western outlook. An important reference for this work is the

role of 'post-colonial' associative meanings in the use of Portuguese as the (still) official language in Mozambique, one of the countries considered in the case-study (Chapter 5). Guissemo (2018), for example, explores the handling of multilingualism and language nominations from the perspective of temporal framing with regards to Portuguese and its 'colonial' trait. This approach is important in understanding how:

an ideology was created that attributed distinctive significance and value to Portuguese and local African languages in such a way that local African languages were seen as being frozen in the past, whereas Portuguese was depicted as a modern, state bearing language of progress. (Guissemo, 2018, p. 3)

Here it is possible to foresee the conflict between knowledge systems. Also relevant to the approach of this work is the importance of 'public space' and official ownership of the public space in upholding "ideologies of multilingualism management." (Guissemo, 2018, p. 3). A once private and relatively contained phenomenon has "spilled over its local and private roles into having a much broader, global importance and it [multilingualism] is one of the most essential social practices in the world." (Aronin, 2019a, p. 43). Multilingualism has shifted from "(...) useful but not crucial for the maintenance and advancement of communities and groups" (Aronin, 2019a, p. 49) gradually developing into a "(...) phenomenon crucial in its role in and impact on human civilization. It is central to the progress and maintenance of modern civilization." (Aronin & Singleton, 2012). These different perceptions all inhabit the realm of translation and interpretation, where perceptions and worldviews gush together and are required to be interwoven into a garment which fits the purposes of organizations, stakeholders, clients, and individual and societal differences. Difference, conflict and tension are where the tensions lie and those are the strains which require new approaches if true and effective multilingualism portrayed as a tolerance and respect-based approach is to be consistently practiced:

The gap between the idea of peace and the reality of tension and conflict, however, has proven to be a major challenge to the world organization ever since its foundation after World War II—and that challenge was not only due to conflicting political and economic interests. Situations of conflict often arise in a complex setting of historical, social, cultural and political interaction between communities; accordingly, they must be dealt with in a multifaceted and integrative manner. (Köchler, n.d.)

The notion of language nominations provided by multilingualism is one of the useful working concepts and definitions explored in this thesis, with language nominations here understood as: "(...) specific appellations that are assigned to various named languages and dialects according to

their perceived role for particular individuals or communities. Language nominations are used in addition to the names of languages (...)” (Aronin, 2019a, p. 68).

This is the case, for example, of the six ‘official languages’ used within the UN and, consequently, within the IAEA:

There are six official languages of the UN. These are Arabic, Chinese, English, French, Russian and Spanish. The correct interpretation and translation of these six languages, in both spoken and written form, is very important to the work of the Organization, because this enables clear and concise communication on issues of global importance. (UN, n.d.)

By explicitly addressing the implications of language nominations such as “official languages”, “dominant languages”, “working languages”, “majority languages”, “indigenous languages” “immigrant languages”, “national languages”, “associate languages”, the importance of reassessing the current role(s) of T&I becomes clearer:

In order to eliminate the 'disparity between the use of English and the use of the other five official languages' and 'to ensure the full and equitable treatment of all the official languages,' as mandated by the UN General Assembly, the Department of Global Communications has set minimum standards for UN web multilingualism. (UN, n.d.)

Additionally, the narrative of neutrality in translation and interpretation becomes clearer when viewed through the lens of language nominations:

A delegate may speak in any official UN language. The speech is interpreted simultaneously into the other official languages of the UN. At times, a delegate may choose to make a statement using a non-official language. In such cases, the delegation must provide either an interpretation or a written text of the statement in one of the official languages. Most UN documents are issued in all six official languages, requiring translation from the original document. (UN, n.d.)

To point out short-comings is not the purpose this work. The overall goal is, however, to propose and encourage a critical integrative approach regarding the handling of multilingualism by organizations that hold high-credibility positions through the acknowledgement that translation and interpretation play a critical role in the materialization of the rights and responsibilities upheld by organizations such as the UN.

Multiculturalism also contributes significantly in conceptualizing what is being addressed when the important role of language as a political tool is approached. Multiculturalism can be broadly, and relatively consensually, understood as:

(...) system of beliefs and behaviors that recognizes and respects the presence of all diverse groups in an organization or society, acknowledges and values their socio-cultural differences, and encourages and enables their continued contribution within an inclusive cultural context which empowers all within the organization or society. (Grishaeva, 2012, p. 916)

However, literature in the field of Multiculturalism highlights aspects which are crucial for T&I and for the process of becoming critically aware of apparently 'neutral' concepts. Multiculturalism is "before anything else a theory about culture and its value" (Rodrigues, 2014). Other authors highlight the policy nature of multiculturalism which "may be used for the management of culturally diverse societies." (Barrett, 2013, p. 15). Multiculturalism and the complexities entailed are not a consensually viewed policy and approach. While the Council of Europe's White Paper (CE, 2008, p. 17) defines multiculturalism clearly as a "specific policy approach" which aims at encouraging intercultural dialogue:

understood as a process that comprises an open and respectful exchange of views between individuals and groups with different ethnic, cultural, religious and linguistic backgrounds and heritage, on the basis of mutual understanding and respect. It requires the freedom and ability to express oneself, as well as the willingness and capacity to listen to the views of others. Intercultural dialogue contributes to political, social, cultural and economic integration and the cohesion of culturally diverse societies. It fosters equality, human dignity and a sense of common purpose. It aims to develop a deeper understanding of diverse world views and practices, to increase co-operation and participation (or the freedom to make choices), to allow personal growth and transformation, and to promote tolerance and respect for the other.

The document goes on to acknowledge that:

Whilst driven by benign intentions, multiculturalism is now seen by many as having fostered communal segregation and mutual incomprehension, as well as having contributed to the undermining of the rights of individuals – and, in particular, women – within minority communities, perceived as if these were single collective actors. (Council of Europe, 2008, p. 19)

Numerous paths of study can be envisioned through the relationship between multilingualism, multiculturalism and translation. The goal however here is to integrate the contributions of these fields in providing concepts which allow a clearer and more open-ended discussion and contribution to be given within the field of T&I when dialoguing with other experts

about multilingual preparedness for national and international risk, crisis and emergency communication.

In the particular case of translation and interpretation, research in multilingualism and multiculturalism provide conceptual tools to further address the misconceptions and misaligned expectations that place translation and interpretation services predominantly at the level of operations support because going multilingual means more than just translating and/or interpreting, it means understanding that: “(...) cultural aspects of emotions, metaphorical language about emotions, and human physiology in emotion are all part of an integrated system” (Kövecses, 2004).

In using the Translation-Integration Model (TIM), the numerous theories designed and developed in the fields presented here provide a vision which is significantly different from isolated viewpoints.

1.3 Crisis translation and interpretation: storytelling and the power of conceptual metaphors

There are biases in thinking processes that can influence both how people think of problems in advance — risk perception — and how they solve problems when faced with them directly. The cognitive biases that have been identified are not just bad habits that people have acquired; if they were, they could be trained out relatively simply. Cognitive biases are the consequences, or downsides, of highly effective ways that people solve most of their problems and make the most of their everyday decisions. Cognitive biases are tendencies to think in certain ways. They can lead to systematic deviations from a standard of rationality or good judgement. Knowledge about these biases has been developed to understand decision making under uncertainty, which is considerable in emergency situations. (IAEA, 2018, p. 12)

People and their emotions are at the core of risk communication. Cognitive science and cognitive approaches to T&I provide research data which sustains the development of models that can incorporate emotions in a transformative way, encouraging organizations to develop greater self-awareness in the decisions they make to pursue their missions. This might seem daunting to organizations which privilege systems-based approaches and where technology has gained credibility to the point where it has become a safety paradox. However, it is urgent that a change in stance be made because “(...) the scientific community provides technical knowledge while the audience or stakeholders manifest values, beliefs, and emotions (...)” (Bourrier, 2018, p. 7).

Acknowledging that conceptual meaning and associative meaning are forced to co-exist in effective risk and crisis communication requires bringing associative meaning to the forefront and reshaping the role of conceptual meaning and accepting that cognitive and logical viewpoints also reveal biased viewpoints.

While the IAEA outlines specific procedures for communication between Regulatory Bodies and interested parties, for example, it is important to acknowledge that risk and crisis communication are intrinsically related to governance and, as such, here too, the emotional territory can become fuzzy and sensitive: “(...) inputs come from both sides. There are no ‘hard facts’ on one side and ‘soft facts’ on the other, expertise on one side and emotions on the other. Experts get emotional on risk matters as well.” (Bourrier, 2018, p. 7).

The aim of this work is to demonstrate how “all” these variables impact directly on translation and interpretation and to show how emotions and their study from the perspective of language can bring interesting insights to domains where diverging conceptual understandings of events can compromise action through, for example, diverging conceptual metaphors. In the clear attempt to rewrite the nuclear narrative through combinations such as «atoms for peace», «clean energy», «peaceful uses of nuclear energy», risk perception can vary significantly as a result of (1) the desire/need to “persuade the public of the sound basis experts’ judgments” (Bourrier, 2018, p. 4), namely that scientific knowledge “is enough” as clarified in all IAEA publications in the section dedicated to the application of IAEA safety standards: “The scientific considerations underlying IAEA safety standards provide an objective basis for decisions concerning safety” (IAEA, 2017b).

And (2) the assumption that: “Members of the public usually have incomplete knowledge and a great deal of uncertainty regarding any issue involving nuclear and radiation safety because of the complexity of the topic.” (IAEA, 2017b, p. 1).

In this regard, current research in risk communication has demonstrated the importance of moving away from a still predominant paradigm where “public officials or industry representatives often refer to irrational public fears, or unfounded doubts, that they have to fight.” (Bourrier, 2018, p. 4), and/or where there is a prevailing intention to educate the public and the media (Bieder, 2018; Bourrier, 2018). More interestingly from the perspective of this research is that the industry/organizational belief in the assumption of the uninformed public is repeated more often in publications than «translation» and/or «Interpretation» as critical mechanisms to disseminate information and knowledge. The intrinsic belief in the uninformed public therefore represents a risk in itself.

Also, (3) the western perspective of the place of scientific knowledge within the associative realm compromises the alignment with complementary knowledge systems.

Translators Without Borders (TWB) and INTERACT – International Network on Crisis Translation have broached new approaches to translation and interpretation in crises scenarios by highlighting dimensions ignored in the aftermath of disasters, with lessons learned rarely including a detailed discussion of the role of translation and interpretation. An example is the proposal of O’Brien et al’s (2020) 4-A Framework applied to translation and interpretation, where a human-rights approach to information in a crisis or emergency provides specific parameters for organizations to assess how multilingual information is made available.

Research carried out in the field of crisis translation is also highlighting the need to revise and expand notions where meaning is significantly changed when a crisis is analysed from the perspective of access to information. Vulnerability in a crisis scenario should not be limited to the perception of an individual who might have some sort of impairment, but rather should:

reflect the scale of challenges that a person faces. In this sense, speaking a different language from that of the disaster-stricken region or simply coming from a different cultural background could make a person ‘informationally’ vulnerable or disabled, given that accessing needed information would represent a challenge in its own right unless translation and/or interpretation services were to be available. (Rodriguez & Torres-del-Rey, 2019, p. 93)

The situation in Beira, Mozambique, is illustrative of this fact. In March, 2019, 1.85 million people experienced the loss of lives and livelihood, when the Idai Cyclone hit the northern part of the country. In their field survey, TWB shared the following regarding communication challenges which compromised greater efficiency by responders:

Table 1. Language Challenges in the Beira response (Translators Without Borders, n.d.a)

%	Languages Challenges in the Beira Response
41	do not understand written Portuguese
65	of women do not understand written languages in any language
57	of people over the age of 50 do not understand written messages in any language
44	of women do not understand audio messages in Portuguese
33	of people either do not have, or are not sure they have, enough information about humanitarian services

This field study resulted in a list of recommendations for future emergency response, namely:

- Avoid communicating only in written form
- Audio messages in mother tongues -there are 17 in Beira- should be preferred
- Disaggregation of information per age groups and gender
- Audio content in Portuguese is better understood than in written form
- 80% of people understand pictorial language
- Recognizing preferences in forms and channels of communication contributes towards meaningful communication. (TWB, n.d.c)

Furthermore, and in order to respond to lacks in language data for humanitarian purposes, TWB (TWB, n.d.c) proposes the integration of four questions to assist in the preparation of multilingual crisis and emergency risk communication plans in multisectoral needs assessment:

1. What is the main language you speak at home?
2. Which language do you prefer to receive written language in?
3. Which language do you prefer to receive verbal information in?
4. How do you prefer to receive language (in person, radio, TV, poster, leaflet, phone call, SMS, etc.)

Communication during the Fukushima Daiichi incident was also not exempt from failures at the level of multilingual preparedness, compromising cross-border top level and technical communication, when the lack of an emergency management plan and lack of crisis awareness left Tokyo Electric Power Company (TEPCO) unable to appropriately respond when two unforeseeable natural events –an earthquake and tsunami- simultaneously impacted the power plant.

Despite the relevance of world crises and emergencies and the multilingual and multicultural makeup of response capabilities, organizations are still struggling to integrate models and procedures which formally address translation and interpretation, as demonstrated in O'Brien et al. (2018) study of five national approaches to crises and emergencies (discussed in further detail in Chapter 2).

Scientific tradition has created a challenge which is clear in the third space where Translation and Interpretation operate. There is an assumption that anything which does not conform with the scientific outlook on the world is wrong, or biased. When assuming that “a standard of rationality” or “good judgment” can be deviated from, a model which can situate this perspective can positively contribute to the transfer and integration of technological and scientific information and

knowledge to be used by the public. Translation and interpretation are invaluable tools in this process.

Translating and interpreting in situations of crisis and emergency creates unique settings which require unique skills and competencies on the terrain, to allow humanitarian aid to reach the affected populations as efficiently as possible. It requires (1) responding organizations to acknowledge translation and interpretation as part of their toolkit and consequently work towards preparedness for translation and interpretation; (2) professionals who are trained to provide or lead translation and interpretation aid; (3) models, tools and methods which acknowledge, embrace and respond to inconsistency and unexpectedness resulting from different cognitive experiences.

Additionally, it is a risk to assume that there is a common desire to engage globally; it is a misperception to assume that universality is a shared value. The growing migrations throughout the world, as individuals flee life threatening circumstances, illustrate social and cultural challenges which arise when refugees, for example, seek foreign destinations in the pursuit of better living conditions. As we see refugee camps grow all over the world, the more individuals and communities are confronted with personal belief systems and identity challenges. The exercise of awareness and consciousness is not the same for all and does not align globally with the pacific acceptance of the Other.

In stating that “Standards are only effective if they are properly applied in practice.” (IAEA, 2017c), there is the expectation that languages and the stories behind the individual and collective experiences would become an area of interest in nuclear risk communication because:

Risk communication campaigns must now be tailored to a variety of audiences that do not read the same media outlets, nor inform themselves in the same ways. Campaigns must be devised in many more subcategories and must reach many more communities and stakeholders. This is true both for routine risk communication and ad hoc crisis communication. (Bourrier, 2018, p. 9)

The proposal to include storytelling as a risk communication strategy throughout this thesis is intertwined with the motivations behind integral theory (Chapter 2 and 4) and because:

By engaging our imagination, we become participants in the narrative. We can step out of our own shoes, see differently, and increase our empathy for others. Through imagination, we tap into creativity that is the foundation of innovation, self-discovery and change. (Rutledge, 2011)

In an attempt to find alternative forms of communicating the same risk in multiple languages and cultures, storytelling is an inevitable tool with its value being demonstrated in fields varying from education, to health and business, among others. Johnson (2018), for example, lists 10 functions storytelling serve, namely to explain origins, identify notions of truth, illustrate individual and group identity, communicate tradition and taboo, simplify and provide perspective, illustrate natural order, provide stepping stones to communicate complexity, communicate moral and ethical positions and the values which need to be maintained or changes, provide insight into relationships to, and with, authority, model socially acceptable -and desirable- behaviours, and define purpose and connection between the individual and the ecosystem they interact with.

Stories have been told since the beginning of Humanity. Channels have differed; the narratives have included new characters, new adventures, new contexts and new languages. However, fundamental sense-making of events, emotions, experiences, to which stories lend themselves fulfil a unique purpose: they relate in some way to authentic human experiences and human needs. And core experience lies at the heart of connection.

Psychology has provided us with the unique reasons why stories have such psychological power and permanence:

1. Stories have always been a primal form of communication
2. Stories are about collaboration and connection.
3. Stories demonstrate how we think.
4. Stories provide order.
5. Stories illustrate how our brain is wired.

Like storytelling, translation and interpretation can enhance collaboration, connection, an understanding of how individuals think and, therefore, assist in bringing order in moments of disruption. To demonstrate this is the aim of the following chapters.

Summary

This Chapter defined the context and relevance of addressing risk, crisis and emergency communication from the perspective of translation and interpretation. The evolution of the culture of safety within the field of nuclear energy was discussed and linked to the complexity generated by the multicultural and multilingual contexts of communication, of responsibility and of accountability. The contribution of storytelling as a tool to gain deeper insight into language and

culture specificities stated and the invitation for further exploration in alignment with a Translation-Integration approach introduced.

The scope of the study has been set, the distinction between risk communication and crisis and emergency communication on the other has been established, the challenges of nuclear risk communication and its impact on crisis and emergency communication pointed out and the potential of translation and interpretation as knowledge builders and accelerators proposed.

The following chapters provide more detailed insight into all of the abovementioned aspects.

Part II – Theoretical and Conceptual Framework: a proposal

Chapter 2 – Theoretical and Conceptual Framework

The illusion of transparency is an effect of fluent discourse, of the translator's effort to insure easy readability by adhering to current usage, maintaining continuous syntax, fixing a precise meaning. What is so remarkable here is that this illusory effect conceals the numerous conditions under which the translation is made, starting with the translator's crucial intervention in the foreign text. The more fluent the translation, the more invisible the translator, and, presumably, the more visible the writer or meaning of the foreign text. (Venuti, 1995, p. 2)

The conceptual difficulties encountered by the dominant tradition in the cognitive sciences in attempting to explain the nature of 'social cognition', language and communication are not accidental. They stem from the epistemological and methodological individualism inherited from the 'possessive individualist' cast of Western culture (and capitalism), and the dominant position accorded in this tradition to natural science and technology *vis-à-vis* the humanities and social sciences. (Zlatev et al., 2008, p. 16)

Introduction

Translation and interpretation are fields of study which materialize the convergence of global connection in all their dimensions: social, economic, political, ideological, spiritual, emotional, technological and cultural. How words are used, how decisions are made with regard to equivalence of meaning when mediating information and knowledge from a source language to a target language entails significantly more complex processes than those of normative value, i.e., complying with terminological and grammar-based aspects. It is in and through translation and interpretation that the multicultural universe(s) behind the construct can be more clearly acknowledged. While the outcomes of "understanding" and "accepting" the universe(s) behind the construct(s) remain a topic of crucial – and much needed – debate, it is clear that the role of culture and the role of the translator/interpreter as individuals with their own narratives, values, cultures and cognitive skills can no longer remain an invisible variable when looking to contribute to the field of translation and interpretation studies (TIS).

Part II of this thesis addresses the theoretical and conceptual theories and models that inform the research underlying the proposal of the Translation-Integration Model (TIM) rooted in cognitive and integral approaches.

Radical shifts in paradigms and new theoretical proposals concerning the process(es) that materializes meaning and, consequently, how knowledge and understanding as cognitive processes develop and impact on the nature of the intersubjective (relationship between the individual and others) and interobjective (the objective manifestation of culture) dimensions of communication represent the effervescent environment and inherently dynamic and exciting ecosystem of TIS. The natural interdisciplinary nature of TIS allows the field to benefit from findings in all fields of study. Without exceptions. The theoretical and conceptual framework proposes a model that acknowledges uncertainty and transversal interrelatedness as a core approach to TIS. Translation and interpretation exist because there is a(n)Other. The notion of Culture and its importance for translation and interpretation are discussed and present in all instances of this work. To overlook the importance of culture in any translation and interpretation endeavour would, for example, make understanding and addressing the importance of “risk perception(s)” in crisis and emergency responses seem contradictory and senseless.

The outcomes of physical and geographical mobility, complemented by technological connectedness, are critically acknowledged as the COVID-19 health pandemic forces changes at all levels, creating challenges beyond apt technological solutions. The call for global cooperation brings to light the existing vulnerabilities which underlie international agreements on shared meaning and shared priorities. As pointed out by Bourrier (2018):

(...) “good” risk or crisis communication can do little in the face of massive governance problems, where controversies and conflicts naturally arising inside first-line institutions dealing with complex crises will inevitably also be invisible on the outside. Suppressing controversies over uncertainties is not possible., Therefore, crisis management is increasingly becoming a question of (risk) governance. (Haferkorn as cited in Bourrier, 2018, p. 3)

Crisis translation as a response tool is an emerging branch of study which sits at the sensitive crossroads where specific communication needs and requirements reveal that translation and interpretation play an undeniable role in shaping the outcomes of a crisis or emergency, whether the event has a natural or man-made origin. As discussed in Part I, tolerance to risk varies according to the origin of the risk: natural cause or man-made. Part II illustrates how the role of translation and interpretation changes too, as does the attention to the visibility of the translator/interpreter.

In the extreme cases of man-made crises and emergencies, translation and interpretation are required to adapt and carried out under circumstances more comparable to those of a war, than to those of standard translation and interpretation protocol. For this reason, attention needs

to be paid to who is translating and interpreting, and how. Extreme communication circumstances have the potential to become even more overwhelming if assistance cannot be provided and/or is provided with communication obstacles, generating cascading effects in all areas of human interaction. The effects of disrupted human ecosystems have become visible through the growing numbers of refugees and migrants which, in turn, brings changes to the host ecosystems where language policies, for example, reflect the complexities of the struggles arising from multicultural and multilingual interaction:

For the members of the host society, the visible presence of new languages can trigger anxiety or fears about national identity surrounding challenges to (often imagined) linguistic unity or corruption of the dominant language as a result of “contamination” by other languages, not necessarily just those used by migrants. People find it hard to accept the development of a new form of diversity that replaces the traditional linguistic diversity of their home territory (regional and minority languages). These reactions occur at an ideological level, although the arrival of new languages in a given territory does not have direct implications for the established population who are under no obligation to learn the new languages. (Council of Europe/ Language Policy Unit, n.d.)

Therefore, and although translation and interpretation have been carried out for millennia, understanding the processes which allow a piece of information to be transformed from one language into another is relatively recent as cognitive science provides the observable and measurable data which allows a given field of study to be perceived as objective and credible within Western scientific tradition. As cognitive science and translation and interpretation studies give rise to fruitful intersections and reciprocal contributions (Diamond & Shreve, 2017; Ferreira & Schwieter, 2017; Martin de Leon, 2017; Vandepitte, 2017; Whyatt et al., 2017), additional works in parallel fields also encourage new paths by inviting pluralistic and complimentary approaches to be explored in response to the changing requirements and demands of growingly connected multilingual and multicultural ecosystems. As the invitation for plural, inter and multidisciplinary approaches are discovered and proposed, there is greater receptiveness to models which focus on skills such as awareness and consciousness of the role of language *per se* in how ideologies and other sources of power shape the world we live in (Faur, 2013; Federici, O’Hagan et al., 2019; Lakoff & Johnson, 1980; O’Brien et al., 2018; Venuti, 1995; Zlatev, 2011).

In order to honour the complex tapestry of Humanity, the intricacy needs to be clearly addressed through the collaborative sharing of what makes each translation and interpretation act unique when removed from the standard version that has prevailed in traditional approaches.

By addressing different levels of meaning (Leech, 1981; Zlatev, 2002) and knowledge (Coseriu, 1982; Coseriu & Lamas, 2006; Faur, 2013; Murray, 2006), this work will expand on and argue in favour of the contribution of integral approaches because difference is “central to each society’s vision of the world and its relationships with others” (Baker, 2010, p. 198) and assumed homogeneity that:

heightens the perception of radical difference between us and them and leaves members of each society, including translators and interpreters, little or no room for manoeuvre – no room to negotiate a more tolerant, more accommodating relationship even with the odd member of the ‘enemy’ camp, and no ‘in-between’ space of the type that romantic theories of translation tend to assign them to. (Baker, 2010, p. 198)

2.1 Why (the value of) meaning (still) matters

Without the ability to categorize, we could not function at all, either in the physical world or in our social and intellectual lives. An understanding of how we categorize is central to any understanding of how we think and how we function, and therefore central to an understanding of what makes us human. (Lakoff, 1987, p. 6)

Introduction

The discussion of meaning, how it comes about and the role of mind and body in the process is neither new, nor consensual. The fact that meaning remains a passionately debated notion is revealing of its importance in individual and collective existence. The dynamic nature of meaning has consistently tested and challenged theories, paradigms and models in an attempt to gain deeper and more operational applications of the universes behind the normative manifestation of worldviews and experiences which shape our identities at any level: social, political, ideological, religious, spiritual, cultural. Meaning and its multiple definitions will continue to challenge scholars – and society in general – because meaning is interlocked with the notion of communication and communication is at the basis of community building and individual relatedness with the ecosystem in which they exist.

A work on translation and interpretation would certainly seem incomplete if it did not explicitly address the notion of meaning. This chapter therefore discusses and explores the following topics and their connection to translation and interpretation:

1. the relationship between *culture* (Baker, 2011; House, 2016; Nord, 1994) and *translation/interpretation*.
2. “meaning” and how “embodied meaning” for the purposes of translation and interpretation in general and for crisis translation and interpretation in particular is relevant (Federici, O’Hagan et al., 2019; Federici et al., 2020; Leech, 1974; O’Brien, 2016, 2017, 2018).
3. the relationship between embodied meaning (Zlatev, 2002, 2009) and knowledge (Coseriu, 1982; Coseriu & Lamas 2006; Murray, 2006) and how these two notions impact on the dialogical and (ideally) reciprocal dynamics of communication (Kovecses, 2008).
4. the positive contributions of the meta-framework and meta-concepts provided by Integral Theory and the AQAL (all quadrants, all lines, all levels, all states and all types) (Wilber, 1997)

2.1.1 Culture

“Language is the prime means of an individual’s acquiring knowledge of the world, of transmitting mental representations and making them public and intersubjectively accessible.”

(House, 2018, p. 51)

‘Culture’ has known an array of definitions over time given its bearing to different fields of study such as anthropology, sociology, psychology, cultural studies, to name just a few. The common recognition of the importance of culture in the process of creating ‘meaning’ at the individual and collective level have encouraged many different, and sometimes conflicting, definitions. Examples such as Hofstede’s well marketed Model of Cultural Dimensions – with verifiable impact on intercultural communication training within organizations - where culture is treated as a disembodied and manageable asset to be more or less strategized to meet, essentially, organizational goals through the proposal of a ‘dimension paradigm’ where culture is defined as “the collective programming of the mind that distinguishes the members of one group or category of people from other.” (Hofstede, 1980). Currently such a definition exposes itself to potentially harsh criticism due to the ease with which it can propagate and reinforce stereotyped and potentially discriminating perceptions of the Other, in addition to motivating extremely reductionist views and understandings of the world even if such an approach is explored from the perspective of organizational values. More positive approaches to difference and perceived

homogeneity stemmed and developed within cultural studies based on works such as the Theory of Types (Bateson, 1972) to Hall's popular Triad of Culture (1959/1990) and the iceberg model, which contributed to moving 'culture' and its role in shaping individual and collective worldviews and self-perceptions to a place which honours the entire individual and values the role of intersubjectivity as a determiner of the quality of the relationship of the individual and their ecosystem.

Definitions are multiple and continue to develop in complexity as they address the dynamics of world change and the surfacing of multilingual and multicultural tensions. An example close to heart are the challenges brought about by the new coronavirus COVID-19, declared a health pandemic on March 11, 2020. Dialogues between WHO and world leaders have been marked – and highly challenged – by tensions in managing expectations on international cooperation which has met with diverging problem-solving perspectives and different perceptions of what it means to communicate scientific knowledge into local legislation and general public practices. How different governments have reacted to WHO recommendations has highlighted the relationship between culture, policy and power in the context of a crisis or emergency, bringing unexpected vulnerabilities to international cooperation and outcomes of knowledge management.

COVID-19 has had a significant impact on democracies and democratic processes, resulting in postponed elections, declarations of national emergencies, with sweeping executive powers, and restrictions on the press, freedom of speech, and the right to protest peacefully. While trust in governments in many countries reached a high point in the first weeks of the pandemic, confused responses, miscommunication, misinformation and the deep impact of restrictions and lockdowns on the population has led to mistrust, polarization and rising nationalism, threatening social stability in some places. In other parts of the world where leaders were able to “flatten the curve” and keep the pandemic in check, COVID-19 has shined a light on the importance of effective leadership and good governance (GPMB, 2020, p. 18).

The data on how to communicate within the context of the COVID-19 health pandemic has helped bring to light the challenges translation and interpretation face in the field: choosing the right words to mitigate the outcomes of the crisis and emergency. The criticality of the relationship *culture* «» *meaning* increases when crisis and emergency situations require language to mediate differences and perceived homogeneity which were – and still are- unaddressed until the unexpected happens, when global vulnerabilities surface and where the choice of what is transferred through language can be compromised by the skills of the translator and interpreter

(Baker, 2018; O'Brien et al., 2018; Todorova, 2018). Overlooking translation and interpretation can compromise “the availability to articulate the kind of nuances and shades of meaning that are so vital to effective narration, especially in a tense and conflictual context (...)” (Baker, 2005, p. 217), when language mediators might also have been impacted by the event. O'Brien and Federici (2020) exemplify such circumstances when describing the cascading crisis caused by the unprecedented trail of destruction that resulted from the Idai Cyclone, in Mozambique, on March 14, 2019. In addition to the disruption caused by the cyclone, responder communication was compromised and delayed due to lack of literacy skills, misperception of language prevalence and cultural differences which were exacerbated by the event. Translators Without Borders (TWB) has been actively producing and “publishing crisis language maps since 2016, as an aid for international responders to be aware of the linguistic diversity that they will face in a humanitarian crisis.” (O'Brien & Federici, 2020, p. 2). In the case of Mozambique, the data was illustrative of misaligned views, as demonstrated in Figure 1.

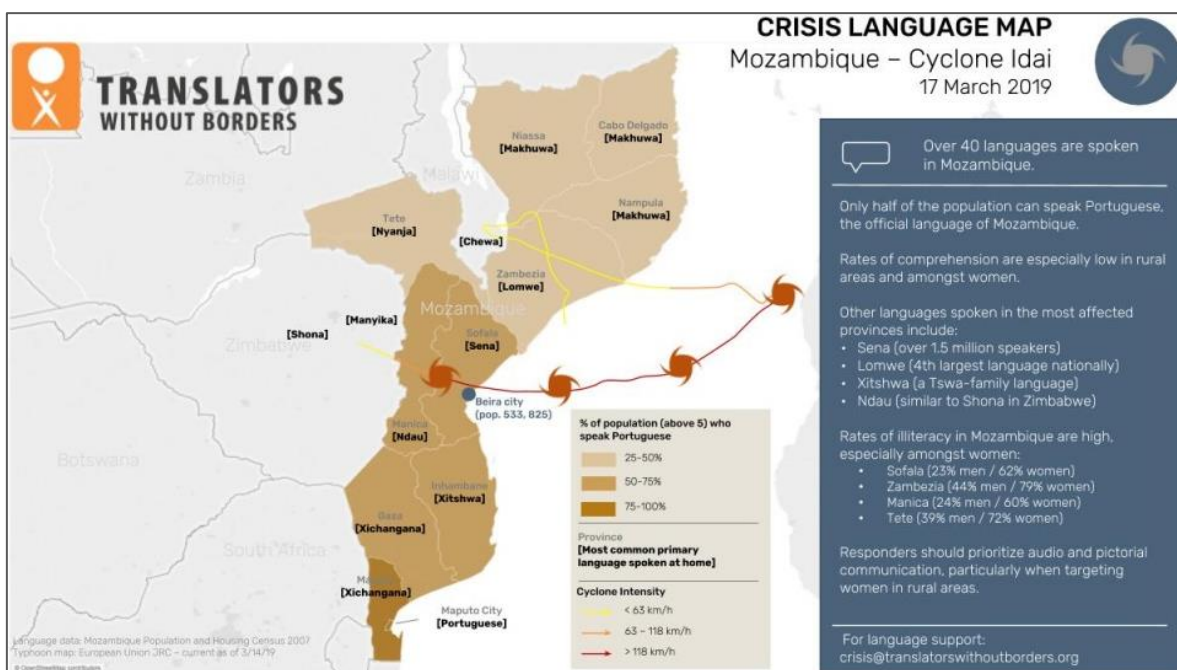


Figure 1. TWB Crisis Language Map for Mozambique (Cyclone Idai, March 17, 2019).

Source: Translators Without Borders (n.d.a).

Considering that Mozambique is prone to natural disasters of this nature, one could question if language maps could not have already been created with the twofold purpose of preparing and

disseminating risk, crisis and emergency information, integrated into complementary local indigenous systems.

While providing a glimpse of the iceberg of what multilingual risk communication entails, O’Brien and Federici (2018) propose an adapted use of Tomasevski’s 4A Framework (Chapter 3). This approach is aligned with the humanist concept of culture where the focus remains on the text or hurried selection of what may be perceived as *relevant* by donors and aid providers, while missing out on the underlying and associative layers of meaning behind the construct:

Table 2 is an example of a glossary compiled for emergency response by Translators without Borders (TWB). The glossary was a response to the language emergency which expanded the outcomes of the disaster because it was assumed that the population in the areas affected by the Idai cyclone understood Portuguese. Not only was it necessary to translate into 5 local languages but also ensure, to the degree possible, that the terms proposed were acceptable.

Table 2. Example of TWB Glossary for Crisis and Emergency Response for Mozambique (Cyclobe Idai, March, 2019)

English	Sena	Ndau	Shona	Nyanja	Portuguese
aid worker	M’phatabasa wa anyakuphedza	Mubati obasa roumunthu	Mushandi pamabasa ekuyamura	Wogwira ntchito ya thandizo	Trabalhador humanitário
dignity	Ulemerero	Reremejo	Ruremekedzo	Ulemu	dignidade
risk	Ngozwi	Zviro zvokuchata zwiitike	Mukana wekuti chinhu chakaipa chiitike	Ngozi	risco

Source: Translators without Borders (n.d.b)

In such cases, the role of the translator/interpreter remains to ‘transfer’ terms and concepts from a source language (predominantly English) into a target language, frequently without the mediation of a professional translator/interpreter who is ideally aware of what takes place during such a process, namely the ethical dimensions of translating/interpreting, suffering profoundly from what would ideally be ‘linguistic diversity awareness’ in responders. While TWB contributions are invaluable and provide the opportunity for victims to connect to responders, the emerging field of crisis translation needs to amplify and enhance its understanding of ‘culture’ in order to address the situations which require translation and interpretation professionals to engage with extreme situations as a complement to the volunteer translator approach defended by O’Brien and Federici (2020). The fact that the world is not becoming an easier place to communicate in is illustrated by

the Statisa map (figure 2) where the parts of the world still experiencing conflict on a daily basis are signalled with vary shades of red. From the perspective of translation and interpretation this requires responding to the call for contributions in crisis translation where notions such as advocacy, accountability and ethics are gaining new meanings, alongside the development of AI, for example.

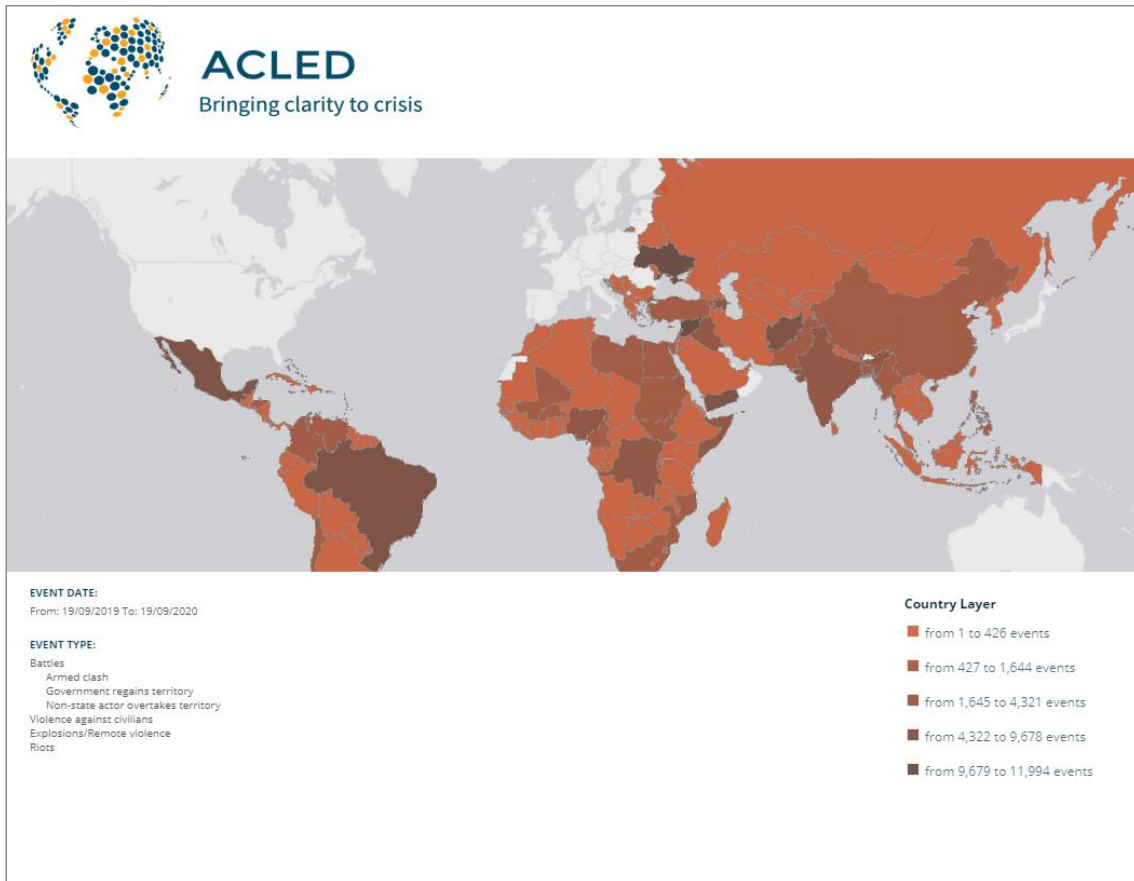


Figure 2. Distribution of world conflict during the time period of 19/09/2019 to 19/09/2020.

Source: The Armed Conflict Location & Event Data Project [ACLED] (n.d.).

Additionally, and as pointed out by Todorova (2018), translation is more than the simple transfer of terms and concepts between languages, “it requires a more complex mediation process where actors do not only engage in linguistic exchange but also in political debate and the modification of ideas.” (Todorova, 2018, p. 354) because translation and interpretation are the engines behind the connection and travelling of ideas and values which can contribute positively at a global level or diverge and conflict profoundly with the values and beliefs of Others. In her work on the innovations to political discourse in Southeast Europe, Todorova (2018) addresses the

translation and interpretation challenges regarding the discourse of civil society, but also the lack of a ‘specialised political discourse to convey its purpose and importance to the general population’ (Todorova, 2018, p. 354). Ideas which are introduced through translation and interpretation, like “wash your hands”, wear a mask”, “maintain social distance” are rendered useless unless this discourse is culturally and situationally viable in a given language and culture.

As previously mentioned, addressing culture as part of the translation and interpretation process is essential and has been done from varying perspectives. House (2018, pp.46-55), for example, establishes two main approaches: (1) the humanistic approach which comprises an understanding of culture as a “model of refinement, an exclusive collection of a community’s masterpieces in literature, fine arts, music, etc.” and (2) the anthropological approach which “refers to the overall way of life of a community or society”. In her work, House adopts the anthropological approach, defining it as “a group’s dominant and learned set of habits, as the totality of its non-biological inheritance [which] involves presuppositions, preferences and values” (House, 2018, p. 47). In her discussion of culture, House defines four analytical levels of culture:

Table 3. House’s Level of Cultures

1. General Human Level	2. Societal, national level	3. Societal and national subgroups	4. Personal, individual level
The level which distinguishes humans from animals with regard to their ability to think reflectively, shape and change their environment	The unifying, binding force which enables human beings to position themselves vis-à-vis systems of government, domains of activities, religious beliefs and values in which human thinking expresses itself.	Expands on the previous level by capturing various societal and national subgroups according to geographical region, social class, age, sex, professional activity and topic.	The level which corresponds to the individual’s guidelines for thinking and acting; a level of cultural consciousness, which enables a human being to be aware of what characterizes his or her own culture and makes it distinct from others.

Source: House (2018)

House presents a predominantly disembodied perception of the culture and places the individual’s most participatory dimension at the level of awareness, albeit acknowledging that the continuous discussions regarding ‘culture’ invite a more advisable definition. Pillar (2013) defines culture “as a diversified entity that is dynamic, fluid and hybrid with cultural borders being increasingly difficult to determine in a globalized world.”, reinforced by House’s statement that “cultures are more and more interconnected and ‘superdiverse’ through multiple interactions and exchanges – not least through the increasing number of translations worldwide.” (House, 2018, p.

52). Following a more normative line which is of obvious and undeniable importance to TIS, House defines an approach which envisages translation 'quality control' and, therefore, does not dedicate the same attention to subjective and objective realities, informing the process-oriented dimension of translation.

The initial definition of culture presented by House is broadened and further problematized within the field of critical discourse analysis (CDA). From the viewpoint of CDA, translation is perceived as a privileged field of "ideological struggle, a view of translators as stimulators of 'resistance' of hegemonic influence, and a focus on how 'meanings' in texts serve to set up and maintain relations of power and domination." (House, 2018, p. 53). This line of research is further explored and developed by Baker whose work has focused on the impact of the western narrative that consistently treats translation as a bridge (quote), overlooking the finer cultural implications of often unquestioned perceptions and viewpoints (quote).

Nord contributes with a different perspective to culture and translation. According to Nord (1997, p. 34): "Translation means comparing cultures. Translators interpret source-culture phenomena in the light of their own culture-specific knowledge of that culture, from either the inside or the outside, depending on whether the translation is from or into the translator's native language-and-culture."

Rooted in a functional approach to translation, Nord's definition of culture seems to lack the ability to embrace what Todorova perceives as the place where there is room for a shift in values and ideas (Todorova, 2018) and also the potential for development of an awareness that can inform the translation process and the translator from various quadrants as proposed in the Translation-Integration Model (TIM) in Chapter 4.

According to Nord (2016) and from a functional perspective, translation is a situated and purpose dependent process and therefore culture plays the role of function guide, i.e.,

for the production of a text that is supposed to work in a certain way in the target culture, we have to adjust the form to the norms and conventions of this culture, using the function markers which will be correctly interpreted by the target-culture audience. (Nord, 2016, p. 5)

From this standpoint, Nord focuses on the process, very much like House, by exploring the linguistic and cultural adaptation at the level of the conceptual system through levels of textuality (pragmatics, linguistic dimension and semantic dimension) and normativity.

In a different light, scholars such as Venuti (1993), Baker (2005, 2013, 2014), Todorova (2018) and Tymoczko (2000), explore the relationship between translation/interpretation and culture in a move from process to action; here the act of translating/interpreting and the translator/interpreter themselves are perceived as situated, intentional and powerful in the role they play in “bridging” differences in a manner which has, according to Baker, blossomed within a tradition that romanticizes the role of translation and interpretation allowing the profoundly political nature of translation to be overlooked and encouraging the “bridge metaphor” to evolve in a manner that unquestioningly places translation and interpretation in an “in-between” land governed by false neutrality. According to Baker (2005, p. 12):

(...) no one, translators included, can stand outside or between narratives. Hence, a politically attuned account of the role of translation and translators would not place either outside nor in between cultures. It would place them at the heart of interaction, in the narratives that shape their own lives as well as lives of those for whom and between who they translate and interpret.

Venuti (1993) had already established a less romanticized approach to translation by defining translation as a ‘cultural political practice’ materialized in social affiliations which render texts and their effects as more or less worthy of translation, hence feeding the potential for violence through translation:

The violence of translation resides in its very purpose and activity: the reconstitution of the foreign text in accordance with values, beliefs and representations that pre-exist it in a target language, always configured in hierarchies of dominance and marginality, always determining the production, circulation, and reception of texts. Translation is the forcible replacement of the linguistic and cultural difference of the foreign text with a text that will be intelligible to the target-language reader. (Venuti, 1993, p. 209)

This more polarized and tense perspective of translation and interpretation has found further development in the works of scholars who analyse the role of translation as the mechanism through which new political discourses can (or cannot) be constructed by introducing new vocabulary and new ideas and values, and allowing them to travel from one socio-political context to another (Todorova, 2018).

However, and based on the findings from the case-study, a more critical approach to the role of translation and interpretation – and of the translator and interpreter - is adopted in this thesis, given the (a) local implications of adopting global standards and guidelines which create, for example, tensions between systems of knowledge, reinforcing asymmetrical power relationships

and (b) expanding domains and, consequently, world perceptions. The case-study in Chapter 5 discusses the risks this entails for radiological and nuclear risk communication.

By presenting varying definitions of culture within the broader field of Translation, House and Baker, among others, illustrate that linguistic, conceptual and cultural specificities impact significantly on the understanding of translation quality. Addressing associative meaning contributes to advance the development of tools, theories and frameworks within crisis translation where the main purpose of translation and interpretation is to save lives. The emergence of tangible aspects of culture through translation, demonstrated, for example, by the inexistence of the notion of «social distancing» in the recent SARS-COVID-19 health pandemic in some cultures, or the impossibility of practicing «hand washing» in less developed areas of the planet or, in the case of a radiological and nuclear crisis and emergency, the difficulty in addressing an «invisible and odourless risk»² highlight the call to action through translation and interpretation in a crisis and emergency. When considering the designing and development of national and international Crisis Communication Plans (CCP), where information and knowledge need to be combined to guarantee a specific action to mitigate threats and risks, the contributions of transition to demonstrate how associative meaning impacts on action is clearly important.

2.2 Meaning and/or embodied meaning: does it really matter?

“Meaning (M) is the relation between an organism (O) and its physical and cultural environment (E), determined by the value (V) of E for O. $M = V(O, E)$ ”

(Zlatev, *Meaning = Life*, 2002, p. 258)

Such a neatly tucked definition of ‘meaning’ provided by Zlatev (2002) is as appealing as $E=MC^2$. This formulaic expression of what meaning entails is an attempt to bridge the long-term conflicts concerning the ontological status of meaning as described by Zlatev et al. (2008), i.e., abstract, (Frege), physical (Barwise and Perry), mental (Jackendoff; Lakoff) or social (Zlatev, 2002). In his unified biocultural theory of meaning, Zlatev attempts the challenging endeavour of developing a concept of meaning which is both integrative and domain-sensitive and based on an explicitly evolutionary and developmental perspective. The approach relies on two assumptions: (1) “all living systems and only living systems are capable of meaning” and (2) that “there is a hierarchy of meaning systems which is both evolutionary and epigenetic: each preceding level is

² See Chapter 5 for Case-study of radiological and nuclear risk communication.

presupposed by and integrated in the one that follows, both in evolution and in human ontogenetic development.” (Zlatev, 2002, pp. 257-258). Although Zlatev does not, from the perspective of this work, provide a sufficiently clear definition of ‘living system’, therefore leaving a phenomenological gap in the debate, his proposal does illustrate the value of interdisciplinarity because, as stated, similar integration perspectives have been developed in other fields but they remain separated and isolated from each other (Zlatev, 2002). The relevance of this fact lays in the belief that such a gap may continue to persist as a result of insufficient meta-theories and models which rehearse and practice interdisciplinarity as an integrated approach within ‘knowledge building communities’ (Murray, 2006). Zlatev’s evolutionary approach – openly in dialogue with artificial systems and admitting its still hypothetical nature – argues in favour of an apparently simplistic understanding of meaning: ‘Meaning = Life’, i.e., meaning requires organisms which combine natural and cultural dimensions, in this way effectively integrating biological value into cultural and linguistic meaning. Zlatev’s major contribution to this study is the development of the notion of intersubjectivity (Chapter 3), understood as “the sharing of experiential content (e.g., feelings perceptions, thoughts, meaning) among a plurality of subjects.” (Zlatev et al., 2008, p. 2).

Through a bio-cultural approach, and reaping the benefits of the work of scholars who are developing complementary approaches by drawing on each other’s findings to overcome their own constraints, Zlatev’s work, together with that of Faur (2013) and other scholars, continue to understand ‘meaning’ as a dynamic and evolutive element.

Embodied meaning as proposed by Lakoff (1987) and Johnson (1987) brought two assumptions to the table regarding the objectivist understanding of conceptual categories understood by classical theory as pre-existing in the world and therefore needing to be acquired by the individual, and thus not influenced by the bodily nature of the *knowing* individual: (1) conceptual categories are characterized in terms of objective properties *and* “by the bodily nature of the people doing the categorizing rather than solely by the category members.” (Lakoff, 1987, p. 371); and (2) “Human conceptual categories have properties that are a result of imaginative processes (metaphor, metonymy, mental imagery) that do not mirror nature” (Lakoff, 1987, p. 371). The debate originated by this change in perspective was crucial to the development of cognitive linguistics and influenced the approaches developed in integral linguistics by acknowledging the subjective nature of the individual, namely the physical and sensorial dimensions of the cognisant individual and giving metaphor a role, which has traditionally been limited to realm of literature. Acknowledging the resistance which metaphor still encounters when discussing the formulation of conceptual categories, the case-study presented demonstrates that metaphor and imagination are

still powerful tools not only within the construction of domains and conceptual metaphors, but also within the process of translation and interpretation.

Drawing on Lakoff and Johnsons' work (Lakoff & Johnson, 1980), as well as on the research which developed from it, namely the work of Kövecses (2008), Conceptual Metaphor Theory (CMT) is perceived here as a useful tool in analysing the discourse of nuclear power and in exploring its intricacies from the perspective of TIS.

2.2.1 Why use Conceptual Metaphor Theory (CMT)?

"(...) metaphor is pervasive in everyday life, not just in language but in thought and action. Our ordinary conceptual system, in terms of which we both think and act, is fundamentally metaphorical in nature." (Lakoff & Johnson, 1980, p. 3)

Conceptual Metaphor Theory (CMT), like any theory, has enthusiasts and critics. Its initial revolutionary nature, materialized by Lakoff and Johnson in *Metaphors We Live By* (1980), consisted, essentially, in bringing metaphor to the forefront of language use in general, removing it from a traditionally exclusive literary function. Lakoff and Johnson argued that metaphor plays a more important role, in fact, a critical role in shaping meaning. In this respect, by emphasizing the role of metaphor as a mental, physical and cultural process, the notion of embodied subjective meaning gains visibility and purpose, honouring the complexity of meaning building and creating as a process and action-based dynamics which is constantly being renewed and organized, accompanying the complexity of human existence. This dynamic is, according to the authors, guaranteed through the notion of image schemas, which allow information to be 'packaged' in a way that triggers creative strategies to be used to produce meaning.

CMT has continued to be studied by numerous scholars who have developed Lakoff and Johnson's initial theory, namely Kövecses (2008), Schmidt (2015), Faur (2013), Nerlich and Clarke (1999), Zlatev (2009b), Bundgaard (2019) who have acknowledged CMT as one of the most comprehensive theories in explaining the uses of metaphor in fields which go beyond that of literature. For the purpose of this work, I draw on the findings of the application of CMT in cross-linguistic and translation and interpretation research. The contribution of this particular work to CMT for translation and interpretation purposes lies in its effectiveness to (1) analyse associative meaning pertaining to the field of nuclear energy and technology and its (peaceful) uses and (2)

identify variation within the same language, used in different countries, with significantly different cultures.

Aligned with Lakoff, Kövecses and Schmidt, this work suggests that CMT can provide important insights in defining and refining effective communication methods for crisis and emergency response by explicitly addressing what notions such as ‘plain language’ entail within international emergency methods and communication strategies.

In this section, the aspects which make CMT relevant for this work are discussed and in Part III its applicability is demonstrated through the analysis of the corpus selected.

CMT building blocks

Conceptual metaphor theory provides useful notions when the goal is to integrate translation and interpretation (T&I) into already existing communication practices. In this work, CMT is combined and blended with other theories and models, namely Coseriu’s Matrix (Coseriu, 1982; Coseriu & Lamas, 2006), Leech’s levels of meaning (1974) and Kecskes (2008) Dynamic Model of Meaning (DMM) within the overarching meta-framework of Integral Theory and its meta-concepts because the aim is to analyse the potential of T&I as a lender within already existing communication strategies.

The following quote taken from the International Atomic Energy Agency (IAEA) *Method for Developing a Communication Strategy and Plan for a Nuclear or Radiological Emergency* (IAEA, 2015a) illustrates the integrational challenge taken on in this study, and its relevance to international guidance on developing national and local emergency communication plans. In the case of the IAEA, this demands implementation capabilities in 173 Member-States:

The purpose of a communication strategy is to determine how to identify key issues, target audiences, appropriate messages and communication activities to deliver the intended information. (...) Although any strategy should be prepared in advance, it may need to be defined or adapted at the time of an emergency according to the specific circumstances and based on ongoing feedback as the emergency evolves. (IAEA, 2015a, p. 4)

Although the purpose of the publication is to design a methodological approach to communication, there is a strategy underlying the *why* and *how* the communication needs to be developed, but there are additional – and crucial – aspects which ground the efficiency of the communication response, namely feedback during the event (an issue of the greatest importance in the field of crisis translation and interpretation because this feedback is frequently provided by

volunteer translators and interpreters who are, as discussed in Chapter 3, predominantly motivated by reasons and experiences which differ significantly from those which guide the work of a professional translator and interpreter). The key issues are language-based and the language, commonly referred to as 'plain language' is rooted in individual and collective 'image schemas' and the meanings which the communication plan aims to access regarding what is referred to as the 'Public Environment', i.e.,

(...) any available, or collected, results of public opinion research or surveys that explore public perception of issues such as radiation and its risks, acceptance of related technology, disposal of waste and past radiation emergencies. Attitudes towards nuclear power plants, siting of radioactive waste facilities and any remediation activities are also potential sources of information about public opinion. (IAEA, 2015a, p. 4)

The relevance of CMT in taking this analysis further is to consider the following general aspects which CMT practitioners agree on (Kövecses, 2004):

1. metaphors are all-pervasive
2. it allows systemic mappings between two conceptual domains
3. directionality is from objective domain to abstract domain
4. metaphors primarily occur in thought
5. conceptual metaphors are grounded
6. provenance of source domains is predominantly universal.

Assuming that "(...) communication is based on the same conceptual system that we use in thinking and acting, language is an important source of evidence for what that system is like." (Lakoff & Johnson, 1980, p. 3), then to potentially integrate T&I into international communication strategies, predominantly in English, there needs to be the explicit referral and acknowledgment that:

1. conceptual domains and, consequently, conceptual systems are affected by culture;
2. conceptual meaning and associative meaning engage audiences in different ways and that conceptual meaning is frequently irrelevant in crisis or emergency communication with the public;
3. the experience and categorization of notions of *risk* will vary considerably across cultures horizontally and vertically
4. directionality from objective domain to abstract domain is rooted in different knowledge systems (Local Indigenous Knowledge Systems versus Science and Technology Knowledge Systems);

5. thought processes are dynamically related to the ecosystem and therefore different cognitive skills are developed and called upon;
6. provenance of source domains is predominantly universal but the experience and materialization of the content of the domains might not be.

With a more critical approach as to the relevance of conceptual meaning, the importance of language, and of the role of T&I considering the IAEA definition is, in this work, clear. It is also evident, when analysing the corpus comprised of 1.5 million words resulting from the compilation of 87 texts from the IAEA and Regulatory Authorities in Brazil, Mozambique and Portugal, that the relationship between linguistic, conceptual and communicative strategies are unclear and that the design and production of tools to assist in this clarification is urgent if the commitment to prioritising communication is to be fully achieved:

Experience from nuclear and radiological (radiation) emergencies highlights public communication as one of the most important challenges in emergency management. Sometimes an event is not considered to be an emergency to experts or responders but is perceived very differently by the general public. Communicating effectively with the public about radiation emergencies is key to successful emergency management. It will help mitigate the risks, support the implementation of protective measures, and contribute to minimizing negative psychological impacts. (IAEA, 2012, p. 1)

Different perceptions resulting from diverging cultural and knowledge-based realities is at the core of the TIM which, through linguistic evidence, proposes the benefits of explicitly addressing **conceptual metaphors**, here understood as “a systematic set of correspondences between two domains of experience” (Kövecses, 2008, p. 2). While linguistic metaphors represent the coding of a particular experience and the establishment of similarities between two realities for intentional illustrative purposes, which is the case of Caputi’s (Caputi, 1993) feminist analysis of the nuclear metaphor in “The metaphors of radiation: Or, why a beautiful woman is like a nuclear powerplant”, positive and negative analogies related to women and to nuclear are explored through linguistic devices with specific communicative intentions. Conceptual meaning, on the other hand, expands the potential insight into human understanding of reality through the cognitive mapping of experience, namely by “understanding one domain of experience (that is typically abstract) in terms of another (that is typically concrete).” (Kövecses, 2017, p. 1). The relevance of CMT lies in the conceptual agility brought to TIS with operational concepts to understand the role metaphor can play in pinpointing those areas in the translation of technological and scientific information and knowledge which have the potential to introduce bias into the knowledge generation process. For

example, one of the respondents in the case study presented in Chapter 5 stated that one of the challenges in communicating about «radiation» lay in the «invisibility» and «odourless» quality of radiation. The materialization of this difficulty is exciting from the perspective of translation because although Portuguese is a common language between the participants in the study, this particular challenge illustrates how individual and collective experience can potentially hamper the transfer of technological and scientific knowledge and information into local indigenous knowledge systems. From the perspective of crisis and emergency response which entails global cooperation, the lack of preventive risk communication which considers such limitations may compromise or leverage the efficiency of an emergency crisis communication response. Conceptual metaphors are also relevant if considering, for example, that “generalizations can be detected from linguistic metaphors and that these generalizations seem able to generate novel metaphors, and probably frame world-views.” (Kövecses, 2017, p. 28). Such an understanding is critical for translation because, if domains generate new metaphors, new world-views, this seems to justify the important contribution TIS can bring to multidisciplinary approaches to risk, crisis and emergency communication when there is the understanding that “an event is not considered to be an emergency to experts or responders but is perceived very differently by the general public” (IAEA, 2012, p. 1). To illustrate the tensions and the frequently uncritical approach to language is the current challenge in dealing with the ethical dimension of artificial intelligence and the non-artificial bias in language when using semi-automated solutions to respond to a crisis and emergency. Also, when introducing a new domain into a language and culture, translation is not only contributing as a technological and scientific accelerator, it is also creating new narratives, as demonstrated and discussed in Chapter 5. While linguistic metaphors provide access to the broader universe of shared references, it is in the intricacies of conceptual metaphors and the associative meanings that the subjective and value-based tensions arise when translation is perceived as a mere process.

The discrete yet powerful insight associative meaning and metaphor provide as scaffolding devices for scientific and technological communication lays in the pool of references available to the translator. Caputi’s (Caputi, 1993) feminist analysis of the nuclear metaphor in “The metaphors of radiation: Or, why a beautiful woman is like a nuclear powerplant” and her review (1995) of the works *Knowing Nukes: the Politics and Culture of the Atom* (William Chaloupka), *Life Under a Cloud: American Anxiety about the Atom* (Allan M. Winkler), *American Ground Zero: the Secret Nuclear War* (Carole Gallagher) and *Seul: Seeking the Corn-Mother’s Wisdom* demonstrate the potential of illustrative linguistic metaphor materializing a view which can be understood by an audience which shares the same set of references, contributing to broader pool of associative meaning. While

linguistic metaphor draws on the pool of culturally shared meanings, conceptual metaphors are the building blocks from which linguistic metaphors is able to draw its impact. While linguistic metaphor is code dependent, conceptual metaphor is experience dependent, i.e., while “(...) a beautiful woman is like a nuclear powerplant (...)” potentially provokes a reader’s interest in exploring this viewpoint; “Atoms for Peace”, “Clean Energy” and “Atoms for Humanity” are rooted in collective perceptions, associations and values. The choice of «peace», «clean», «humanity» the aim is not only to present a specific domain as «good» and aligned with the values supporting the Sustainable Development Goals, for example, but also reflects the status, weight and viewpoint of the scientific community. Experts are also emotional about their convictions, which can conflict or align, to a greater or lesser degree with collective narratives, a relevant aspect for translation purposes as illustrated by Baker’s research. Baker has consistently highlighted the importance of acknowledging that translation is not neutral and that there are specific risks which result from the transfer of narratives. While such risks can be clearly understood in Baker’s analysis of “Narratives in and about Translation” (Baker, 2010), which demonstrates how conceptual narratives present in Samuel Huntington’s *The Clash of Civilizations and the Remaking of World Order* (1996) and Raphael Parai’s *The Arabic Mind* (1973), illustrating the impacts that go beyond the boundaries of their fields of study, penetrating “the public sphere” and influencing “public narratives during a specific period of history.” (Baker, 2005, p. 6), translation risks can seem less obvious when analysing the outcomes for man-made risk and emergency communication.

While linguistic metaphors serve Caputi’s critical purpose, conceptual metaphor brings greater complexity to communicating about nuclear when approached from the viewpoint of associative meaning, an area which remains opaque as demonstrated by Leech’s division of associative meaning into five different categories (Figure 6).

Additional conceptual narratives which have informed the nuclear source domain have originated predominantly by North American writers, scholars and other specialists such as Lawrence Freedman (2003) in *The Evolution of Nuclear Strategy*.

As CMT allows us to begin to understand, the communication strategy for nuclear requires explicit attention to language as a form of accessing conceptual metaphors and, specifically, to the role of translation which is the process and action through which domains and conceptual narratives become available to and are blended with public perceptions of nuclear.

The contribution of CMT when adopting a TIM approach to nuclear risk, crisis and emergency communication is the surfacing of the non-natural and non-universal experience of nuclear.

Considering the directionality parameter of CMT, the nuclear domain experience is baffling in the sense that some scientific communities state that nuclear is «good» while other communities state that it is «bad». Considering Coseriu's levels of knowledge, for example, TIM troubleshoots what needs to be addressed for translation purposes: the conceptual metaphor, rooted in the individual and collective experience of nuclear, will impact on the more or less effective use of expressive knowledge (see Table 4). The fact that nuclear risk is a man-made risk invites for the analysis at the level of what Leech defines as the collocative meaning, i.e., "what is communicated through association words which tend to occur in the environment of another word." (Leech, 1981, p. 23). The following examples demonstrate that more than scientific knowledge and information is communicated. The IAEA is clearly communicating one of the possible approaches to «Atoms»:

- (a) "Atoms for Peace and Development"
- (b) "Nuclear Power Supports Clean Energy Transition with Secure and Flexible Electricity Supply"
- (c) "World Food Safety Day: Nuclear Techniques Used to Keep our Food Safe"

Using CMT as defined by Kövecses, and using the conceptual metaphors proposed, it is possible to put forward two levels of conceptual metaphors: (i) the universal metaphor, which has been identified as being common to many non-English languages. Examples are: theories are BUILDINGS, life is a JOURNEY, love is FIRE which, despite their shared conceptual metaphoricity, may not be expressed through equivalent linguistic metaphors in different languages and cultures. The second level of conceptual metaphor suggested is that of (a) an organizational metaphor. This type of metaphor is described by Kövecses (2014b, p. 5) as the type of metaphor which does not naturally occur, i.e., a new target domain is created through the application of one (or more) source domain(s). Kövecses illustrates this process with advertising techniques where new realities – the result of source domains being called upon to create new target domains – lead us to 'see' an existing reality from another perspective. The example of body odour is useful to illustrate that perceiving our body as something which needs to be protected, and by purchasing the product 'deodorant', the metaphor of the odour as the 'enemy' as something to be 'protected against' a metaphorical reality and reasoning is used to determine my actions. This example is useful in extending the challenges of creating new target domains from the perspective of translation and interpretation. Here, *Localization*, a more informed approach to presenting a product or idea to a specific foreign target audience, by selecting the *content* which will make the product or idea *accessible* and *meaningful* in the target market might seem like the 'natural' answer. Indeed, it might be, as this field is rife with examples of what the inappropriate content can generate in a

foreign audience when language choices do not consider the cultural dimension of language. It is also a field which has developed solid research to assist substantial decision-making processes. However, and as discussed in detail in Chapter 3, there is a dimension beyond the traditional notion of translation which needs to be addressed, i.e., the meaning beyond conceptual meaning, an approach which can be useful in risk, crisis and emergency communication.

The application of CMT to translation is not entirely new and, from the viewpoint of TIM, provides useful mechanisms to understand what is being transferred through translation. By doing so, the gaps which challenge efficient risk and emergency communication become clearer and, hopefully, easier to address through translation. Additionally, drawing on CMT, the political challenges posed to translation become clearer too, as demonstrated by Schaffer. Schöffner (2004) analysed political texts between English and German and approached metaphor as an intertextual phenomenon. The role of metaphor translation between English and Arabic, for example, is also presented by Al-Hasnawi's hypothesis based on two cognitive schemes: (1) similar mapping conditions and (2) different mapping conditions. The conclusion is that similarity between cultural conceptualization of an experience facilitates, or makes the translation task more difficult. Schmidt (2015) also addresses the important contributions of CMT by identifying "universality of the metaphor as one of the important factors influencing the choice of translation procedure." (Schmidt, 2015, p. 261). Schmidt provided a CMT typology which combines the typologies from Toury (1995) and Kövecses (2008) and applied it to a corpus of literary translations and proved to be informative and fruitful for inter-lingual and cross-cultural translations.

This study, however, unveiled that although CMT has proven to be fruitful for translation purposes, its application to the analysis of how translation and interpretation deal with domains with regard to their different cultural dimensions in the field of science and technology remains unaddressed.

By allocating to science a role of knowledge system, and comparing it with local and indigenous knowledge systems, conceptual metaphor becomes an important role-player for crisis and emergency translation and interpretation, and for the nuclear sector in particular, where the domain not only needs to be created in some languages and cultures, but where the conceptual metaphor and conceptual system can be significantly challenged by diverging levels of knowledge and experience.

In the following section, Leech's seven types of meaning and Coseriu's (Coseriu, 1982) knowledge framework can potentially support a clearer understanding of the relationship between domain, conceptual metaphor and translation and interpretation.

2.2.2 Leech, Coseriu and knowledge generating communities: types of meaning and types of knowledge

Types of Meaning

Leech (1974) and Coseriu's (Coseriu, 1982; Coseriu & Lamas, 2006) works provide stepping stones for the TIM through the systemization of types and levels of meaning and knowledge. Levels of meaning and levels of knowledge have been discussed by different scholars, from different approaches, all of which contribute to the choice made here to pursue a path based on the following assumptions:

- (a) Meaning is a dynamic process which calls to action and connects the individual with their ecosystem.
- (b) Shared domains are at the basis of how knowledge systems develop and their status within a given community.

Based on these assumptions, Leech's seven types of meaning contributed to the flexibility of the foundations required by ecosystemic approaches to meaning. Zlatev (2002), for example, divides meaning into four different types: cue-based, associational, mimetic and symbolic, addresses meaning from an evolutionary and developmental perspective. Coseriu's matrix of knowledge has also allowed for fruitful new research paths to flourish -even through their counter-argument to Coseriu's work- as demonstrated by Faur (2013), where a combined and mutually enriching blend between cognitive semantics (CS) and integral semantics (IS) captures the important role of conceptual metaphor in the generation of new knowledge, i.e., "new cognitive contents and new conceptual domains of thought".

Within the scope of this work, and in order to pull together a potentially new theoretical approach to crisis translation and interpretation, 'meaning' and 'knowledge systems' available in the source text (ST) and target text (TT) are always the backdrop of the discussion. The approaches selected are those which, from the perspective of Cognitive linguistics (CL) and Integrational Linguistics (IL) best account for how 'meaning of knowledge' is moved between languages (from an

intra-lingual and cross-lingual perspective) and how choices impact on the ‘honouring’ or potentially ‘transformative’ action of translation and interpretation.

A theoretical and conceptual proposal such as the one this study is attempting to explore is challenging because there are so many valid contributions to integrate and, simultaneously, because levels of complexity spiral and move in ways that are still unfamiliar to manipulate because they do not present themselves in the traditional systematic manner. However, the growing research in so many complementary fields calls for more inclusive theoretical approaches within TIS:

(...) it must be true that the more we understand the cognitive and communicative structures of language, the better we are able to recognize and control the ‘pathological’ or destructive elements in communication, and the better we are able to appreciate and to foster the forces that make for concord. (Leech, 1981, p. xii)

Leech’s seven types of meaning remain current and relevant from an Integral perspective. Leech proposes seven types of meaning presented in Table 4.

Table 4. Leech’s Seven Types of Meaning

Communicative value	Conceptual meaning or sense		Logical, cognitive, or denotative meaning.
	Associative meaning	Connotative meaning	What is communicated by virtue of what language refers to.
		Social meaning	What is communicated of the social circumstances of language use.
		Affective meaning	What is communicated of the feelings and attitudes of the speaker/writer.
		Reflected meaning	What is communicated through association with another sense of the same expression.
		Collocative meaning	What is communicated through association words which tend to occur in the environment of another word.
Thematic meaning		What is communicated by the way in which the message is organized in terms of order and emphasis	

Source: Leech (1981, p. 23)

Leech distinguishes between conceptual meaning which represents logical categorization based on the principle of contrastiveness and structure and connotative, or associative meaning which refers to “the communicative value an expression has by virtue of what it *refers to*, over and above its purely conceptual content.” (Leech, 1981, p. 12). The distinctions provided accept and address the fact that “languages differ in the way they classify experience (Leech, 1981, p. 24).

Additionally, it acknowledges the continuous and equally dynamic nature of knowledge of ourselves and of the world we live in as “Scientists are continuously adapting and reordering their conceptual apparatus in order to give a precise explanation of what they observe; in order (...) to reduce the universe to order in new and improved ways.” (Leech, 1981, p. 32). While Leech focused on addressing the types of meaning, this work will use these types of meaning as a tool to gain deeper insights to what happens in and through translation and interpretation choices when new domains are created through the scientific knowledge system and are required to be located due to international membership.

While the relationship between conceptual, associative and thematic meaning is considered in this work, it is the associative level of meaning which will be explored in its relationship with conceptual metaphors, i.e., the internal mechanisms which represent how meaning is mapped and organized into domains that order the relationship of the individual with the ecosystem. Associative meaning is the core item to be valued because, in the case of risk, crisis and emergency communication, it is the individual’s prior experience and knowledge that surfaces to give meaning to uncertainty. Through a corpus-based approach and the comparative analysis of associative meaning between English and Portuguese (cross-cultural) and between variations within Portuguese (intralingual), in addition to highlighting the fruitful insights provided by CMT, cross-cultural, ideological and political dimensions and connections also become clearer as domains, metaphors and systems are used as tools to inform translation and interpretation decision-making. Ideally, they will also encourage greater awareness on *how* to answer the *why* it is important to develop multilingual emergency communication plans.

CMT as presented in this work and optimized through the TIM will be useful for the translator and interpreter working for – or *with* – organizations such as the IAEA whose organizational conceptual domain and conceptual metaphors are based on the following understandings of ‘communication’ and of ‘communication with the public’ as presented in the IAEA *Nuclear Communicator’s Toolbox* (NCT), where the purpose of communication is clearly to “(...) help develop and protect the credibility of a nuclear science or technology organization.” (IAEA, n.d.a). In the IAEA publication for purposes of crisis and emergency communication, *communication with the Public in a Nuclear or Radiological Emergency* (2012), the objective of the publication is “(...) to provide practical guidance to those responsible for keeping the public and media informed and for coordinating all sources of official information to ensure consistent messaging is being provided to the public before, during and after a radiation emergency.” (IAEA, 2012, p. 1).

By drawing on the research from the fields of cognitive linguistics, integral linguistics and translation and interpretation, the TIM aims to contribute to the management of what the abovementioned communicative goals entail within a community of 173 Member-States and how they might be addressed with the contributions from TIS.

Types of Knowledge

'Knowledge', along with 'culture' and 'meaning', is another foundational concept in this work because translation and interpretation rely on how knowledge, information and experiences are organized and materialized through language and culture.

Knowledge and its subsequent subdivisions and definitions, like meaning and culture, will vary according to the object of study. The anthropologist perspective presented by Blaikie et al. (1997) defines knowledge as follows: "(...) culturally-conditioned products emerging from complex and ongoing processes involving selection, rejection, creation, development and transformation of information. These processes, and hence knowledge, are inextricably linked to the social, environmental and institutional contexts in which they are found." (Blaikie et al., 1997, p. 217).

This definition further emphasizes the fact that knowledge "is not homogeneous within a local population but varies according to the respondent, whose knowledge may be inflected by gender, class, age, occupation and social status." (Blaikie et al., 1997, p. 218) In this particular area, Terminology can provide invaluable contributions in contexts related to the collection and organized of particular knowledge domains, with a specific purpose in view.

Traditional approaches to knowledge distinguish essentially between two types of knowledge: 'scientific knowledge' and 'local knowledge', further subdivided into 'indigenous knowledge' (IK), Indigenous Technical Knowledge (ITK) and Rural People's Knowledge (RPK). Different types of knowledge have become the focus of many groups and organizations, namely UNESCO's Local and Indigenous Knowledge Systems programme (LiNKS) which provides the following definition: "(...) the understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings. For rural and indigenous peoples, local knowledge informs decision-making about fundamental aspects of day-to-day life." (UNESCO, n.d.)³.

³ LiNKS is UNESCO's Local and Indigenous Knowledge Systems programme (LiNKS) promotes local and indigenous knowledge and its inclusion in global climate science and policy processes. LiNKS has been influential in ensuring that local and indigenous knowledge holders and their knowledge are included in contemporary science-policy-society fora on issues such as biodiversity assessment and management (CBD, IPBES), climate change assessment and adaptation

Additionally, Information and Communication Technology (ICT) has had an undeniable impact on how knowledge is perceived, organized and made accessible, essentially in English. The interface of technology has brought about additional skills and competencies which influence not only how domains are generated, but also how they impact on the appropriation of conceptual metaphors in different languages and cultures, creating new dynamics and new communities where knowledge is created and disseminated.

The fact that 'knowledge' and how it manifests has become a topic of focus in the western world, reinforces Integral Theory's relevance by proposing and developing a more epistemological centred approach to knowledge and defining it as "(...) accepting and integrating diverse perspectives in ways that transcend and include them." (Murray, 2006, p. 210).

The meta-approach developed within Integral Theory (IT) has naturally generated criticism at many levels, however, "due to its values and core methods, the integral theory community is in a unique position to develop novel and more adequate modes of inquiry and dialog." (Murray, 2006, p. 210). Accepting the gaps identified in the initial version of Ken Wilber's world of integral theory, integral theory has progressively moved toward "a community knowledge endeavor" (Murray, 2006, p. 212) in order to provide new approaches to dealing with uncertainty, ambiguity and paradox, suggesting its adequacy as a theoretical approach to frame a model for crisis and emergency communication. For this reason, integrating perceptions of how knowledge is generated and expressed through language is relevant for the designing of a translation and interpretation model.

Integral Theory provides the flexibility to integrate and combine different perceptions (individual and collective) and materialize these differences using a common code (language). For risk and emergency communication and translation, a model which is able to address these dimensions in different languages and cultures is critical when meaning is required to call for specific action.

Coseriu's (1982) matrix (Table 5) is one of the relevant proposals in establishing a relationship between language and knowledge, and their potential correspondence to levels of activity, knowledge, product and content is addressed.

(IPCC, UNFCCC), natural disaster preparedness (ISDR) and sustainable development (Rio+20, Future Earth). Working at local, national and global levels, LINKS strives to strengthen indigenous peoples and local communities, foster transdisciplinary engagements with scientists and policy-makers and pilot novel methodologies to further understandings of climate change impacts, adaptation and mitigation (<https://en.unesco.org/links>).

Table 5. Faur’s representation of Coseriu’s levels of knowledge

Points of View				
Levels of language	Activity (Enérgia)	Knowledge (Dynamis)	Product (Ergon)	Content
Universal	Speaking in general	Elocutional knowledge	Totality of utterances	Designation
Historical	Concrete particular language	Idiomatic knowledge	(Abstracted particular language)	Meaning
Individual	Discourse	Expressive knowledge	Text	Sense

From the perspective of CMT, Coseriu’s proposal, in the 1950s, already provided the acknowledgment of the creative potential of metaphor by admitting its existence at all levels of language, and introducing the notion of *consciousness* as a cognitive device which makes metaphorical creativity in everyday language use a possibility. Coseriu identified *intersubjectivity* as a fundamental distinguishing element pertaining exclusively to human interaction, a notion further emphasized by Zlatev who stated that “other species may have varying degrees of awareness, they do not seem to be fully aware of the subjectivity of others.” (Zlatev et al., 2008, p. 1). Intersubjectivity is addressed by Coseriu at the historical level, where the content ‘meaning’ is materialized. Intersubjectivity is commonly understood as “the sharing of experiential content (e.g., feelings, perceptions, thoughts, meanings) among plurality of subjects.” (Zlatev et al., 2008, p. 2) Intersubjectivity is crucial to translation and interpretation in the sense that it allows T&I to account for what conceptual metaphors aim to see achieved in a target text, language and culture. Also, intersubjectivity entails the notion of Other; the awareness and consciousness that other minds do not perceive in the same way and that, potentially, there will be domains that will not be accommodated in a target language and culture, requiring a domain to be transferred. In these cases, as demonstrated in the case-study, a conscious choice of imposing conceptual metaphors through translation and interpretation is action-based and poses risks: for translators/interpreters and for the target text/culture, in this way aligning with Baker’s approach to translation and interpretation, and justifying her call for more realistic accounts of what translation and interpretation do. As stated by Baker (2005), translators and interpreters working in the contexts of international deliberation for national and local implementation and integration:

(...) we need to recognize and acknowledge our own embeddedness in a variety of narratives. Whether professional translators or scholars, we do not build bridges nor bridge gaps. We participate in very decisive ways in promoting and circulating narratives and discourses of various types. (Baker, 2005, p. 12)

Diverging perceptions of translation (neutral versus non-neutral) and the lack of explicit reference to translation and interpretation as active knowledge transferring processes in scientific and technology-oriented knowledge generating society will necessarily create gaps. An integral perspective perceives these challenges as “epistemological indeterminacy”, i.e., “uncertainties, ambiguities, and paradoxes in knowledge and its communication and validation.” (Murray, 2006, p. 212). Drawing on the universality of conceptual metaphors, theories which acknowledge this trait bring about different insights which allow integral approaches to contribute to broader and more inclusive views of a given phenomenon.

Through the universal level of language, Faur (2013) establishes the following common points of connection between Cognitive semantics (CS) and Integral Semantics (IS) which could, initially have been considered incompatible frameworks. Both CS and IS (Faur, 2013, p. 109):

- (a) place metaphor at the centre of human creative-imaginative activities;
- (b) view metaphor as a cognitive category of thinking and human language;
- (c) understand metaphorical knowledge as knowledge based on images.

How these aspects interplay with each other in order to optimize translation and interpretation will be discussed in Chapter 4.

2.2.3 The Dynamic Model of Meaning

Kecskes’ intercultural pragmatic Dynamic Model of Meaning (DMM) is explored within this theoretical and conceptual framework because it focuses on dimensions which are essential within CMT and for translation and interpretation, namely situationality and the individualistic and societal dimensions of an utterance. By addressing situationality, the DMM takes into account everything situation and context represent and bring together and which is at the basis of the process of dynamic co-construction of meaning. By acknowledging the permanent co-existence of a private and public dimension in each individual and each utterance, Kecskes’s dynamic-model of meaning (DMM) “is an attempt to give equal importance to message and actual situational context in meaning construction (...), and blend the internal and external approaches.” (Kecskes, 2008 p. 385).

The convergent nature of the DMM represents the comprehension that one-sided approaches provide incomplete solutions and contexts in which there is an explicit desire to cooperate. For this reason, the DMM is used within the TIM as a tool to assist in the analysis of cohesion and coherence between conceptual meaning and its consistency in the generation of new

conceptual metaphors in the field of nuclear and, consequently, its expansion into crisis and emergency communication and its ideally multilingual and multicultural dimensions.

Unlike the more traditional approaches to communication as transfer between interlocutors, Kecskes's DMM perceives communication as dynamic and cooperative effort between interlocutors who navigate between private and public perceptions of the world and of the contexts in which they interact. Drawing on the DMM, two important assumptions can be proposed:

- (1) The dynamic behavior of human speech implies a reciprocal process between language (message) and actual situational context (...) so language is never context free. There are no meanings that are context-free because each lexical item is a repository of context (contexts) itself.
- (2) Communication is increasingly intercultural.

These assertions identify context as a meaning building prompt and the growingly intercultural nature of communication draws on the diversity of perceptions and views which need to meet and cooperatively build meaning.

By addressing the two sides of the same coin, the DMM provides a set of notions aligned with the quadrant model discussed in Chapter 4 and brings into play the importance of context.

The dynamic and dual nature of meaning

Context is defined by Kecskes (2008, p. 387) as "any factor – linguistic, epistemic, physical, social – that affects the actual interpretation of signs and expressions." While more traditional approaches to context perceive it as being the modifier and/or specifier of word value, on the one hand; others state that experience is developed through regular exposure to recurrent and similar situations. According to CMT, this is further explained by conceptual domains. Kecskes' DMM is based on the dynamic dualism of private and public encoded meanings and the cooperation which occurs in determining *emerging common ground*, as illustrated in Figure 3.

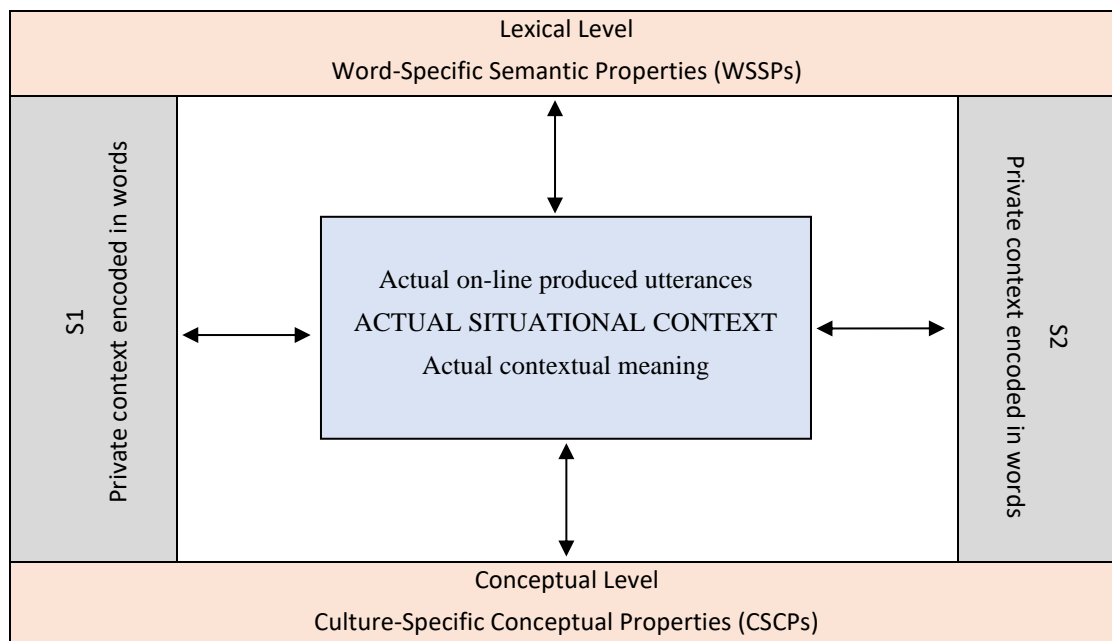


Figure 3. Kecskes' Representation of Interrelationship between Context and Meaning from the perspective of the DMM.

This co-constructive nature of communication in intercultural contexts is especially relevant because bi- and multilingual mechanisms of meaning construction and interpretation are activated, creating an arena where differences in modelling meaning and participation in contexts can differ significantly because they resort to different prompting cognitive construction mechanisms. Meaning construction systems and meaning prompting systems differ considerably in intercultural communication because they are culture embedded and culture specific, i.e., although there might be shared domains, their conceptual metaphoric reference might not coincide between languages.

Translating from one language to another requires a reconstruction of cognitive and cultural configurations that were prompted by one language and a determination of how another language would set up similar configurations with an entirely different meaning prompting system and pre-constructed background. (Kecskes, 2008, p. 390)

While the DMM “focuses mainly on the meaning values of words and emphasizes that the word functions as an interface that links the phonological, syntactic, lexical and conceptual structures in working memory in the course of perceiving or producing an utterance” (Culicover & Jackendoff, 2005 as cited in Kecskes, 2008, p. 390), this study draws on the DMM and links it to the external societal aspects of intercultural communication and the challenges this poses for translation and interpretation. As stated by Evans (2009), meaning *per se* is not a property of language, it is a “constructive process, in which integration of lexical units involves differential

access to the conceptual knowledge which lexical entities potentially afford access.” This is true in that lexical entities play a vital role in the learning process and in the activation of correlations between situation and the need for additional information both at an individual and collective level, even though that might require adaptation strategies. The value of the DMM lays in its distinction between *meaning values* of lexical units and *situational meaning*. The process of situational meaning construction includes both “unpacking” (stored private contexts expressed in meaning values of lexical units) and “constructing” (interplay of private contexts of interlocutors with the actual situational context) (Kecskes, 2008).

Giora (1997), in the discussion on the processing of surface meaning and figurative meaning, provides a useful concept for the purpose of this study: the graded salience hypothesis. The notion of *salience* means that “there are certain situational elements which are highly specific and informative that they are somewhat bound to certain contexts and therefore are more highly expected. Therefore, it can predict the appropriate meaning of the oncoming (linguistic) stimulus quite early on” (Giora, 2004, p. 93).

However, predicting the suitable meaning does not avoid or block contextually inappropriate choices. Salient meanings are therefore more context resistant and provide a possible point of departure for co-construction of new meanings which result from the new information each agent brings to a specific encounter. “The main claim of the graded salience hypothesis of Giora is that salient meanings are processed automatically (though not necessarily solely), irrespective of contextual information and strength of bias in the first phase of comprehension when lexical processing and contextual processing run parallel (Giora, 2004, p. 24). This means that situational context allows certain instances to be predicted but ineffective in obstructing initial access of salient context encoded in lexical items based on prior experience (Kecskes, 2008, p. 391).

The DMM (Figure 4) proposes two dimensions to the meaning value of a word (lexical unit): *coresense* and *consense* which will be discussed in the following section.

Coresense and consense

As discussed in Part I of this thesis, by focusing on the notions of intention and attention and their relationship with core common ground and emergent common ground from the perspective of egocentrism and disagreement, Kecskes’ DMM begins to create measurable references which can be optimized within the TIM. Also, by focusing on the purpose of communication and how

emergent common ground is co-constructed, the DMM contributes with two important notions: *coresense* and *consense*, two dimensions to the meaning value of a word.

The notions clarify and establish the difference between the diachronic and the actual use of a word. “Coresense is a denotational, diachronic, relatively constant, and objective feature that reflects changes in the given speech community” (Kesckes, 2008, p. 393), while consense is “actual, subjective, referential, and connotational, and changed by actual situational context.” (Kesckes, 2008, p. 393). This distinction is valuable for technological and scientific translation purposes because, combined with Leech’s planes of meaning, associative meaning becomes clearer when using the TIM because the quadrant-based approach allows the synergetic relationship between conceptual meaning and conceptual metaphors to become clearer, and the answer to the question “Am I safe?” easier to address because the logical, cognitive and denotative values of meaning are placed alongside feelings, attitudes, social experiences instead of minimizing their value.

Kesckes’ dualistic approach to the construction of meaning is interoperable with the quadrant model discussed in Chapter 4 as illustrated below:

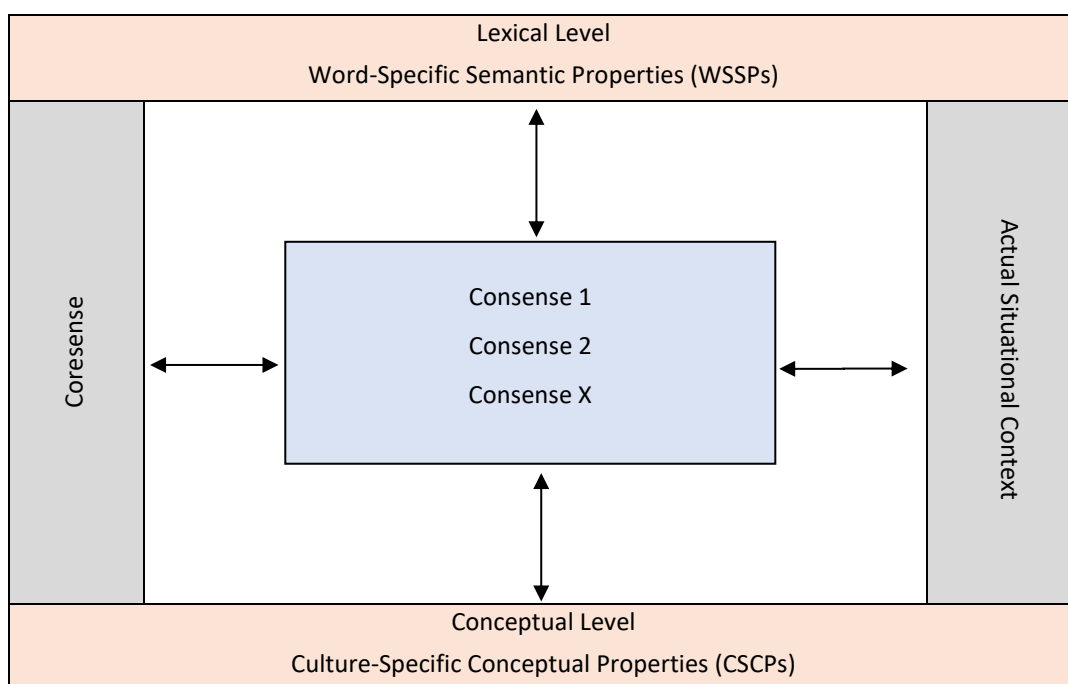


Figure 4. The Dynamic Model of Meaning.

Word-specific semantic properties link the coresense to the lexical level while culture-specific conceptual properties tie it to the conceptual level. Culture specific conceptual properties belong

to conceptual pragmatics, while word-specific semantic properties are features of the world itself, hence are a matter of lexico-semantics. It is within these two types of properties where individual differences occur, where individual speakers' private contexts tied to a particular world may differ. (Kecskes, 2008, p. 394). Culture specific conceptual properties (CSCP) tie coresense to the conceptual level. Not all concepts have culture-specific conceptual properties. Culture-specific conceptual properties are very dynamic features of words and keep changing all the time. They are sensitive to socio-cultural changes in the given language community. CSCPs represent the cognitive base for word meaning value, and are responsible for changes in the coresense of a word and its word specific semantic properties. "When culture-specific conceptual properties get fully localized they turn into word specific semantic properties" (Kecskes, 2008, p. 395) and these are the reasons why native systems do not need to check the conceptual system when using certain words (which does not block the differences between regions).

Word-specific semantic properties denote a set of semantic properties which belong to the lexical rather than the conceptual level and are the result of the recurrent use of certain words in particular contexts.

The combination of Leech's and Kecskes' approaches to planes of meaning allow the Translation-Integration Model (TIM) proposed in this work to explore the possibility of developing an approach to translation that includes the elements which are usually removed from scalable solutions, yet constitute the one of the critical elements in effective risk, crisis and emergency response⁴.

Application of the DMM

The Dynamic Model of Meaning (DMM) is one of the approaches that contributes to bring together the internal/external and individual/collective dimensions of meaning by clarifying the link between situationality and context. Also, DMM acknowledges the dynamic co-constructed aspect of meaning that results from the layering of experiences, in this way evolving meaning and simultaneously the experience behind the construct.

⁴ Scalability of translation solutions, namely through Artificial Intelligence and the potential bias resulting from crowdsourcing as a path for further research is addressed in section III.

2.3 Integral Theory

Never have there been so many disciplines and worldviews to consider and consult in addressing (...) issues: a cornucopia of perspectives. But without a way of linking, leveraging, correlating, and aligning these perspectives, their contribution to the problems we face are largely lost or compromised. We are now part of a global community and we need a framework – global in vision yet also anchored in the minutiae of our daily lives – that can hold the variety of valid perspectives that have something to offer our individual efforts and collective solution building. (Esbjörn-Hargens, 2009, p. 1)

Integral Theory (IT), developed by American psychologist Ken Wilber in the 1970s, is a meta-theory, developmental and evolutionary in essence, designed with the purpose of capturing different perspectives, theories and models, regarding all dimensions of human existence and *integrating* them in a manner which allows higher levels of knowledge and awareness to develop, in this way achieving outcomes which are more complex and insightful, and therefore more capable of addressing the complexity of the world we live in.

In any analysis of Integral Theory (IT) it is important to locate IT within the broader field of Integral Studies (IS), understanding it as a 'subset of integral studies, which focuses primarily on Ken Wilber's work and is committed to the critique, application, and theoretical development of the AQAL model. (Esbjörn-Hargens, 2009, p. 22)

Acknowledging the still emergent and innovative approach proposed by integral studies in general, and by integral theory and the AQAL map in particular, this research is aligned with the work of other scholars who have chosen to embrace the challenges of integrating diverse perspectives with the motivation of developing more comprehensive models and theories which provide new tools to cope and navigate complex phenomena while, simultaneously, honouring the diversity, and conflicting, outcomes such a path entails.

2.3.1 What is the AQAL model?

This new understanding [the inherent unpredictability of complex systems and the fundamental limitations of individual and collective human understanding and problem solving] has led to many varying degrees of relativism, narcissism, solipsism, cynicism, paranoia, defeatism, or despair as the full curse of complexity, unpredictability, or

uncontrollability is unveiled. These inevitably show up in discourse, and for the most part, we lack tools to navigate these waters. (Murray, 2006, p. 215)

The AQAL model (all quadrants, all levels, all lines, all states and all types) can be defined as a “third-person map of reality, a second-person framework for working within and across disciplines, and a first-person practice for engaging the development of our own embodied awareness.” (Esbjörn-Hargens, 2009, p. 19). This compacted description is efficient yet requires a more detailed explanation as to its relevance as a meta-framework for translation and interpretation in general, and for the emerging field of crisis translation and interpretation in particular.

The AQAL map is a quadrant-based model (Figure 5) according to which four perspectives must be taken into account for any complete understanding of any given phenomena. These perspectives are designated as: *subjective*, *intersubjective*, *objective* and *interobjective*. Consequently, everything can be approached from an “inside/outside perspective” and from a “singular/plural perspective”. The combination of the four quadrants represents dimensions of reality which are always part of reality, allowing for the productive inclusion of different perspectives, for example, of CMT.

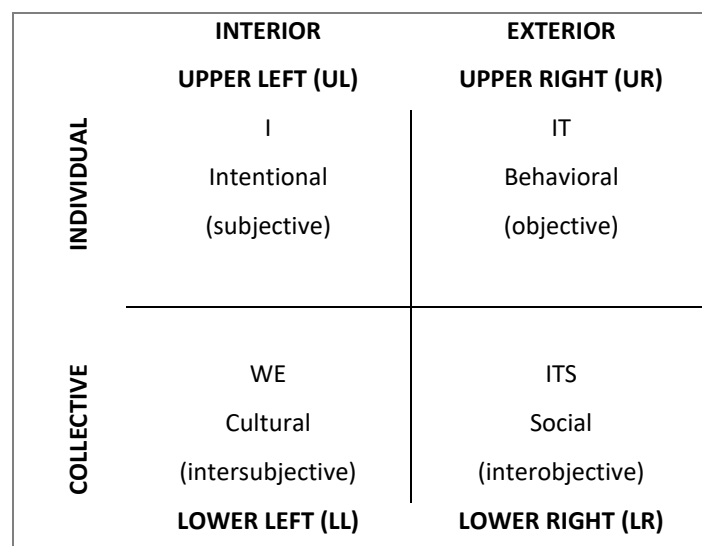


Figure 5. AQAL Model.

Source: Adapted by Esbjorn-Hargens (2009, p. 3).

These four dimensions are represented in language by four pronouns: ‘I’ (UL), ‘we’ (LL), ‘it’ (UR) and ‘its’ (LR), resulting in what Wilber describes as the “Big 3”: ‘I’ (subjective), ‘We’

(intersubjective) and 'it/its' (objective). The quadrants are seen as constantly interacting and interinfluencing each other.

The AQAL model provides two ways in which the model can be used for crisis translation purposes: (1) a *quadratic approach* in which the individual is placed at the centre of the model and where "Through his use of different aspects of his own awareness, or through formal methods based on these dimensions of awareness, he is able to encounter these different realities in a direct and knowable fashion." (Esbjörn-Hargens, 2009, p. 6); and (2) a *quadri-val approach* where the "different perspectives associated with each quadrant are directed at a particular reality." (Esbjörn-Hargens, 2009, p. 7). This means that a multilingual and multicultural risk, crisis and emergency communication plan can simultaneously focus on the individual (expert or non-expert) and collective (organizational, national and/or international) dimensions of a crisis translation plan.

Levels in the AQAL model deal with the notions of *depth* in the interior quadrants and *complexity* in the exterior quadrants, i.e., levels represent the dynamic nature of reality and its interrelatedness with the other quadrants illustrating how different realities emerge as a result of certain conditions. The notions of *salience* and *relevance* fit in here because within such a model it is possible to better "appreciate and better interface with the realities associated with each quadrant. Each quadrant serves as a map of different terrains of reality." (Esbjörn-Hargens, 2009, p. 7).

The *lines* in IT refer to what is developed through the levels represented by each quadrant. Like levels, lines too are related to each of the other quadrants. The essential difference here is that lines represent "sequential development with increasing levels of complexity or depth that transcend and include the previous level." (Esbjörn-Hargens, 2009, p. 11).

States represent temporary events of life, which occur throughout different periods of time and are, generally, incompatible with each other. This particular aspect will be further discussed in Chapter 4.

Types, another relevant meta-concept, relates to styles and patterns which occur irrespectively of developmental levels and which can co-occur and overlap and are present in all quadrants. In the case of the TIM, this particular notion allows collaborative efforts to be addressed.

An additional element in the AQAL model is *integral methodological pluralism* (IMP). Through its quadrants, eight unique areas, or *zones*, of 'human inquiry and research', representing "one of the most pragmatic and inclusive theoretical formulations of any integral or meta-theoretical

approach.” (Esbjörn-Hargens, 2009, p. 215) is presented. IMP poses considerable challenges as IT has tended to move from Wilber’s approach to a “community knowledge endeavor.” (Murray, 2006, p. 212). The advantage of this development lies in accentuating a critical issue for ‘knowledge building communities’ with significant outcomes for T&I, namely “knowledge indeterminacy (...) and highlights the general need to deal creatively with it.” (Murray, 2006, p. 210). By emphasizing “(...) multiple perspectives and multiple knowledge building methodologies” (Murray, 2006, p. 212), IT has moved from an initial ‘what’ (to integrate?) to ‘how’ (to integrate); initial articulation and blending of models and theories gives way to the practical articulation of such integrated approaches. How to achieve positive outcomes through integrated approaches is where this study finds the strongest argument for the choice of this meta-framework in proposing new approaches to translation and interpretation in general, and to crisis translation and interpretation in particular.

2.3.2 Why choose the AQAL model?

As part of the post-modern transformation of consciousness and culture, we have progressively come to understand, to our frustration, that knowledge is fuzzy, multi-layered, constructed idiosyncratically by each individual, socially negotiated, affected by emotions and biases, and forever subject to revision. (Murray, 2006, p. 212)

A simple justification for the choice of the AQAL model is: because we are painfully aware of our difficulty in dealing with the complexity of the problems the world is currently facing. From the perspective of TIS, in a globally connected world, where information and knowledge are exchanged for health, financial, political, technological, among other purposes, translation and interpretation are the channels through which other fields are developing, with a special emphasis in technological and scientific fields such as Artificial Intelligence and its multiple applications, where natural language processing is playing a critical role. With national and global agendas increasingly focusing on topics such as those materialized in the Sustainable Development Goals (SDGs), translation and interpretation need to be revisited and redefined in some cases if such goals are to be truly accomplished. With the contribution of cognitive science, there has been a shift in the role of translation and interpretation globally. Although technology has strategically questioned the human/machine translation/interpretation *process*, the *action* is yet to be accounted for in the over simplistic equivalent manner in which machine-translation is presented. It is in the action-based approach that IT and the AQAL map have strong contributions to offer by providing a meta-

framework that embraces individual and group/collective dimensions, from an internal and external perspective.

How translation and interpretation are integrated into the practices of different organizations, communities, policies and legislation determines how knowledge is validated and disseminated from the macro to the micro-level; like (or in addition to) crises and emergencies, there are cascading effects. Fragmented approaches to TIS, i.e., theories and models which are not linked to *everything else* risk providing partial solutions and levels of performance which keep translation and interpretation off the agendas and out of the communities instead of alongside cutting-edge knowledge. IT and the AQAL map, in the view of this work, provide a framework which is worth trying because:

(...) it provides individuals and organizations with a powerful framework that is suitable to virtually any context and can be used at any scale (...) Because it organizes all existing approaches to and disciplines of analysis and action, and it allows a practitioner to select the most relevant and important tools, techniques, and insights. (Esbjörn-Hargens, 2009, p. 2)

Furthermore, and to the advantage of the concerns addressed in this work, the integral approach highlights the challenges of “epistemological indeterminacy” as discussed by Murray (2006), providing the branch of crisis translation and interpretation (CTI) with essential tools for the field of CTI, and also to all those with responsibilities in coordinating (inter)national crisis and emergency response. Despite the criticism it has motivated, Integral Theory “is one among several contemporary theories that provide a systemic counterweight to the materialistic, objectivist, instrumental, and/or reductionist thought systems that prevail in much of culture, politics and academia.” (Murray, 2006, p. 215). Also, the Integral Theory approach goes beyond critiquing other theories and models; it proposes “an integrative framework that coordinates these theories and also by incorporating subjective and intersubjective matters of self, culture, and spirit.” (Murray, 2006, p. 215).

The choice of the AQAL model is also justified, for example, by Murray’s contributions on the topic of “knowledge indeterminacy”, where the fundamental role of the communities that represent the creation, building and dissemination of knowledge is identified as being essential to the choice of methods and validity of the knowledge which is directly impacted on by the group’s goals and values. In the case of the IAEA viewpoint concerning the value of nuclear technology and knowledge, the role of translation is also directly associated to the transfer of a worldview. Explicitly addressing the values of the IAEA regarding “Atoms for peace and humanity”, then it is clearly

insufficient to overlook how translation -or access to the knowledge in a local and national language- is contemplated when Member-States need to resort to translation to localize and integrate knowledge and procedures.

Murray's work contributes to the description of the integral paradigm or method of knowledge building, i.e., methodological pluralism and to the description of the scope and contents of 'integrally informed theories'. Based on Murray's proposal, integral theory and inherent methodological pluralism are here understood as an approach that, "in the presence of apparently incompatible, conflicting, or unrelated data, tries to make a productive, creative synthesis of the divergent elements" with a "gracious, spacious, and compassionate embrace." (Murray, 2006, p. 216). By adopting a "both/and" instead of an "either/or" approach, it is immediately clear how this impacts the development and perception of knowledge in societies where the transmutability of science is often uncritically overlooked as it progresses through constant revision and clarification as pointed out by Leech (1981):

1. There are usually competing scientific -or other- accounts of the same phenomenon
2. Science does not progress in a straightforward and continuous manner. It progresses through continuous revision and clarification which is not compatible with embodied knowledge
3. Definitions in science usually exchange one set of linguistic symbols for another salt=NaCl.

Integral theory and its methodological pluralism are therefore perceived as the ideal meta-framework to address language, more specifically translation and interpretation, because *why* something is important, relevant and meaningful will always remain at the centre of human action and reaction.

Murray also proposes that an integrally informed approach entails the following (Murray, 2006, p. 217) (Figure 6).

1. An acknowledgment and treatment of the “big three” ontological domains: objective (it), subjective (I), and intersubjective (we) (and/or the three cultural value spheres of science, morals, and art; the true, the good, and the beautiful; and/or the dimensions of body/mind/spirit and nature/self/culture).
2. A holarchical approach to problem solving that acknowledges and treats multiple holarchical levels (i.e., that when the central concern is with entities at a particular level, entities at higher and lower levels are acknowledged, if not worked out in detail).
3. A methodological pluralism is used, which, as described above, tries to incorporate material from as many valid perspectives and methods as available.
4. Developmental and evolutionary processes are incorporated into the explanatory narrative.
5. There is an attempt to discover integrative principles or models that transcend and include the various dimensions, levels, and perspectives described above.

Figure 6. Five Scope and tenor of integral theory.

Like Murray, the choice of Integral Theory focuses on its value as a tool of insight to inform the practices of knowledge building communities where effective and practical changes can be made and, ideally, impact on the manner in which narratives are born and disseminated through translation and interpretation. This work does, however, acknowledge that the quadrants and their distinctive characteristics are still object of criticism regarding the instability of some concepts such as *holon*.

By exploring this model in TIS, the complexity of the issues involved in translation and interpretation surface in a different light and allow for new and exciting research paths to be developed in TIS *within* a knowledge building community which is capable of acknowledging the role language(s) play in leveraging the outcomes of all communities.

Integral theories are more drawn to developing models or frameworks “with explanatory and/or organizational functions.” Although Murray states that integral approaches have a limited potential as predictive tools, in the case of TIS, and considering the focus of this work, although prediction is not the aim, it is argued that by adopting the TIM, decision-making will become clearer which, in turn, can develop predictive actions by different knowledge building – and applying – communities.

By equally acknowledging the subjective and objective aspects of the world and of individual experience, IT encourages us to pursue new and more complex trains of thought in an attempt to bring solutions to the issues which impact our world.

2.3.3 Integration (a western need?)

Integral theory has an evolutionary approach underlying it which is explicit in the manner in which different levels unfold – holons –as experience with the world expands our consciousness and awareness of different approaches to domains...and to the acknowledgment of the validity of co-existing domains.

The fact that western science and philosophy has been guided by principles which place objectivist approaches at the forefront has led to current calls to integrate and optimize the inputs from other systems of knowledge without a feeling that in some way, *what and how we know* is incompatible with what is different to our standard *way of doing things*.

The recognition in the western knowledge generating communities of dimensions already acknowledges in eastern and African worldviews, such as well-being, holistic perspectives, emotional intelligence and the current challenges in the development of Artificial Intelligence, are exhorting the traditional objectivist scientific approach to integrate and unfold into more expanded and possibly improved theoretical approaches to the growingly complex global challenges. Parallel systems of knowledge will continue to do so regardless of where we might be on the continuum of our system of knowledge. For this reason, a theory or model based on collaborative approaches entails the fulfilment of a conscious and accountable acceptance of community values and practices. Therefore, and like any other theory or model, Integral Theory might have a novel and leading-edge manner of addressing ‘the unknown’; however, it also presents the limitations of other methods and theories because it is dialogical and requires mutual recognition and mutual respect if it is to reach its fullest potential.

The role of scientific knowledge is currently unquestionable, especially in the face of a health pandemic. How knowledge is generated, how it evolves and is disseminated, how it is accessed, made available, accepted, adapted and, ultimately, through which languages and complementary channels it is circulated poses, today, one of the greater challenges knowledge communities face: more than generating data, the question lays in how such data is interpreted and used. The channels of knowledge, over time, have become as important as the knowledge generated because knowledge is shaped and modelled to fit the channel. The languages of the channels, as we shall

see in Chapter 4 and Part III of this work, are not to be overlooked. The TIM will provide relevant information for the field of crisis translation and interpretation as the notion of knowledge building communities is explored.

In the desire to develop theories which can serve as models for humanity, there lies the challenge of turning inwards to consider how this can be done, with what purposes, with what intentions? Reminding ourselves of Baker's (Baker, 2010, 2013; Baker & Maier, 2011) works and of the research which is informing the new branch of crisis and emergency translation and interpretation, it is challenging to talk about translation and interpretation without addressing politics and ideology and the ethical dimensions resulting from choices and decisions made by professional translators and interpreters versus the choices and decisions made by the (in)voluntary translator and interpreter who is an advocate for a cause but whose reports inform global decision-making.

The "epistemological indeterminacy" (Murray, 2006) which the new move within IT brings to the surface is another relevant perspective to integrate in the TIM because it localizes the places where practices can be positively impacted by the data provided by T&I.

Given that IT is based on methodological pluralism, the topic of knowledge, knowledge indeterminacy, and how knowledge is generated, built on and accommodated, the openness to multiple perspectives and knowledge needs are central concepts. The challenge now lies in understanding how the integrated models and theories speak to each other because, as stated by Murray (2006) too often the knowledge within the knowledge community is not 'epistemically sensitive or aware.' (p. 213)

(...) the quest for knowledge and understanding has intrinsic *ethical* implications involving the freedom, equality and authenticity of participants. Epistemological indeterminacy, as it involves increased levels of ambiguity, self-reflection, and openness in dialog, can also increase social vulnerability, which in turn calls for compensating increases in generosity or regard, if the social fabric is to remain robust. The discussion of *mutual regard* looks at approaches to balancing critical rigor, reflective self-disclosure, radical openness to the perspectives of others, and an authentic reflection on power and privilege. (Murray, 2006, p. 214)

2.3.4 Integral Theory: Perspective(s)

Integral theory and the AQAL model, have been met with criticism from within Integral Studies as well as by other disciplines where there has been an attempt to apply the AQAL model.

Regarding IT and the AQAL model, one of the topics of tension lies in the definition(s) and role of *holons* used by Wilber in a broad sense to “refer to that which, being a *whole*, in one context, is simultaneously a *part* in another” (Wilber 2000b, p. 26). In this respect, Murray (2006) states that “In most cases the disagreements have the same epistemological source: claims are not so much categorically wrong as seen to be invalid under a particular definition or interpretation of a term (a <holon-type>, <characteristic> or <implication>) where the interpretations of the terms varies among authors.” (Murray, 2006, p. 220). This in itself need not be negative as it challenges scholars to revisit their own claims in the light of the perspectives of a given event they intend to study. It is also expected, more so in emerging fields, that the discussion of meaning will be a constant topic as a result of the western knowledge building narrative and because IT challenges traditional practices and perspectives. It is also an understanding of this work that the meta dimension – and purpose - of the model is sometimes lost when the aim is to continue to pursue a RIGHT/WRONG approach. Due to the nature of the model, there will be challenges *because* of the practices underlying the treatment of epistemological indeterminacy as discussed by Murray because “it behoves the community to reflect more deeply upon the forms, processes, and styles that it uses to articulate, communicate, and evolve knowledge.” (Murray, 2006, p. 212). In other words, an integral approach ‘forces’ knowledge communities to become more conscious of and more aware of systems which cause uncertainty to be generated around what we take as being ‘true’. For example, Brys and Bokor (2013) state “So far clinical and experimental psychology could not incorporate WIP [Wilber’s Integral Psychology] due to its abstract nature” and add that although it “coherently integrates the underlying philosophies of various psychological and spiritual traditions (...) WIP also integrates the errors and mistakes of these theories.” (Brys & Bokor, 2013, p. 30). On the other hand, and attesting the flexibility and transversality of the model, Kleineberg (2016, pp. 138-139), on the application of IMP as an organizing principle for method classification states that:

(...) integral methodological pluralism, deduced from fundamental formal-pragmatic distinctions, offers a comprehensive basic schema for a classification of methods that is able to show the complementary character of different approaches, to identify methodological reductionism, and to guide interdisciplinary or multiple methods research.

It is not the intention of this work to focus on integral theory. Instead, the intention is to apply it and therefore, a more extended discussion of the potential(s) and limitation(s) of IT and the AQAL model are discussed in Chapter 4.

In short, by exploring the applicability of the AQAL map, this study aims to contribute to understanding if the criticism directed at IT can be considered the laying down of new stepping stones for knowledge building communities to self-assess the broadness -and flexibility- of their conceptual system to engage in discussions which, as intended by the IAEA, can harness capabilities in order to guarantee efficient international cooperation in the event of a crisis or emergency.

The fact that Integral Theory has managed to generate such a heated debate merits, to a degree, consideration as to its role in encouraging the debate around what we perceive as being “the” method to develop and disseminate knowledge.

There is a risk that IT endeavours may leave a sense of lack of structure, validity, ‘closedness’ which is given by fixed concepts and definitions. The situation generated by the COVID-19 health pandemic has forced knowledge communities to recognise that procedures and perspectives on knowledge communication and sharing needs to change in order to continue to honour the role of knowledge, and of science, in benefitting Humanity. To this end it is important to question the advantages or disadvantages of understanding what lays outside comfort zones. This requires: “awareness of the phenomena, understanding the phenomena, and offering some tools (and some hope) for dealing with it.” (Murray, 2006, p. 260).

In all domains of modern life, from the family living room, to the seats of national Senates, to the texts produced in “ivory towers,” we can observe that many people will acknowledge the fundamentally uncertain nature of knowledge in an *abstract* sense, but that they are bereft of productive ways to *deal with* this uncertainty, and thus overlook or deny it in practical situations. (Murray, 2006, p. 212)

Summary

Chapter 2 aimed at identifying the theories and models which, from the perspective of translation and interpretation, are capable of integrating an applicable model which informs decision-making at many levels, but more so, and as explored in Chapter 4, at the level of crisis and emergency communication.

Culture was presented as being the backdrop against which translation and interpretation work and *Meaning* was presented as an embodied ecosystemic and progressive endeavour which is impacted by different levels of knowledge that model and shape worldviews. Here *CMT* and the useful concepts of domain and conceptual metaphor were complemented with Leech's seven types of meaning, in order to highlight the importance of explicitly addressing associative and thematic meaning when creating new domains and conceptual metaphors. Knowledge, as the differentiating element in *how* meaning can be managed more effectively in the context of international cooperation, was presented as a dynamic process where Kecskes DMM was presented as a tool which allows the notion of intersubjectivity to be framed as a navigation between private and public meanings, but assuming that the dialogical exchange is based on the cooperative relationship between the participants within a specific context and situation.

Lastly, Integral Theory and its most recent developments within the approach of 'knowledge building communities' was presented as the meta-framework, with its meta-concepts, as the basis for the TIM for translation and interpretation purposes. The strength of the AQAL model lies in its flexibility as a knowledge building and cooperative meta-practice generator which provides substantial and fruitful inputs for intra-lingual and cross-cultural communication through translation and interpretation action and processes. The developments in IT since Wilber's initial contributions place this theoretical approach at a vantage point for positive transformative practices with knowledge building communities which draw "on the collective intelligence of a group engaged in researching, theorizing, critiquing, doing, and synthesizing in order to progressively evolve some body of theory and practice." (Murray, 2006, p. 213).

The following Chapter - *Crisis Translation and Interpretation: or a new world order?* - will discuss the importance of each of the theories and models presented and their relevance within the scope of crisis translation and interpretation. This calls for new research paths which are capable of integrating indeterminacy within a globally connected world where the risks of keeping translation and interpretation at the level of a process overlooks the accountability and ethical outcomes as translators and interpreters participate in the action of creating a new world order.

Chapter 3 – The Translation-Integration Model (TIM): a proposal

“One particular language need in disaster research specifically in the area of risk assessment (...) is the translation of concepts including interpretation (or reinterpretation) and adjustment of their meanings to make them acceptable or adaptable across cultures.”

(Cadag, 2020, p. 182)

Introduction

Crisis translation workflow research is surfacing in TIS as data begins to be presented regarding the positive and negative outcomes of accessing the right languages at the right time to save lives. The research from conflict zones (Al-Shehari, 2020; Baker, 2013), from humanitarian aid (O’Brien et al., 2018), from criminal investigation settings (Drugan, 2017) shed light on topics which are crucial to achieving the 2030 Sustainable Development Goals (SDGs). This newly emerging data has drawn attention to the urgent social, political, economic, organizational and individual changes required to navigate 21st century global challenges. While technology advanced societies perceived themselves immune to certain types of risk, the 2020 SARS-COVID-19 health pandemic jolted the world in ways which are, to date, still to be fully acknowledged. Technologically emerging countries and societies experienced the heightened disadvantages of already existing inequalities and, also, maybe not surprisingly for those who live with heightened levels of risk in several areas of their lives, with opportunities arising out of critical situations. Uncertainty was embraced and managed in ways which made the topic of multilingual and multicultural risk, crisis and emergency communication a topic of interest, which the majority of (digitally) literate individuals can relate to today in ways which might not have been possible prior to COVID-19.

The strategic importance of accessing technical and scientific information and knowledge, in real-time, from validated sources, in the right language, is easier to defend because of COVID-19. The health pandemic originated the need on behalf of all audiences to be informed while, simultaneously dealing with high levels of fear, anxiety, uncertainty. Organizational and individual values clashed; cultural differences became object of political and social tension; feelings and emotions were present in the discourse of organizations that were unable to guarantee certainty; «solidarity», «empathy», «trust» became mottos while distrust grew in the parts of the world where risk, crisis and emergency communication planning did not exist. Despite the leading role

the World Health Organization (WHO), communication in times of COVID has been a challenge few organizations and countries were prepared to undertake.

As the world moves towards a new stage in the management of this health pandemic, it would seem wise to capitalize on this learning experience and prepare. This is the context the Translation-Integration Model (TIM) was designed to participate in. Additionally, the TIM has the potential to contribute in the following areas:

- (1) Regulation of the profession of translator and interpreter and of the organizations providing translation and interpretation services (Baker & Maier, 2011; Filmer, 2020).
- (2) Design and development of international, national and local emergency response policies (Alexander & Pescaroli, 2020; O'Brien et al., 2018; Cadwell, 2020).
- (3) Development of language preparedness mechanisms to support and inform volunteer T&I in an emergency (Federici, O'Hagan, et al., 2019).
- (4) Development of language policies for Knowledge Building Communities (KBC) which focus on the transfer of technology and knowledge for public utility purposes
- (5) Contribute to the development of improved technological and integrated solutions for Machine Translation (MT), Artificial Intelligence (AI) and A/S for crisis translation purposes (Baker, 2010, 2013; Drugan, 2017).
- (6) Development of education and performance-based accreditation for crisis translators and interpreters.

At this stage, the distinctiveness of preparing for a technological, or man-made disaster, should be clear, namely regarding the preparedness phase which requires additional information and knowledge transfer as a result of the changes in behaviour which might manifest when 'the avoidable' becomes 'unavoidable'.

In the case of a radiological and nuclear crisis or emergency, the role of scientific knowledge is critical both for emergency responders and for the general public that needs to manage and integrate the information and use it to make informed decisions to save lives and mitigate the outcomes of the event. In the case of a technological disaster, with the intersection of different layers, levels and stages of responsibilities and obligations. Expert responsibility and accountability is increasing and "(...) becoming an essential and integral part of disaster risk management systems." (Albri et al., 2020, p. 1). In the case of nuclear technology, the IAEA lays out the guidelines which impact private (operators) and public (Regulatory) entities to approach the preparedness phase from two perspectives: (1) facilities emergencies (level of knowledge X) and (2) locations

emergencies (level(s) of knowledge y). “In both cases the functions and operational conditions and requirements of the facilities and locations must be carefully considered and necessary advanced preparations made. Public communications will be key in both areas.” (IAEA, 2012, p. 4) For this purpose, the IAEA highlights the importance of the role of the Public Information Officer (PIO) for whom, ideally, national authorities will have developed the following items that are important for PIOs:

- Emergency response organization – roles and responsibilities
- Contacts for information
- URLs, phone numbers and emails:
 - Authorities for response (national legislation/regulations)
 - Basic advice on general actions the public can take
- Monitoring, surveillance and laboratory services available to detect an uncontrolled release of radioactivity
- Dose assessment capability
- Response planning (medical capacity, protective and response actions).
- National response criteria (generic and operational) and explanations of possible protective actions.
- General background information on facilities and use of radioactive materials in State.
- List of risks based on use of radioactive materials in the State/area/region. (IAEA, 2012, p. 7)

This information made available to the PIO implies that:

(...) local authorities will have in-depth knowledge of the community and can be a source of valuable information on siting information centres, organizing public meetings, church and community groups that are able to share information with their memberships, and other existing mechanisms for communicating with local residents. (IAEA, 2012, p. 6)

Chapter 3 proposes a Translation-Integration Model (TIM) which draws on the theoretical contributions presented in Chapter 2. The strength of the model lies in its transversal and flexible adaptation to all contexts here translation is required. The focus, however, for explanatory and illustrative purposes is on technological disasters as a potential outcome of risk-related industries, such as the field of nuclear energy. This work will not address the situations resulting from the malicious use of nuclear or radiological devices, namely within situations of armed conflict or detonation of nuclear weapons, although the relevance of these areas is mentioned when they overlap into the field of risk perceptions on the topic of nuclear.

3.1 Description of the Translation-Integration Model (TIM)

Informed by the AQAL Model, the TIM brings visibility and awareness to how different stakeholder prioritize translation and interpretation and how, in turn, translation and interpretation can contribute to all the stages in risk, crisis and emergency communication. Additionally, and throughout the research process, it has become clear that translation plays a critical role in the development of artificial intelligence solutions. Drawing on the contributions of the AQAL model, CMT, the DDM, Coseriu’s levels of knowledge and Leech’s three levels of meaning, the TIM exercises the advantages of bringing together a set of complementary theories and models to understand what new data surfaces by using the “view through” and “view from” approach. The aim of the TIM is to assess whether an AQAL-based framework can, as expected, provide reproducible guidelines that allow organizations to follow and consciously develop risk, crisis and emergency communication plans based in the 10 INTERACT Crisis Translation Policy Recommendations (Federici, O’Brien et al., 2019):

1. Emergency management communication policies should include provision for translation and interpreting and should be regularly reviewed and revised.
2. A specific owner of the policy on translation and interpreting should be identified and assigned within organizations responsible for emergency communication policy and implementation.
3. Emergency management communication policies should be developed in consultation with relevant multilingual and multicultural communities.
4. Emergency management communication policies should cover all phases of crisis and disaster management (mitigation, preparedness, response, and recovery).
5. Emergency management communication policies should consider languages spoken by affected communities (including sign language), levels of literacy, and cultural appropriateness.
6. Alternative formats and channels for dissemination of translated information should be considered – not just traditional written or spoken formats.
7. Emergency management communication policies should allow for two-way communication between responders and affected communities.
8. Ensure training is provided for professional and volunteer translators and interpreters so that they can effectively operate in crisis and disaster settings. Also ensure training for users and managers of translation and interpreting services.
9. Establish direct lines of communication between emergency responders and professional associations of translators and interpreters for the purposes of collaboration.
10. Recruit into multilingual organizations who are responsible for aid or emergency response in such a way as to avoid reliance on international lingua franca and ad hoc or convenience translation and interpreting.

Figure 7. Ten INTERACT Crisis Translation Policy Recommendations.

While the abovementioned policy recommendations are vital to identifying the aspects that need to be accounted for, the TIM demonstrated that additional frameworks need to complement these recommendations. If this does not happen, in the practical life of organizations, prioritizing an area in which, as the survey in Chapter 5 demonstrates, organizations do not habitually have trained professionals, will generate a sense of frustration and, in many cases, a misguided allocation of resources, when these are available. By placing the stakeholders of this study at the centre of the model, communication priorities – and conflicts – are contextualized in a manner which facilitates the identification of the network of meanings, i.e., the associative meaning, per quadrant, with the potential to positively or negatively impact organizations' language decisions. At this stage, the TIM focuses on *how* to implement change in multilingual technological crisis communication. The particularity of technological crises is reiterated because not only is the potential event man-made, but also because there is a fuzzy border between the risk an organization may need to communicate and the risk the organization may need to manage within its legal responsibilities.

3.1.1 Layout of the TIM

Like the AQAL model, TIM is quadrant-based and addresses any given phenomenon from the (1) interior / exterior and (2) individual/collective dimensions, interchangeably placing different stakeholders in the centre of the model, allowing for a “view from” the interior (how is translation perceived within the organization, for example) and the “view through” the exterior (how do Member-States, for example, deal with translation and interpretation in response to the information made available in foreign languages?). By changing the viewpoints, not only do opportunities for different informative questions arise, but so do paths to their potential resolution. For example, if we were to place the IAEA in the centre of the model, questions related to the role of translation and interpretation will potentially remain in the social, lower-right quadrant, demonstrating the IAEA obligation to respect Member-State Sovereignty. However, as the case-study demonstrates, through the analysis of language policies, additional layers of meaning are at play which frequently originate tensions.

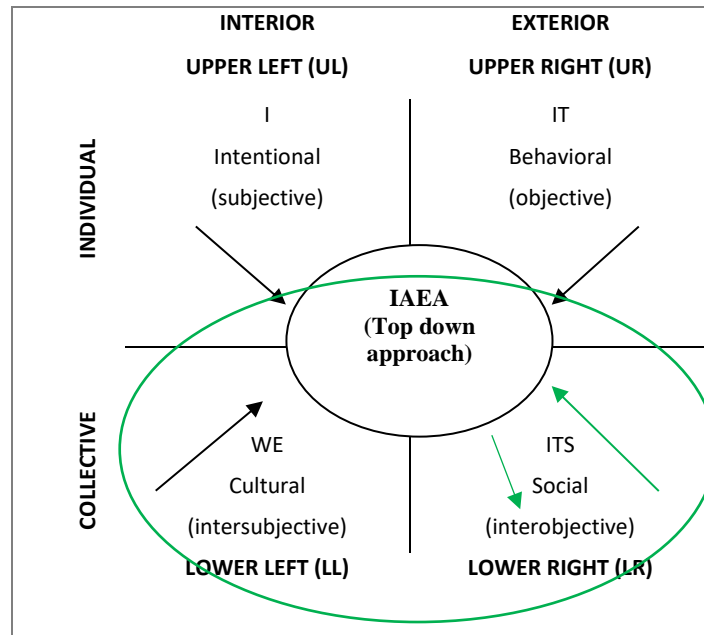


Figure 8. Adaptation of the AQAL Model to Translation – International Organization-centered approach (collective external Lower Right).

Naturally, the potential implementation and use of TIM requires a level of awareness that goes beyond simply acknowledging multilingualism and multiculturalism:

The production of transnational knowledge that is widely recognized as legitimate is a major source of influence for international organizations. To reinforce their expert status, international organizations increasingly produce global benchmarks that measure national performance across a range of issue areas. (Broome et al., 2018, p. 514)

The definition of benchmarks to support organizations in designing and developing multilingual and multicultural communication plans is one of the actions the IAEA could model, for example. However, and as discussed in Chapter 5, through the exploration of associative meaning based on CMT, TIM provides evidence to the limitations and challenges the IAEA would face if there were to be a change in language policy, i.e., explicitly addressing translation as a technological and scientific information and knowledge accelerator. With evidence of conscious efforts to change the nuclear narrative, TIM demonstrates the tension between communicating risk and taking responsibility for risk.

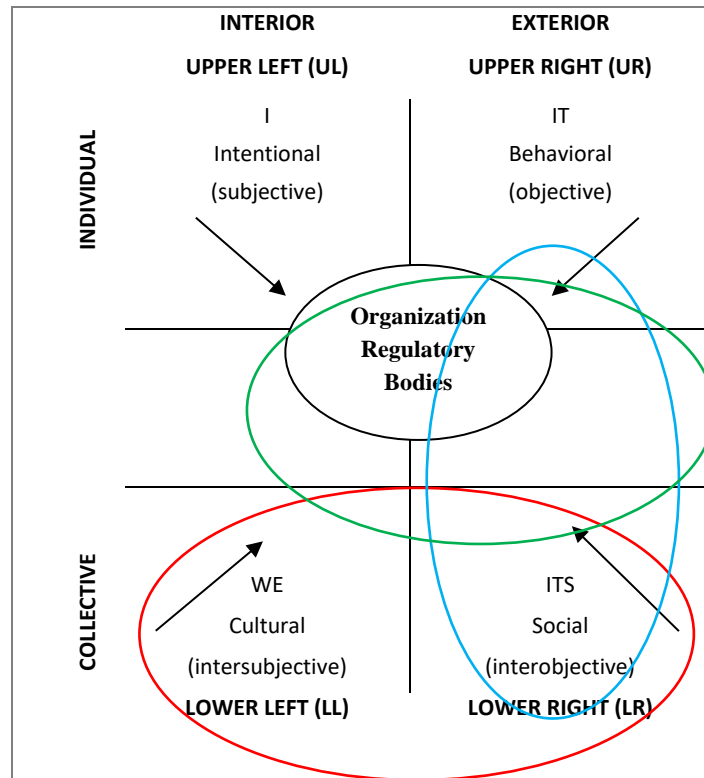


Figure 9. Adaptation of the AQAL Model to Translation – National Organization-Centered Approach (Collective and Individual External and Internal interaction).

In the case of Regulatory Bodies, the visualization of the interactions demonstrates the additional levels of complexity in meaning management and potential conflicting conceptual metaphors because, although the Regulatory Bodies work, essentially, at the level of conceptual meaning, their action and communication is also directed towards heterogenous publics to whom they need to communicate risk.

Benefitting again from the visualization TIM allows for, translation and interpretation, when viewed as external, end of line services, also brings about questions regarding information and knowledge ownership challenges.

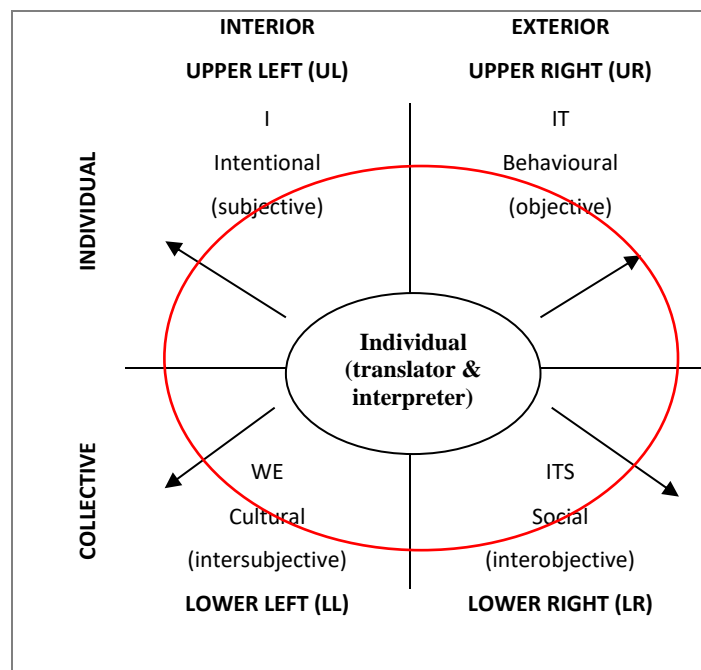


Figure 10. Adaptation of the AQAL Model to Translation – Translator and Interpreter Centered Approach (Collective and Individual External and Internal interaction).

With detailed analysis carried out in Chapter 5, just from the visual interchange of agents, that information and knowledge will hardly remain unchanged.

3.1.2 Integration of additional theories and models

Chapter 2 presented the theories, models and frameworks chosen for this study to explore the contributions and limitations of certain approaches. For example, from the viewpoint of TIM, solutions such as those provided by TWB are functional when no previous translation planning has taken place. However, language maps and glossaries are produced from the external responder organization viewpoint, based on conceptual meaning, yet targeted at the individual internal and external levels, and overlooking associative meaning. As exemplified by Cadag (2020, p. 177) with regards to the typhoon Haiyan, in 2013, claims were made that better response could have been provided and many lives could have been saved if ‘storm surge’ was described as ‘tsunami-like’. This was not however the understanding of the entities responsible for managing the crisis:

Government authorities and scientists, however, maintained that proper warning was given on time and many people just did not understand the warning. Many scientists also strongly disagree with the proposition to describe ‘storm surge’ as ‘tsunami-like’ explaining that it might further confuse concerned stakeholders particularly local authorities and people.

Storm surge and tsunami are totally different hazards with different natural causes and potential consequences despite similarities in some aspects – i.e. both hazards are characterized by strong sea waves directly affecting the coastal areas. (Cadag, 2020, p. 177)

For example, as the leading organization, the IAEA can model the integration of translation and interpretation practices by defining benchmarks that Member-States can mirror in their local and national plans, with specific criteria similar to those provided, for example, by O’Brien et al. (2018) through the adaptation of the 4-A Framework to Translation and Interpretation (see Chapter 5).

Summary

Chapter 3 presented the Translation-Integration Model applied to the Integral AQAL model, exploring the quadrant viewpoints as forms of valuing all contributions, and complementing them in a way which encourages evolutionary developments, with the intention of converging and enriching all views.

With a selection of models, theories and frameworks, TIM is applied to the case-study presented in Chapter 5.

Chapter 4 - Methodology

“Even if we possessed the perfect integral map of the Kosmos, a map that was completely all-inclusive and unerringly holistic, that map itself would not transform people. We don’t just need a map; we need ways to change the mapmaker.”

(Wilber, 2001, p. 55)

Introduction

The Integral Theory AQAL map proposed by Wilber (1996; 2001) has inspired innovative methodological approaches to address complex phenomena in fields such as ecology, to respond to the call for models capable of addressing issues such as the overall implications of climate change (O’Brian, K. & Selboe, E. 2015), health, where the discussion around the topics of health care access and humanization of the health care encounter require models and approaches capable of addressing dynamics and tensions between technological and scientific advances and the integration of human experience (Schlitz, M., 2008) and, more recently, in the field of interpretation studies to propose a view of the multidimensional interpreter, a complexity-based model for interpreter training (De la Cruz Recio, 2019). Despite the broad scope of fields already benefitting from the quadrant approach, the integral map has yet to be explored within the complex setting of translational interactions and exchanges for risk, crisis and emergency purpose. With the proven applicability of the model in varied fields, the AQAL meta-framework and meta-concepts inspired the design of the Translation-Integration Model (TIM).

TIM was designed and conceptualized with the hope of understanding the potential contribution of an integrated approach to map and analyse the translation process within formal international communities and organizations, where scientific and technological transfer, knowledge generation and co-operation are combined with membership obligations and responsibilities that sovereign Member-State need to fulfil in their respective languages and national and local realities. Through the proposed mapping and analysis, the aim was to answer the research questions that motivated this study and which seem relevant to revisit here:

1. How can translation and interpretation contribute to enhanced communication strategies within and across technological and scientific organizations and, in due course, with the non-specialist public?

2. How can risk, crisis and emergency planning benefit from tools and models that address associative meaning?

4.1 Definition of a methodological plural approach

In order to conduct the proposed investigation and assess the contribution of TIM, different methods and perspectives were combined, aligned with the Integral Methodological Pluralism (IMP) goal: to guarantee that valid reproducible knowledge remains immune from one particular method and/or approach.

Firstly, a case-study approach was chosen with the aim of contributing both to the theoretical challenges discussed in previous chapters as well as to the practical challenges risk related technical and scientific organizations face in managing multilingual communication requirements from an operational standpoint at an international, national and local level. Case-studies have an established tradition in translation studies and there is a solid recognition of case-study research as a valid, flexible and pragmatic research approach “capable of providing comprehensive in-depth understanding of a diverse range of issues across a number of disciplines.” (Harrison et al., 2017, p. 1). Also, case-studies are an effective way to address, and desirably respond, to real-life challenges, encouraging research for public utility.

Secondly, a set of theories and models was selected to assist in collecting information from each quadrant and to make the data sufficiently tangible to provide technical and scientific organizations (TSO) with options on where and how to integrate languages, namely translation, into risk, crisis and emergency communication procedures. The theories selected to integrate and operate the model were (1) Conceptual Metaphor Theory (CMT), used to identify and discuss instances where the conceptual and packed perception of translation in TSO overlooks embodied subjective and collective meaning in translational exchanges, with specific outcomes for crisis translation; (2) Leech’s associative meaning was used to demonstrate the relationship between associative meaning in nuclear and radiological risk, crisis and emergency communication and the advantage for TSO to perceive associative meaning as a more tangible notion to assist in the definition of communication strategies; (3) Coseriu’s levels of knowledge were used to draw attention to the benefits of integrating different types of knowledge within different stages of risk, crisis and emergency communication preparedness; (4) Keszkes’ Dynamic Model of Meaning (DMM) was used to analyse the situationality and context of nuclear risk, crisis and emergency communication, specifically highlighting the permanent co-existence of private and public

dimensions and the influence on the interpretation of information and activation of field related knowledge and perceptions; (5) the 4-A Framework proposed by O'Brien et al. (2019) was used to demonstrate inconsistencies and gaps in international approaches to translation which in turn materialize into specific constraints in crisis and emergency response.

4.2 Participants

To understand the extent to which TIM could serve the abovementioned purposes, the International Atomic Energy Agency (IAEA) was selected as the focal technical and scientific organization. The choice of the IAEA resulted firstly from the researcher's personal experience as a translator and interpreter for the 'English«»Portuguese' language pair in the field of radiological preparedness. Secondly, the IAEA is the "(...) world's central intergovernmental forum for scientific and technical co-operation in the nuclear field." (IAEA, n.d.). The aspect of intergovernmental cooperation in the nuclear field created the ideal setting for the type of translational exchanges and processes this work aimed to study, i.e., communication between Regulatory Authorities and the IAEA, experts and, ultimately, with the non-specialist public. Thirdly, because the IAEA mission to work "(...) for the safe, secure and peaceful uses of nuclear science and technology, contributing to international peace and security and the United Nations' Sustainable Development Goals." (IAEA, n.d.) provided a unique opportunity to assess the advantages of explicitly addressing associative meaning for safety and security purposes in the event of a radiological and nuclear crisis or emergency which requires international cooperation and collaboration between specialists and experts and, ultimately, with the public. Also, the participants chosen for this study provided a unique setting to better understand what happens in and through translation when the official language of the Member-States is not one of the six official working languages: Arabic, Chinese, English, French, Russian and Spanish. With 175 Member-States (as of 2 march 2022), the relevance of explicitly addressing translation and interpretation as part of the exchange of information and knowledge generation process seemed clear.

The selection of the participants for the study was simple because the sample focused on IAEA Portuguese-speaking Member-States. From this viewpoint, the participation of the IAEA would have been valuable. The research project was presented to the IAEA in person and via email, however, no feedback was received. Although direct collaboration did not take place, the IAEA publications which regulate the peaceful use of radiological and nuclear energy, processes, procedures and technology were publicly accessible online, providing the necessary data for this

work. The Angolan Atomic Energy Regulatory Authority (AREA) was also invited to participate in the study, but no response was received.

The three IAEA Member-States that responded to the request to participate in this work were Brazil, Mozambique and Portugal. Contact with the Portuguese Regulatory Authority existed prior to the study for professional reasons. Brazil and Mozambique were contacted spontaneously and the request to participate in the survey was promptly accepted. In the case of Portugal and Mozambique in-person meetings took place to discuss the research in more detail. In the case of Brazil, the only contact consisted of the response to the survey used in the study. In-person meetings were planned but did not take place due to COVID restrictions on travel.

The Regulatory Authorities that participated in the study were:

1. Comissão Nacional de Energia Nuclear – CNEN (National Nuclear Energy Commission - Brazil)
2. Agência Nacional de Energia Atómica – ANEA (National Atomic Energy Agency - Mozambique)
3. Agência Portuguesa do Ambiente – APA (Portuguese Environmental Agency - Portugal)

CNEN, ANEA, and APA represent three different stages regarding collective relationship with radiological and nuclear information, knowledge and narrative. The data collected from the survey, in-person meetings and corpus allowed a comparative analysis of the role of translation in each organization to be carried out. Independently of stages and/or presence of nuclear technology in the countries, the three participants:

- a) Need to transfer technological, technical and scientific information and knowledge into multiple languages and cultures
- (a) Need to adapt and integrate radiological and nuclear knowledge and information into a crisis and emergency communication plan
- (b) Need to guarantee the language requirements for international cooperation and communication, i.e., English as the mandatory work language.

These needs, and the desire to bridge the gaps generated by these needs, were reflected in discussions about how to introduce the domain of radiological and nuclear risk to the population, how to address risk preparedness in contexts with strong resistance to the “nuclear” topic, how to disseminate risk information to the public, how to integrate translation and multilingualism in emergency response, among others. While information and insights from in-person meetings was

valuable, for the purpose of crisis translation it was important to understand how each entity dealt with translation, how the information from the IAEA was being managed and integrated into Portuguese, and other local languages, both for expert and public purposes.

The expectation of the participants was therefore that through the participation in this research, and namely with the contribution of TIM, new options would surface on how to deal with risk, crisis and emergency communication challenges while also focusing on the technical, technological and scientific requirements of their organizations.

The representativeness of this case-study is based on the fact that Portuguese is, to date, listed among the 10 most spoken languages in the world and Portuguese is the official language of 9 countries distributed throughout Africa, Asia, Europe and South America. This geographical diversity invites further research on the application of TIM.

4.3 Selection and collection of data

The selection and collection of the data for the study was a collaborative task undertaken with the Regulatory Authorities, more specifically with ANEA and APA. Communication with CNEN was solely based on the survey. For this reason, and in the attempt to provide an integral answer, and for comparative purposes, the material from CNEN was selected from information publicly available and aligned with the material provided by ANEA and APA. This allowed for comparative analysis between countries and also for unexpected findings discussed in Chapter 5.

4.3.1 Selection of data

The selection of the material which constituted the data for the case-study was done with the Regulatory Authorities. Considering the answers the research questions were looking to find, Regulatory Authorities were invited to firstly focus on the IAEA recommendations and standards which were more relevant to the organizations current situation. Then, on the publications which assisted them in making language-based decisions for risk, crisis and emergency communication purposes. The criteria were therefore the following:

1. IAEA safeguard, recommendation or standard which required transposition into the language(s) and culture(s) of the participants.

2. Relevance of the information and knowledge for purposes of crisis and emergency response in the case of a radiological and nuclear incident at a national and/or international level.
3. Availability and accessibility of resources for T&I purposes.

4.3.2 Collection of data

The data for the case-study was collected using the following instruments and tools:

1. SurveyMonkey: an online survey software which provides a basic free version, and an advanced professional version for more detailed surveys and analysis. The more advanced version was used for this work in order to distribute the survey to the Regulatory Authorities in Brazil, Mozambique and Portugal and to obtain the quantitative and qualitative data relevant for the study.
2. AntConc: a freeware corpus analysis toolkit for concordancing and text analysis used to analyse the corpus compiled for this study.
3. Survey distributed online for the Regulatory Authorities.
4. Informal interviews which were fundamental in identifying challenges that result from language nominations and language policies which overlook the burden of T&I for the countries whose language(s) are not those of the IAEA.
5. Specialized bilingual parallel corpus compiled for this work.

4.3.3 Survey

The survey distributed to the Regulatory Authorities was designed with the purpose of gaining a clearer understanding of how the Regulatory Authorities were organized and how translation was viewed within the scope of their activities.

For this purpose, the survey was divided into two sections. Section 1, dedicated to the description of the organizational structure, allowing the dimensions of the organizations to be compared and also to understand the attention given to the field of risk, crisis and emergency communication and, consequently, to communication. Section 2 aimed to understand the role of translation and interpretation in the reception, dissemination and production of information and knowledge at the local, national and international level.

The survey (Annex 1)⁵ was sent out electronically, using SurveyMonkey and was comprised of 32 questions, in European Portuguese. All Regulatory Authorities answered, resulting in one answered survey for ANEA, one for APA, and, interestingly, two responses from CNEN. In the case of CNEN, and considering the overall goals of the research, the two responses were included because they revealed different perceptions of the role of translation in the organization, an interesting finding in itself as discussed in Chapter 5.

In the case of Portugal and Mozambique direct contact was established with the Regulatory Authorities before and after the submission of the surveys. These meetings provided fruitful insights which would not have been possible to extract from a survey. In the case of Brazil, additional insights to how the country communicates risk and its nuclear viewpoint resulted from the active public channels of communication developed by CNEN to engage as extensively as possible with the public. Therefore, information collected from the survey, the nature and quantity of information made available for public consultation, and informal conversations with an individual who is an active member of CNEN, and within the Brazilian nuclear society, were considered sufficient.

4.3.4 Corpus compilation and criteria

Considering the importance of the IAEA publications in defining how communication should be approached by Member-States, the corpus included 29 IAEA publications dedicated to the topic of communicating with the IAEA, with different technical and organizational stakeholders, and with the public.

The criteria for the selection of the sample texts took into account Sinclair's (2005) principles in order to guarantee comparability of communicative functions in the two languages being analysed and the representativeness of the language of the texts within the communities in which they perform. Two groups were identified according to readership profile:

- a) Technical and scientific readership
- b) General public readership

The data was analysed and processed semi-automatically with AntConc (Windows 3.5.8 version), a freeware corpus analysis toolkit used for concordancing and text analysis, developed by Laurence Anthony, Professor in the Faculty of Science and Engineering at Waseda University, Japan.

⁵ An English version of the Survey has been included (Annex 1).

The contrastiveness and comparison of text components had the aim of observing language behaviour, and how associative meaning could potentially be elicited and made more tangible, and not so much the terminological or conceptual dimension of the words.

AntConc was used to identify the instances in which translation and interpretation are explicitly addressed in IAEA publications and how the recommendations and suggestions are translated into Portuguese and used to communicate with experts and the public.

4.4 Application of TIM

TIM was designed and proposed for this study based on the expectation that an integral approach would allow tangible pathways to be presented to organizations that need and want to address multilingual and multicultural radiological and nuclear risk, crisis and emergency communication. The focus on Portuguese speaking countries aimed to optimize already existing relationships represented by the CPLP and, ultimately, contribute to the activation of new forms of knowledge co-creation, with associative meaning playing a more explicit role in radiological and nuclear crisis and emergency communication. The relevance of this contribution lies in its potential contribution to radiological and nuclear crisis and emergency response in Portuguese, in Africa, Asia, Europe, and America.

TIM was used to analyse the corpus by applying CMT, the DMM, associative meaning (Leech), levels of knowledge (Coseriu) and the 4-A Framework (O'Brien et al., 2019) to each of the quadrants to obtain information and insights that inform the Regulatory Authorities in ways that make translation and interpretation decisions clearer and more strategic for response purposes.

Summary

This Chapter presented the methodological steps followed in this research and the justification for developing and proposing the Translation-Integration Model (TIM). The methodology chosen aimed to produce results that would provide Portuguese speaking countries with an approach to assist the decision-making process related to translation and interpretation as opportunities to integrate complex challenges into complex realities.

Part III – A Case-Study: Radiological and Nuclear Risk, Crisis and Emergency Communication

Chapter 5 – Case study. Discussion of findings.

“(…) governing risks and managing safety are not exact ‘sciences’. Therefore, multiplying the sources of information, knowledge, perspectives is key to develop as complete a picture as possible and make it evolve as time goes by and conditions and/or knowledge evolve.”

(Bieder, 2018, p. 172)

Introduction

Accurate and timely communication and exchange of information and knowledge in a crisis and emergency is acknowledged as being critical for effective response (Federici et al., 2019). As discussed in previous chapters, the importance of being prepared

to communicate in the national and local settings of Member-States whose official language(s) is (are) not one of the official IAEA working languages results in preparedness efforts that differ significantly from those countries whose official language is one of the IAEA working languages. Additionally, Member-States, with non-official working languages, need to guarantee capabilities to communicate in real-time with the IAEA, for international collaboration purposes.

This Chapter presents and discusses the findings that resulted from the use of the Translation-Integration Model (TIM). The aim was to address the complexity of operating and implementing multilingual and multicultural communication strategies between the IAEA and the Portuguese-speaking countries in the field of radiological and nuclear risk, crisis and emergency situations which entails, for the Portuguese-speaking countries, maintaining effective communication with specialist and non-specialist audiences in multiple directions. TIM also aimed to explore the potential of optimizing associative meaning in the design and materialization of tools that inform the decision-making process and make language-based decisions a more tangible process in risk, crisis and emergency response in non-native English (or other IAEA official language) settings.

The Chapter starts by situating the problem within TIM to illustrate how the model was used to analyse the role of translation and interpretation in the IAEA and in the Portuguese-speaking Member-States of Brazil, Mozambique and Portugal. Secondly, the findings are presented according to the relevance of their contributions to the research questions. Thirdly, the findings are discussed from the perspective of TIM.

5.1. Situating the problem within TIM

The Translation-Integration Model aimed to bring an integral and holistic perspective to the analysis and discussion on the complexity of translation and interpretation between the IAEA and the Portuguese-speaking Regulatory Authorities ANEA, APA and CNEN. The expectation was that by harnessing the meta-framework and the meta-concepts of Integral Theory, TIM would be capable of providing Technical and Scientific Organizations (TSOs) with a tool that made the complexity of multilingual and multicultural communication between experts and with the general public more tangible. TIM was also expected to provide insights as to how associative meaning could inform the decision-making process related to risk, crisis and emergency communication. Because TIM integrated different theories and models, there was also the anticipation that the conceptual frameworks would provide the grounds for a more concrete, transversal and informed discussion about translation and interpretation for risk, crisis and emergency communication and planning.

TIM, aligned with Integral Theory, viewed the translation and interpretation challenges as phenomena that combines objective features, i.e., those aspects which are more observable and measurable such as the *IAEA Safety Glossary. Terminology used in nuclear safety and radiation protection* (IAEA, 2016), with subjective factors which are usually less quantifiable and/or non-measurable, such as the meanings and emotions associated to risk, crisis and emergency situations). TIM allowed moves between individual and collective viewpoints to surface by exploring the co-existing individual and collective features of translation and interpretation represented, in this case, by each Regulatory Authorities' individual context, values, perceptions of risk, that need to integrate the collective IAEA culture, values, and mission. In the case of this work, the theories selected contributed to propose a spiral representation of the quadrant dynamic. The spiral move represented a practical demonstration of the evolutionary movement in the integration of radiological and nuclear energy information and knowledge. With the use of the concepts of levels, lines, states and types, TIM aimed to bring clarity to the language decision-making process. Figure 11 illustrates the spiral effect of the quadrant dynamics used to discuss the findings with regards to the impact of the IAEA view of translation and interpretation on Portuguese-speaking Regulatory Authorities (RAs).

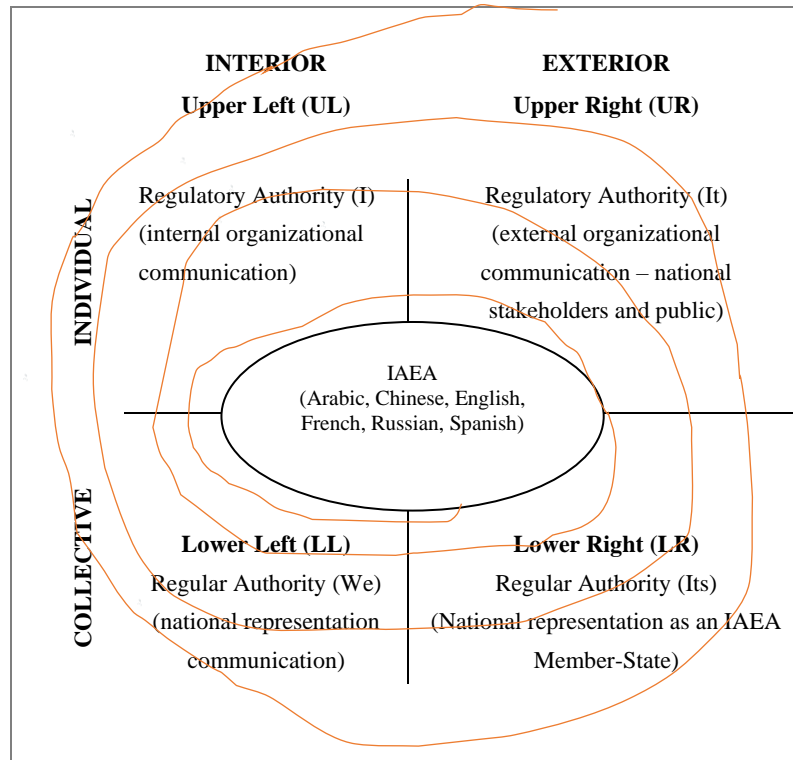


Figure 11. IAEA translation and interpretation spiral

The distribution of the data collected using the TIM approach provided greater clarity on the location of bottlenecks, challenges, and potential biases of multilingual and multicultural communication at the level of the IAEA. The spiral, which is rarely a linear process, is represented as starting from the agency the IAEA brings to the perception of communication about radiological and nuclear topics with a community of multilingual and multicultural Member-States and their respective realities and contexts.

Figure 12 presents the TIM approach applied to the findings resulting from the survey distributed to the RAs. related to the RAs where the illustration of the exchanges and interactions between the quadrants contributed to discuss the complexity of managing multilingual information and integrating it into local and national realities.

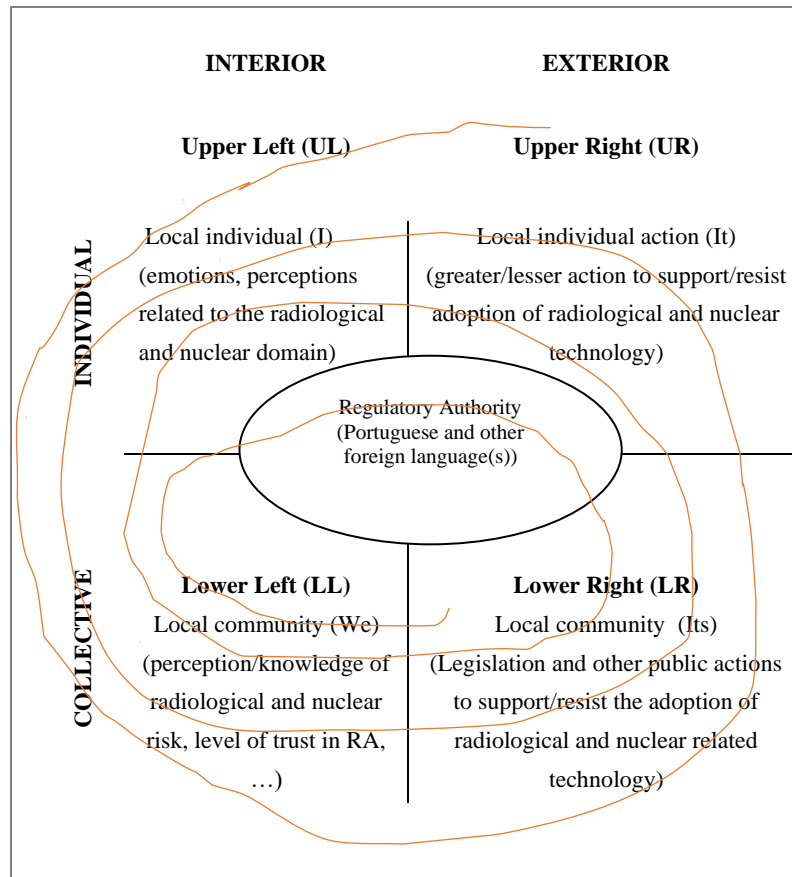


Figure 12. IAEA Regulatory Authorities translation and interpretation spiral

Again, TIM was used to contextualize the discussion on the complexity of managing and integrating multilingual radiological and nuclear information and knowledge into local and national realities. By acknowledging both the human and relational aspects of organizations and communities, the expectation was that new paths for practical outcomes would be achieved by assisting the RAs in navigating the very broad and highly complex domain of risk, crisis and emergency communication planning. The spiral in Figure 12 also represents RAs agency in integrating IAEA information and knowledge into local and national realities.

In addition to the quadrant interior/exterior and individual/collective meta-concepts, the notions of levels, lines, stages and types are used. Levels are used to address the hierarchical development in phases that demonstrate different layers or forms of expansion which typically include the previous phase to support and integrate growing complexity. In this case study to discuss, for example, the greater/lesser level of public knowledge about radiological and nuclear energy. Lines are explored as different directions of development and growth. In this work, lines are represented by the development one would aspire to see reflected in the language policies of

organizations. States represent temporary reactions and interactions that in this work allow the integration of translation and interpretation into stages of risk, crisis and emergency response to be approached from different perspectives. Types are used to describe situations which are accepted as not being open to change like, for example, the IAEA mission to disseminate radiological and nuclear energy for peaceful purposes. The counterpart of peaceful uses is expressed by the non-peaceful purposes that through TIM can be discussed in terms which acknowledge, for example, the limitations between Member-States as to what the limits of peaceful might entail.

With the complexity of multilingual and multicultural radiological and scientific information and communication situated within TIM, the findings will be presented in section 5.2.

5.2. Presentation of findings

The findings in this section draw on the survey distributed to the Regulatory Authorities, the corpus analysis of the IAEA publications and Portuguese documents shared by the Regulatory Authorities (RAs), and the information gathered during in-person meetings.

5.2.1 Survey

The survey was distributed to the Regulatory Authorities between the period of October 2019 and December 2019. However, in January 2021, an additional response was received by one of the organizations and was included due to the relevance of its contributions for the research questions, but also because it demonstrated that within a given entity, in the case of this work, different perceptions of the same phenomena can be an opportunity for internal growth. The fact that the survey remained open for such an extended period of time was justified by the health pandemic which started to manifest at the end of 2019, being declared a pandemic in March 2020. The impact of the pandemic caused organizations to focus on more immediate priorities, generating difficulty in obtaining feedback within desired timings.

Characterization of the Regulatory Authorities (RAs)

The survey had a section dedicated to the characterization of the participants and a second section dedicated to understanding the Regulatory Authorities perspective on the role of foreign

languages, translation and interpretation within their particular organization and for the purpose of the development of their activity.

The participants in the study are geographically located in the African, European and American continents and are, respectively:

- Agência Nacional de Energia Atômica – ANEA (National Atomic Energy Agency - Mozambique)
- Agência Portuguesa do Ambiente – APA (Portuguese Environmental Agency - Portugal)
- Comissão Nacional de Energia Nuclear – CNEN (National Nuclear Energy Commission - Brazil)

The three organizations identified themselves as Regulatory Authorities, with one respondent including that the organization also looks to foster Research, Development and Innovation (R&D&I) and Human Resource training. One of the respondents has more than 50 people allocated to the area of radiological and nuclear emergency response planning, the other two respondents stated that the number of professionals sat within the range of 6-15 people.

In response to question 3, “What are the main responsibilities of the organization?”, the responsibilities of the RAs were stated as follows⁶:

- “Nuclear regulation and inspection, foster R&D&I and human resource training”
- “License, Inspect, Sanction and promote the peaceful use of Atomic Energy”
- “The National Nuclear Energy Commission (CNEN) is a federal agency linked to the Ministry of Science, Technology, Innovation and Communications (MCTIC), created in 1956 and structured by Law 4.118, of August 27, 1962, to develop the national nuclear energy policy. CNEN, the highest planning, guidance, supervision, and inspection body, sets rules and regulations in radioprotection and is responsible for regulating, licensing, and inspecting the production and use of nuclear energy in Brazil. CNEN also invests in research and development, seeking an ever wider and safer use of the nuclear sector techniques, and its focus is to guarantee the benefits of nuclear energy to an ever-larger number of Brazilians, always with safety in the operation of radioactive materials and equipment.”
- “Competent Authority”

Question 4 provided information on the number of people within the RAs who have the function of designing and planning emergency response: “How many professionals are dedicated

⁶ Answers were provided in Portuguese and translated into English for the purpose of this work.

to radiological and nuclear emergency response planning?”. Answers varied between 0-5 (1 respondent), more than 50 (1 respondent), “We have no one, we are in the making of the organization of the Nuclear Safety Department that will be responsible for the Radiological emergency” (1 respondent) and “I am not part of the emergency department, so I do not have a right answer to this question, but I believe it is more than 5.” (1 respondent)

Question 5 “Who are the organization's target audiences regarding radiological protection and nuclear safety?”, answers varied as follows:

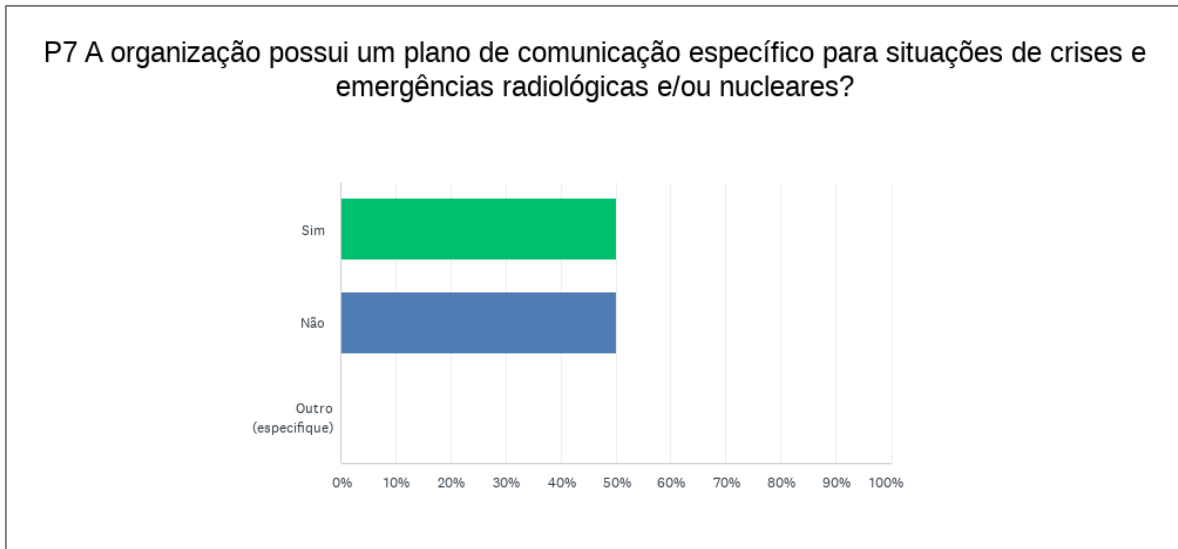
- Public industry (25%)
- Health service providers (hospitals, health centres, ...) (25%)
- Other (50%): “Industry, health care, oil and gas, etc.” and “General public and environment”

Regarding the main communication channels used by the RAs to engage with their audiences, Question 6 “What are the main communication channels used by the organisation to communicate about radiological protection and nuclear safety” indicated that 75% use the organization’s institutional website and 25% Publications (newspapers, magazines, pamphlets, brochures, ...).

Regulatory Authorities’ target audiences and communication preparedness

Questions 7-13 aimed to identify the level of communication preparedness practices currently in place, with a specific focus on an “Emergency Communication Plan” (ECP).

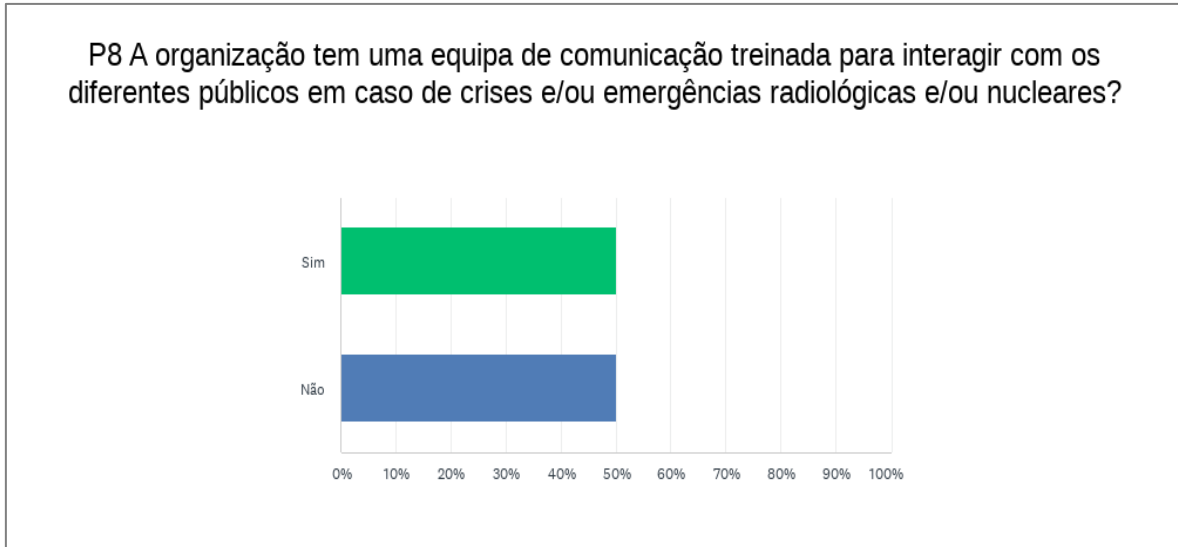
Question 7 “Does the organisation have a specific communication plan for radiological and/or nuclear crisis and emergency situations?”.



Graph 1. Survey – Regulatory Authorities – Question 7.

The 50%-50% distribution should read “Sim/Yes” 25% and “Não/No” 75%. This deviation in the result is due to the fact that the 2 respondents from the same organization answered “yes”. This was an unexpected result as such it was followed up with the respondents who clarified that in the case of one of the countries, emergency communication procedures were under the responsibility of Civil Protection and the RA would be called upon to assist Civil Protection in the event of a radiological and nuclear incident. However, during the exchanges with the team that contributed to this work, insightful discussions took place relating to how the revision of the RAs current communication practices could benefit not only the mission of the organization, namely in the dissemination of radiological and nuclear risk information, but also the ability to respond to the public that would reach out to the organization should there be an event. In this case, additional communication procedures could be put into place to further support the overall emergency communication plan.

The uneven distribution was once again seen in the response to Question 8 “Does the organisation have a communication team trained to interact with the different audiences in the case of radiological and/or nuclear crises and/or emergencies?”. In this case, where 75% of the respondents answered “no” and 25% answered “yes”.



Graph 2. Survey – Regulatory Authorities – Question 8.

Question 9, “Does the organization have a Public Information Officer (PIO) for crisis and emergency scenarios?” generated diverging responses. Although one of the RAs did not have an ECP, a PIO existed; another respondent answered “no”; and, in the case of the RA with a ECP in place, one respondent answered “I don’t know” and the other “Yes”. As discussed in section 5.3, new opportunities to transform practices within the organizations surfaced throughout the research.

Question 10, “What are the organisation's communication risks”, the responses were as follows.

- “Not reaching the desired audience; noise in the message to be transmitted”
- “Lack of knowledge of the organization's activities by the target audience, poor information to the target audience”
- “Timing of response.”
- “Credibility with the public”

The focus on external communication risks versus internal communication risks was particularly interesting from the viewpoint of TIM, especially when analysing the responses to question 11, “How does the organization plan to mitigate the risks listed in question 10”:

- “With specific training”
- “Have an institutional plan for communication or interaction with the public”
- “I don’t know”

- “Improving the communication program”

Question 12, “What are the primary communication challenges the organization faces?”, allowed additional information to be collected in this respect:

- “Misinformation and/or mystification of the nuclear area in society”
- “Lack of plan, lack of trained staff, lack of financial resources”
- “Timing, adequate and adapted communication to various audiences.”
- “Does not interact with social networks”

Question 13, “How does the organization overcome, or plan to overcome, the challenges listed in question 12?”, provided the following answers:

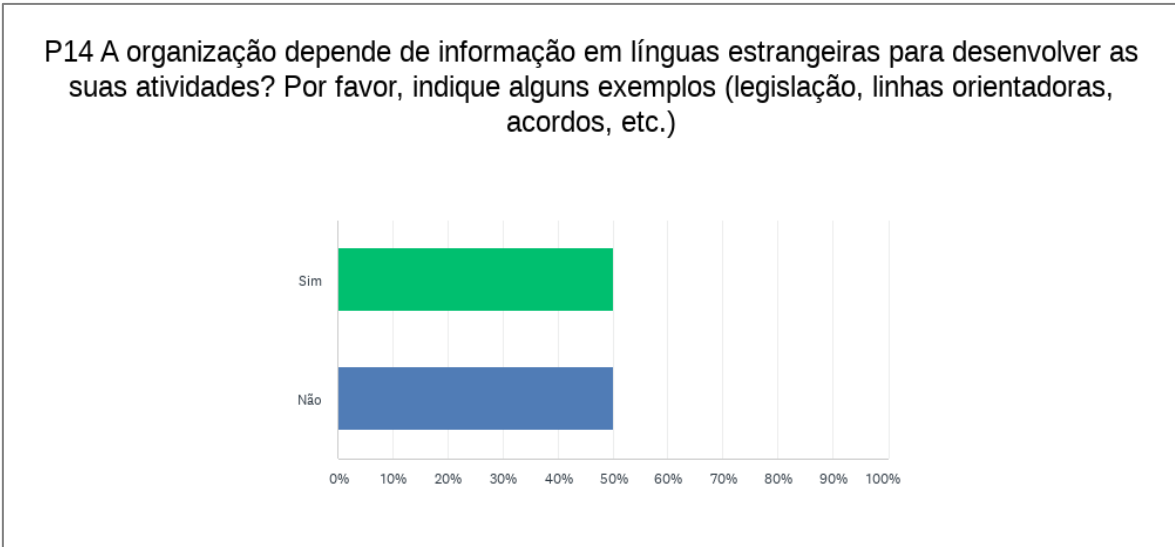
- “Integrated and multidisciplinary plan”
- “Develop a strategic plan, train staff, and recruit financial means”
- “I don’t know”
- “Press releases”

After the characterization of the RAs, the questions presented provided information regarding the perceptions of the challenges surrounding the preparation of communication for specific purposes (situationality) and for specific audiences (levels of knowledge).

The role of foreign languages in the context of Portuguese-speaking Regulatory Authorities

The second section of the survey explicitly addressed the topic of foreign languages, translation and interpretation with the expectation of situating translation and interpretation within RAs activities and procedures.

Question 14, “Does the organisation depend on information in foreign languages to carry out its activities? Please provide some examples (legislation, guidelines, agreements, etc.)”.

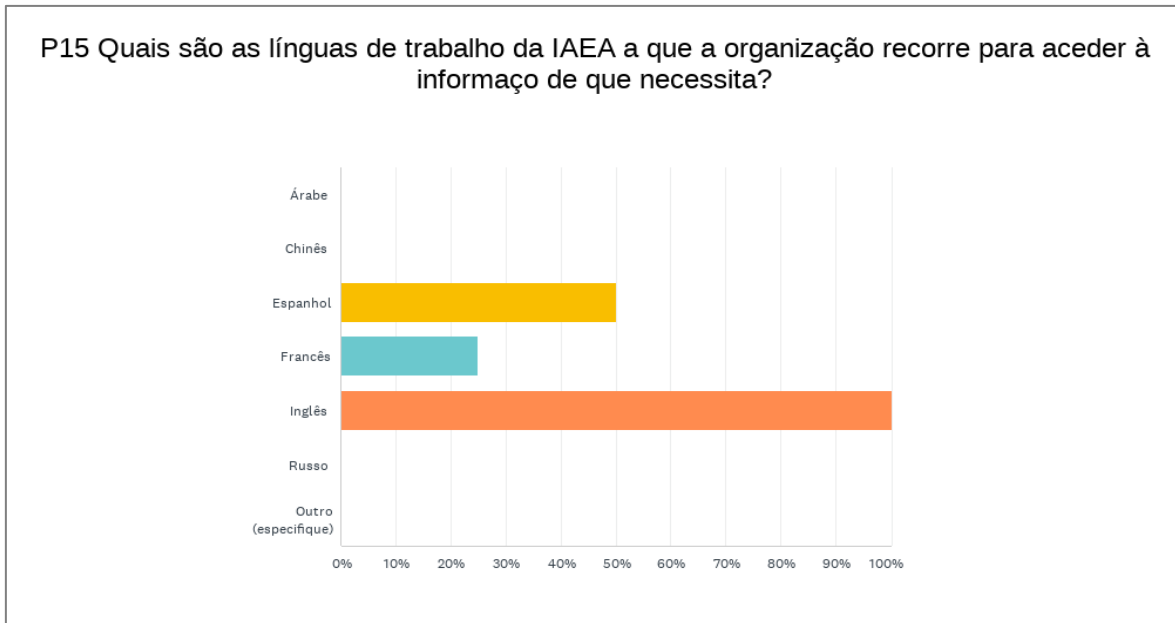


Graph 3. Survey – Regulatory Authorities – Question 14.

Here, again 75% of the respondents answered “Yes”, adding “The Organization uses IAEA manuals, which are in English, in this case we need to translate”. The remaining 25% answered “No”.

Interestingly, Question 15, “Which IAEA working languages does the organisation use to access the information it needs?”⁷, indicated that all RAs access IAEA information through one or more of the IAEA official languages, with 100% of the respondents resorting to IAEA publications in English, 50% to Spanish and approximately 25% to French.

⁷ Translation of the language pairs into English: “Árabe/Arabic”, “Chinês/Chinese”, “Espanhol/Spanish”, “Francês/French”, “Inglês/English”, and “Russo/Russian”.



Graph 4. Survey – Regulatory Authorities – Question 15.

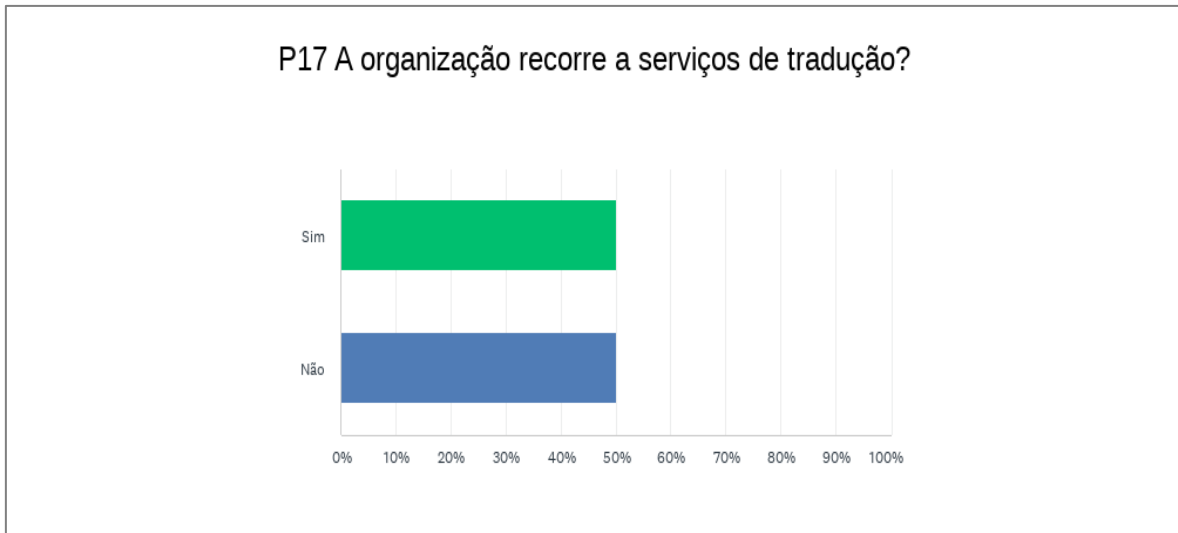
Although the RAs did not all indicate reliance on foreign languages to carry out their activity, the presence of foreign languages, particularly of the IAEA official working languages, is clearly an intrinsic part of the RAs activity.

Question 16, “Which situations require the organisation to communicate or produce information in foreign languages?” elicited the following answers:

- “Cooperation agreements; IAEA procedures”
- “When we send information to IAEA”
- “I don’t know”
- “Communication with IAEA or Ecurie”

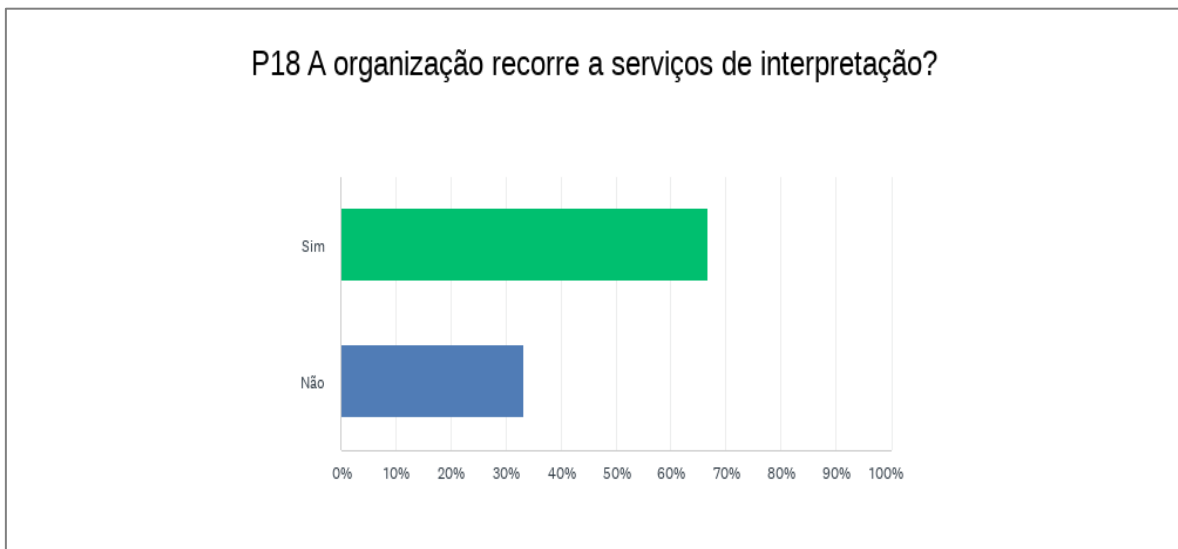
Complementing this information, the survey looked to focus on how the RAs managed the information in the IAEA’s official languages.

To Question 17, “Does the organisation use translation services” responses again provided diverging experiences with 50% of the respondents answering “No” and 50% answering “Yes”. However, answers from one of the RAs illustrated different organizational perspectives with 1 respondent stating “Yes” and another “No”.



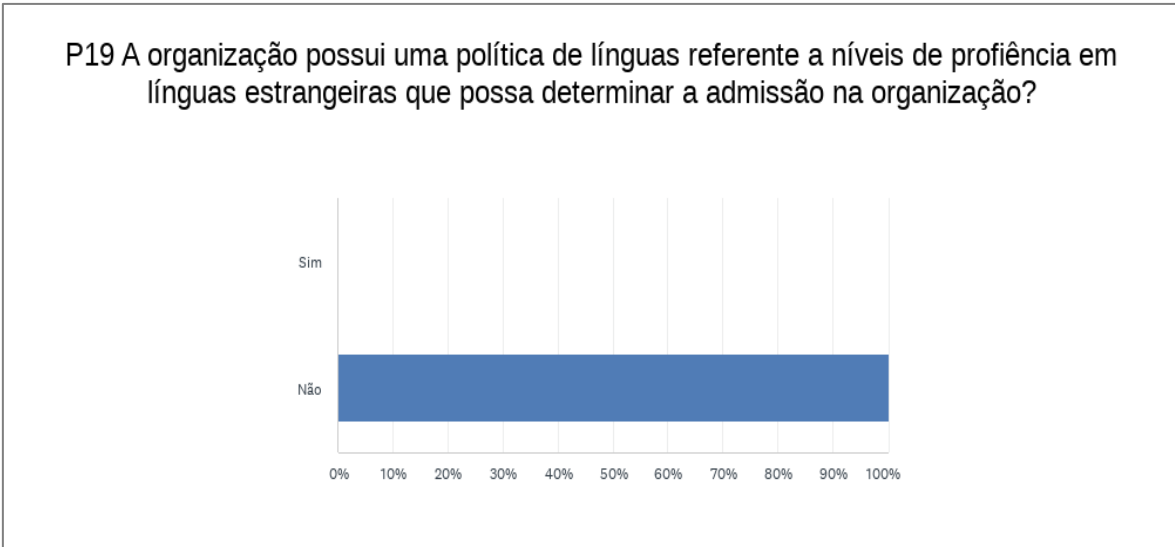
Graph 5. Survey – Regulatory Authorities – Question 17.

Regarding Interpretation, Question 18, “Does the organisation use interpretation services”, 1 respondent answered “I don’t know” and approximately 67% stating yes, and 33% answering “No”.



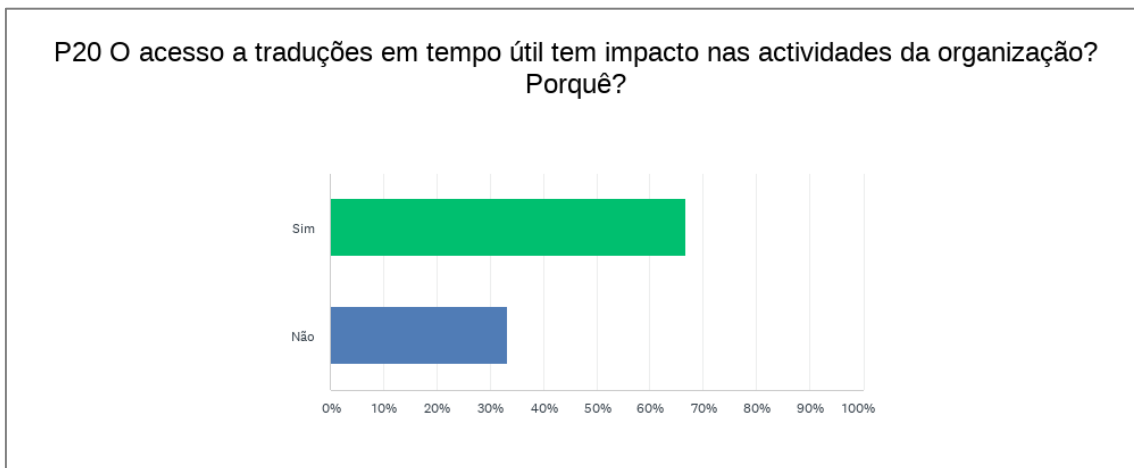
Graph 6. Survey – Regulatory Authorities – Question 18.

Question 19, “Does the organisation have a language policy regarding levels of proficiency in foreign languages that may determine admission into the organisation?” obtained the answer “No” from 100% of the respondents.



Graph 7. Survey – Regulatory Authorities – Question 19.

Question 20, “Does access to timely translations impact on the organisation's activities” confirmed that timely access to translated information for nearly 70% of the respondents had an impact on the organizations’ activities and 1 respondent stating “I don’t know.”



Graph 8. Survey – Regulatory Authorities – Question 20.

Question 21, “What are the main communication challenges the organization faces when receiving information in foreign languages?” identified the three main challenges felt by the RAs:

- Inappropriately translated/interpreted message (50%)
- Different interpretations of basic concepts (25%)

- Target audience's perceptions of the topic (25%)



Graph 9. Survey – Regulatory Authorities – Question 21.

Combining the responses to question 22 “Please list 5 essential requirements when choosing a translator” and questions 23, “Please list 5 essential requirements when choosing an interpreter”, it was clear that RAs current understanding of what to look for in a translator and/or interpreter could be described as miscellaneous.

When asked to identify 5 essential requirements when choosing a translator, responses were as follows:

- “Knowledge of the language; technical knowledge of the subject; availability to work; to be accessible; investment at a fair price”
- “Knowledge of the subject”
- “Quick turnaround, accuracy, impartiality, objectivity, and common sense”
- “n.a.”

Responses regarding the requirments for choosing an interpreter did not vary significantly

- “The same as 22” (referring to the answer to Question 22)
- “Feeling, accuracy, impartiality, objectivity, and common sense”
- “n.a.”

Again, questions 24 and 25 indicated similar translation and interpretation challenges. Regarding question 24, “What are the main translation challenges in the field of Radiological Protection and Nuclear Safety”, RAs listed the following:

- “Concepts that fully adhere to the original text”
- “Translators have little knowledge of nuclear science and technology”
- “Terminologies”
- “Some terms and definitions”

In the case of Question 25, “What are the main interpretation challenges in the field of Radiological Protection and Nuclear Safety?”, answers were in line with the previous challenges.

- “Idem "24"”
- “Translators have little knowledge of nuclear science and technology”
- “Proper message”
- “Technical terms and definitions”

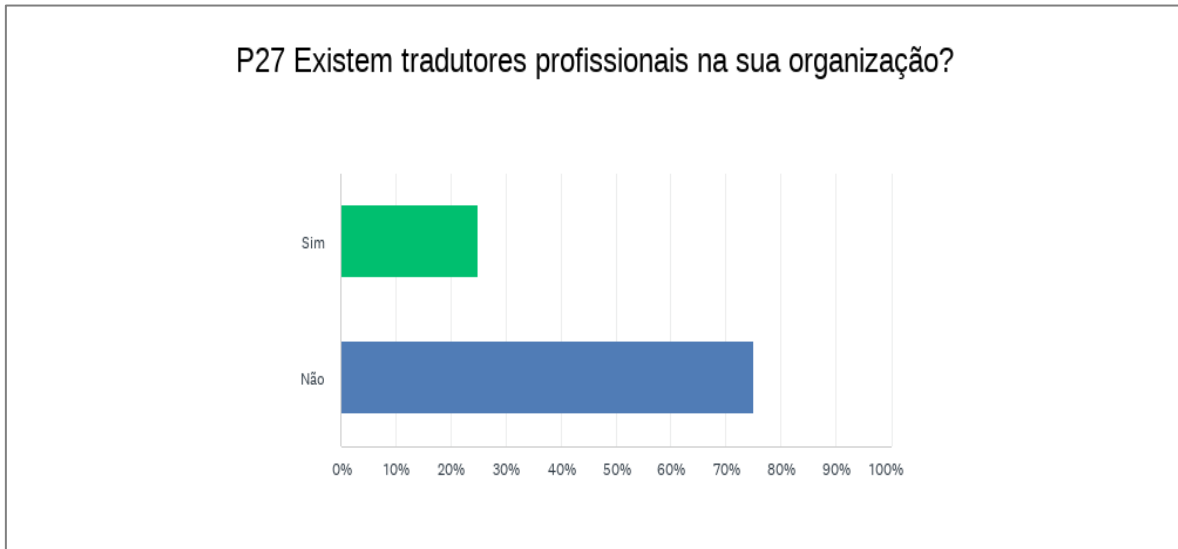
These answers indicate that there is still lack of clarity regarding similarities and differences between the functions of a translator and/or interpreter. This undefinition of expectations can interfere with project budget requirements, defining the appropriate translator/interpreter profile, among other aspects.

Question 26 “How does translation/interpretation contribute to the development of communicative strategies and emergency plans?” resulted in the following information:

- “Accuracy of the message to be passed on”
- “Better knowledge of nuclear science and technology terms, construction of specific terms for the Portuguese language.”
- “Speed and timing in global communications”
- “The use of some material already developed by other organizations”

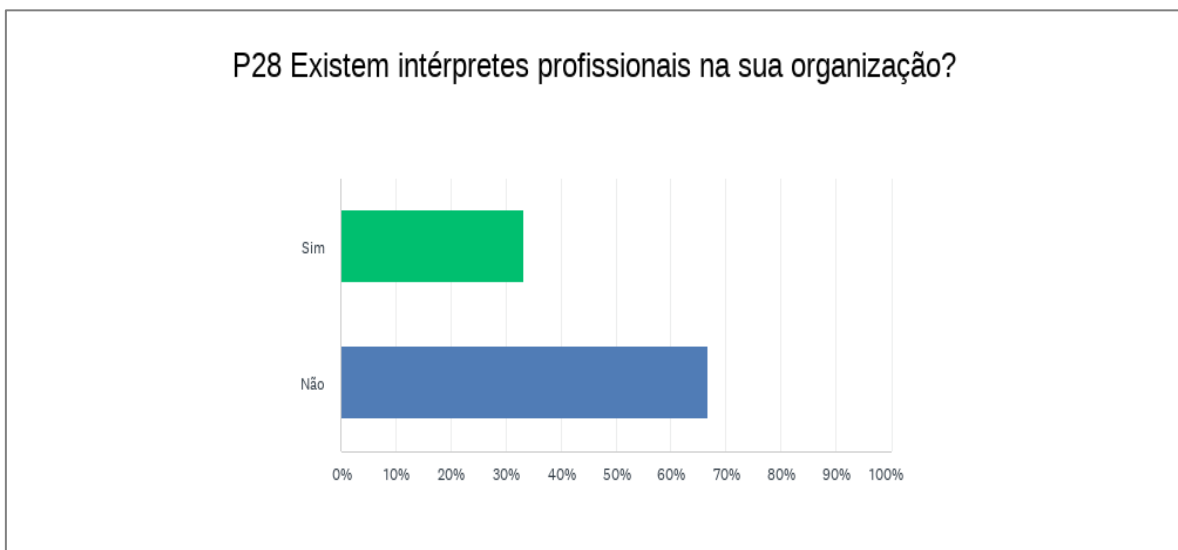
In this case it was interesting to note how knowledge sharing and knowledge development were viewed as potentially enhancing communication strategies. Considering, for example, the costs and budget constraints often encountered to access the information published by the IAEA, sharing products/outcomes of translation has the potential to enhance collaborative learning networks from the TIM perspective.

Interestingly, Question 27 “Are there professional translators in the organisation” provided information which appeared to be inconsistent with the answers given to Question 14 where translation was not perceived as being essential to the organization’s activity yet the RA employs translators.



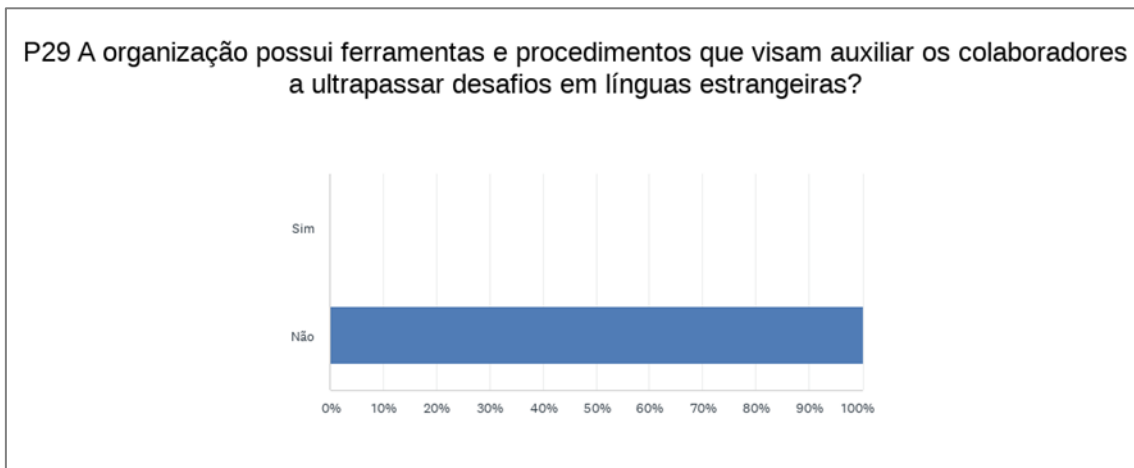
Graph 10. Survey – Regulatory Authorities – Question 27.

The same inconsistency was seen in question 28, “Are there professional interpreters in your organisation?”. Again, despite the statement that that translation and interpretation were not considered essential to the organization’s activities, professional interpreters existed in the RA.



Graph 11. Survey – Regulatory Authorities – Question 28.

Question 29 “Does the organisation have tools and procedures aimed at helping employees overcome foreign language challenges” also presented relevant information for this study as all respondents answered “No”, evincing that despite the need to deal with foreign languages, and an unclear use of translation and interpretation strategies, none of the RAs had internal procedures or tools to assist employees in overcoming issues related to foreign languages.



Graph 12. Survey – Regulatory Authorities – Question 29.

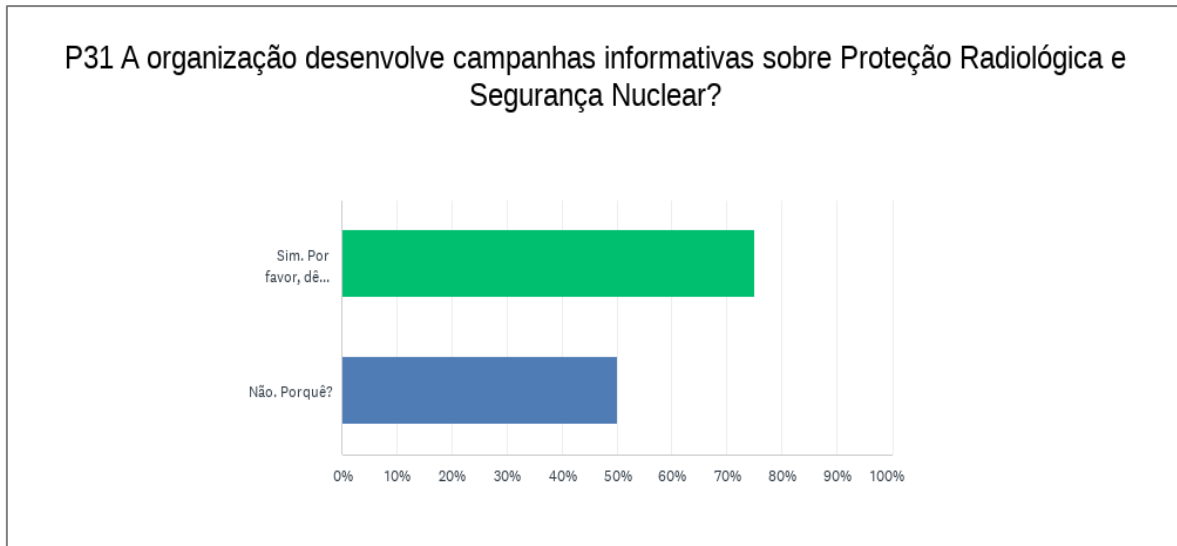
When questioned about “What kind of added value can language professionals bring to the organisation?”, Question 30, respondents answered:

- “Process Improvement”
- “Correct application of terms and translations into Portuguese”
- “International integration and proper globalization”
- “Development of own material based on models already developed in other foreign language institutions”

Interestingly, and much like the case of responses to question 26, there are clearer expectations and broader viewpoints as to what can potentially be gained by a multidisciplinary approach which potentially included language professionals.

While the previous questions were focused on the RAs internal communication needs, Question 31, “Does the organisation carry out information campaigns on Radiological Protection and Nuclear Safety?”, aimed to identify the readership profiles of external audiences with whom

radiological and nuclear information and knowledge would be shared. Responses to this question indicated are represented in Graph 13.



Graph 13. Survey – Regulatory Authorities – Question 31.

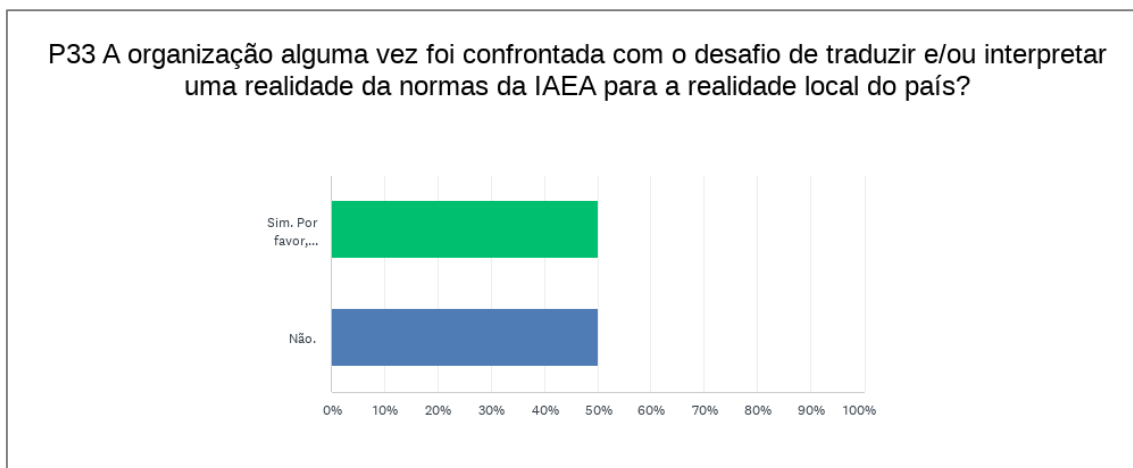
In this case, 1 respondent stated “No”, 2 respondents (from the same RA) answered “yes” and added that the information was disseminated using “Posters, seminars, etc.”, “On CNEN's website there are several publications on the subject - cnenen.gov.br”. Also, one of the respondents stated that despite the dissemination of information at the level of other ministries, dissemination efforts are still insufficient. In-person meetings added to this information that the stage at which the RA found itself, along with the challenges resulting from the lack human resources available to attend to multiple needs, comprised the level of attention that could be given to specific communication aspects. Also, and in order to guarantee accuracy in complying with requirements, sources from other Portuguese-speaking countries were important. The outcome is relevant from the viewpoint of concern with terminological accuracy as the consequence of this strategy results in an interesting combination of terms in European Portuguese and Portuguese from Brazil and in a unique terminology of the field. This seemed to present itself as an interesting opportunity for further research in the field of terminology. Also, the contribution of models with the potential to assist in defining language, translation and interpretation priorities is evident from the viewpoint of TIM.

Aligned with the previous question and communication with external audiences, question 32 looked to identify what the main challenges were when communicating with the public about

radiological protection and nuclear safety. Responses to the question “What are the main challenges the organisation faces when looking to communicate with the public on radiological protection and nuclear safety issues?” were the following:

- “Unawareness of the subject by the public”
- “The complex terminology used in nuclear science, for example how to talk about something that is odourless, invisible, etc, using terms such as Activity, dose, etc.”
- “Fear, association with nuclear accidents, risk perception”
- “Public perception of the theme”

Question 33, “Has the organisation ever been faced with the challenge of translating and/or interpreting a reality of IAEA standards into the local reality of the country”, allowed specificities of local and national realities to be broached.



Graph 14. Survey – Regulatory Authorities – Question 33.

While the 2 respondents from the same RA answered “No”, which would account for 25% of the respondents, the other 2 RAs stated “Yes” (75%), adding that the difficulty was related to “Applicable Standards”. In-person meetings clarified the answer to this question that overall levels of illiteracy in the country, the existence of other viewpoints of the world and co-occurring sources of knowledge presented a very specific challenge for the RA when faced with how to introduce the domain of radiology and nuclear energy. In this particular aspect and context, drawing on strategies such as story-telling already used to address health issues, along with the identification of community leaders whom the populations trusted produced highly productive exchanges. From the viewpoint of TIM, the strategies used in this particular could transfer into other situations, in other

Portuguese-speaking contexts that could comprise “all” the experience generated by different viewpoints enhancing not only communication strategies but also fostering the development of models and tools capable of incorporating such complexity and encouraging co-creative and collaborative multilingual and multicultural capacity-building strategies between experts.

No additional information was shared in the last instance of the survey where respondents were invited to add additional relevant data which may not have been addressed in the previous questions.

5.2.2 Corpus Analysis

The purpose of corpus analysis in this work was to understand, according to readership profiles, how translation and interpretation were addressed in IAEA publications dedicated to the topic of communication. Combined with the data collected from the survey distributed to Portuguese-speaking Regulatory Authorities, it was the expectation of this work that the use of TIM to interpret the data would provide new insights as to how technical and scientific organizations can optimize their communication efforts and transform the processes of translation and interpretation into opportunities to further develop and enhance risk, crisis and emergency communication.

Analysis of the IAEA publications on the topic of communication

The IAEA publications selected for the corpus were those published with a focus on communication with and between experts, with and between stakeholders and third parties involved in nuclear issues and with the public. For this purpose, the 29 IAEA publications listed below were analysed considering, firstly, the readership of experts such as the Regulatory Authorities in Portuguese-speaking countries and, secondly, considering the outcomes of communication recommendations and requirements for the Portuguese-speaking public and for the implementation of multilingual and multicultural communication strategies in Brazil, Mozambique and Portugal.

The list of publications below illustrates the efforts to explicitly address communication with the radiological and nuclear field.

Table 6. IAEA Publications focused on Communication

No.	Publication	Arabic	Chinese	English	French	Spanish	Russian
1	Method for Developing a Communication Strategy and Plan for a Nuclear or Radiological Emergency			X		X	
2	Preparedness and Response for a Nuclear or Radiological Emergency – General Safety Requirements No. GSR Part 7	X	X	X	X	X	X
3	Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards No. GSR Part 3	X	X	X	X	X	X
4	Manual for First Responders to a Radiological Emergency	X		X	X	X	X
5	IAEA-TECDOC-1113 – Safety assessment plans for authorization and inspection of radiation sources			X	X		
6	IAEA report on Enhancing Transparency and Communication Effectiveness in the Event of a Nuclear or radiological Emergency			X			
7	Communication with the Public in a Nuclear or radiological Emergency	X	X	X	X	X	X
8	Communication and Consultation with Interested Parties by the Regulatory Body-GSG-6			X			
9	Arrangements for Public Communication in Preparedness and Response for a Nuclear or Radiological Emergency – GS-G-2,1			X		X	X
10	Fundamental Safety Principles no.SF-1	X	X	X	X	X	X
11	Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency No. GSG-2	X		X	X	X	X
12	Leadership, Human Performance and Internal Communications in Nuclear Emergencies			X			
13	Arrangements for the Termination of a Nuclear or Radiological Emergency – GSG-11			X			
14	Human Factors Engineering in the Design of Nuclear Power plants No.SSG-51			X			
15	IAEA Capacity Building for Nuclear Safety			X			
16	The Nuclear Communicator’s Toolbox ⁸			X			

⁸ The Nuclear Communicator’s Toolbox is only available online.

No.	Publication	Arabic	Chinese	English	French	Spanish	Russian
17	Operations Manual for Incident and Emergency Communication			X			
18	Assessment and Prognosis in Response to a Nuclear Radiological Emergency			X			
19	IAEA Report on Preparedness and Response for a nuclear or radiological emergency in the light of the accident at Fukushima Daiichi Nuclear Powerplant			X			
20	IAEA Response and Assistance network			X			
21	Operations Manual for Incident and Emergency Communication (2012)	X	X	X	X	X	X
22	Pocketbook for medical physicists supporting response to a nuclear or radiological emergency			X			
23	Guidelines on the Harmonization of Response and Assistance Capabilities for a Nuclear or Radiological Emergency			X			
24	Lessons Learned from the Response to Radiation Emergencies 1945-2010	X		X	X	X	X
25	Joint Radiation Emergency Management Plan of the International Organizations (2017)			X			
26	INSAG – Stakeholder Involvement on Nuclear Issues INSAG-20			X			X
27	Communication and Stakeholder Involvement throughout the lifecycle of nuclear facilities			X			
28	Pub 1629 – Communication and Stakeholder involvement in environmental remediation projects			X			
29	Developing the national infrastructure for nuclear power	X		X	X		X

In addition to the publications selected, the languages in which the publications were available was also signalled because they allowed aspects such as the belief “English as the language of science” to be addressed within the context and situationality of crisis communication. By drawing attention to the less observable, less measurable and less objective facets of language, i.e., translation and interpretation, relationships between organizations, stakeholders and the public became clearer, expanding the potential and practical outcomes for more effective decision-making regarding the gaps and vulnerable areas which required more attention.

The choice of analysing the corpus comprised of 24 IAEA publications aimed at drawing on the more objective features of language to provide evidence that the explicit discussion of the role of translation and interpretation in settings such as the IAEA has the potential to bridge the gap between theory and practice, i.e., there are more good practices that can be implemented in the translation domain by the IAEA, within the “IAEA has gone multilingual” motivation than providing a weekly update of the organization’s activities and contents in the six official working languages. To this end, the words in table 7 were analysed in the documents to identify the contexts in which the words “translation”, “translator” or “translators”, “interpretation” and “interpreter” occurred. The findings are presented in Table 7:

Table 7. References to translation in 24 IAEA publications

Word	Occurrence in publications
Translation	18
Translations	26
Translator	1
Interpretation	55
Interpretations	0
Interpreter	0

It was interesting to note that despite the 26 occurrences of the word “translation”, the context in which it occurred was mainly objective, i.e., translation is viewed as an outcome, a process which is separated from a subjective and individual viewpoint and usually included as an end of line service. (See Annex 3) Examples of such sentences are:

“In addition, contracted services for media monitoring, translation, advertising, printing, and audio-visual equipment may be required.” (IAEA, 2012, p. 8)

“Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis.” (IAEA, 2012, p. 5)

This particular sentence occurs in all of the IAEA publications analysed.

If information is received in a language other than English, and if English translations are not readily available from the notifying/reporting State, the IEC produces an unofficial translation of the information to understand the situation. It makes this unofficial translation available to other relevant States and international organizations, but only with the consent of the State that provided the original information. (IAEA 2020, p. 16)

In this example, in addition to the objective view of translation, this particular instance demonstrates the language capabilities non-English speaking Member-States are expected to have during an emergency response in which international cooperation is expected.

“Interpretations” and “interpreter” were not mentioned once, while “interpretation” was mentioned 55 times. (See Annex 4) However, when mentioned, the context of use was not linterlanguage related, as the following sentences demonstrate:

“(…) making summarization and interpretation of results often difficult.” (IAEA, 2014, p. 21).

Table 8 provides data on words which tend to co-occur alongside translation and interpretation and which, in this particular case, provide interesting data when viewed taking into account associative meaning and what is conveyed when words relate to each other. Interestingly, “multilingual” and “multicultural” did not occur in the texts, evidencing a gap which divorces languages from their subjective and inter-subjective realities, and a gap again between the theoretical intention “IAEA has gone multilingual” and practice The word “diverse”, surprisingly, presented a number of occurrences which indicated a level of awareness of diversity, for example, “diverse audiences”, “diverse situations”, “diverse viewpoints”, “diverse means of communication”, among others, with the potential to evolve along a new line of development that could model the integration of diversity for Member-States.

Table 8. Translation and interpretation associated words

Term	Occurrence in publications
Language	191
Culture	89
Multilingual	0
Multicultural	0
Diverse	31
Diversity	3

Analysis of Regulatory Authorities communication channels

The documents provided by the RAs were also analysed taking into account communication with local and national experts and public, while aligning with IAEA responsibilities and obligations. For this particular purpose, the Decree-Laws that establish the scope and action of each RA were analysed. From the viewpoint of TIM, the initial integration of “how” the domain of radiological and

nuclear energy should to be perceived locally and nationally is defined according to each country's legal system, whereby the knowledge domain begins to be framed and made accessible to different audiences. From the TIM viewpoint, the decree-law is where the nature of the relationship between the IAEA and each RA is aligned and integrated with national and local realities, in this way defining a paradigm which is shared between the IAEA community, regardless of the stages, levels and lines at which they may be operating. Also, the number of terms defined in each decree-laws varies, suggesting levels of priority in the definition of the concepts that will regulate meaning within the RA's scope of action.

The decree-laws used for this purpose were those presented in Table 9.

Table 9. Decree-Laws defining Regulatory Authorities scope of action, responsibilities and relevant terms

Country	No. Terms	Decree-Law
Brazil – CNEN	16	Decreto n.º 9.600, de 5 de Dezembro de 2018
Mozambique - ANEA	15	Decreto n.º 67/2009, de 11 de Dezembro – “Regulamento da Agência Nacional de Energia Atómica”
Portugal - APA	110	Decreto-Lei n.º 108/2018 de 3 de Dezembro

Sources: *Lei n.º 8/2017 - Lei de energia Atómica, Moçambique; **Decreto-Lei, 108, 2018, p. 5495, Portugal; *** Glossário do Setor Nuclear e Radiológico, Brazil - CNEN, 2020).

An example of the objective definition provided by the IAEA for the concept of “ionizing radioation”, defined in the IAEA Glossary (IAEA, 2016) as follows:

Table 10. IAEA Definition of “ionizing radiation”

Concept	Definition
<i>Ionizing radiation</i>	When used in IAEA <i>publications</i> , the term radiation usually refers to ionizing radiation only. The IAEA has no statutory responsibilities in relation to non-ionizing radiation. <i>Ionizing radiation</i> can be divided into <i>low linear energy transfer radiation</i> and <i>high linear energy transfer radiation</i> (as a guide to its relative biological effectiveness), or into <i>strongly penetrating radiation</i> and <i>weakly penetrating radiation</i> (as an indication of its ability to penetrate shielding or the human body). For the purposes of radiation protection, radiation capable of producing ion pairs in biological material(s)

Source: IAEA Glossary (IAEA, 2016, p. 137).

The definition available in the IAEA Glossary was then analysed in the decree-laws of the three countries to assess how objective conceptual meaning was translated into Portuguese and if there was any difference between the choices made in each country. The definitions in Portuguese

were then translated into English with the purpose of demonstrating how objective conceptual choices are maintained, or not.

Table 11. Comparison of translations of “ionizing radiation” into Portuguese

Term	Definition (PT)	Definition (EN)	Country
Radiação ionizante (<i>Ionizing radiation</i>)	1. “Significa para efeitos de proteção contra radiações, a radiação capaz de produzir pares iões em materiais biológicos”. *	Means for radiation protection purposes, radiation capable of producing ion pairs in biological materials. *	Mozambique
	2. “a transferência de energia, sob a forma de partículas ou ondas eletromagnéticas, com um comprimento de onda igual ou inferior a 100 nanómetros (nm), com frequência igual ou superior a 3×10 ¹⁵ hertz (Hz), capaz de produzir iões direta ou indiretamente;”. **	the transfer of energy, in the form of particles or electromagnetic waves, with a wavelength of 100 nanometers (nm) or less, with a frequency of 3×10 ¹⁵ hertz (Hz) or more, capable of producing ions directly or indirectly;”. **	Portugal
	3. “Radiação ionizante (ou simplesmente radiação) (es-AR: Radiación ionizante (ou simplemente radiación); en-US: Ionizing radiation (or simply radiation)): qualquer partícula ou radiação eletromagnética que, ao interagir com a matéria, desloca elétrons dos átomos ou moléculas produzindo íons.”. ***	Ionizing radiation (or simply radiation) (es-AR: Radiación ionizante (ou simplemente radiación); en-US: Ionizing radiation (or simply radiation)): any particle or electromagnetic radiation that, when interacting with matter, displaces electrons from atoms or molecules, producing ions.	Brazil

Sources: *Lei n.º 8/2017 - Lei de energia Atómica, Moçambique; **Decreto-Lei, 108, 2018, p. 5495, Portugal; ***Glossário do Setor Nuclear e Radiológico, Brazil - CNEN, 2020.

The findings from this comparative exercise demonstrated that despite the access to the same IAEA resources, translation choices were different. ANEA provided a translation which seems in line with the early stage at which the domain of radiological and nuclear energy is in Mozambique because the country is an early-stage IAEA Member-State (Mozambique became an IAEA Member-State in 2006). APA provides an option which appeared more distant from a human and/or biological approach which may be influenced by public resistance to address the discussion of radiological and nuclear energy. CNEN on the other hand provides an option which has already integrated Spanish, illustrating its experience in communicating about radiological and nuclear energy within its existing nuclear programme.

Another important channel of communication worth analysing were the RAs websites.

Communication with the public – Analysis of institutional websites

Organizational websites were the selected channel of communication with the public because they met with the requirements of representativeness, balance and size of elements to be compared. Exploring the TIM potential, the 4A-Framework was used to assess an important aspect of risk and emergency communication (Federici et al., 2018), namely: accessibility, availability, acceptability and adaptability.

The following websites were analysed:

Table 12. Participant Websites.

Entity	Organizational Website
Agência Nacional de Energia Atômica (ANEA – Mozambique)	Agência Nacional de Energia Atômica (anea.gov.mz)
Agência Portuguesa do Ambiente (APA – Portugal)	Home Agência Portuguesa do Ambiente (apambiente.pt)
Comissão Nacional de Energia Atômica (CNEN – Brasil)	https://www.gov.br/cnen/pt-br

The first distinguishing element prior to the analysis with the 4A-Framework was the fact that the Brazilian and Mozambican Regulatory bodies have independent websites, explicitly acknowledging the existence of a nuclear policy in each country while, in the case of Portugal, issues of radiological and nuclear concern are integrated in the Portuguese Environmental Agency (APA), situating and contextualizing the national viewpoint on the nuclear topic. From the viewpoint of associative meaning, and considering that the TIM places APA in the Lower Right Quadrant, i.e., the quadrant where the interobjective and external materialization of the collective “WE” represents shared values, beliefs, language references (associative) and meaning, among others. From the perspective of translation, it is relevant for the translator to understand the implications for associative meaning when this particular knowledge domain is formally referenced within the ecosystem of environmental issues because «risk», «protection» and «emergency», for example, will more likely be associated to environmental hazards than, for example, with the benefits of nuclear technology applied within the health sector where, interestingly, nuclear medicine is used for diagnosis and treatment purposes of cancer. TIM demonstrates that the movement of associative meaning, for example, from environment to health, has the potential to open paths of dialogue about risk in general, encouraging public debates on, for example, the development of risk literacy, namely by distinguishing «absolute risk» from «relative risk».

The application of the 4A-Framework meets with IAEA requirements regarding the obligation to make information available and accessible to numerous target audiences, while safeguarding the appropriate localization of content according to culture. In this regard, the analysis of the organizations' websites provided the following findings.

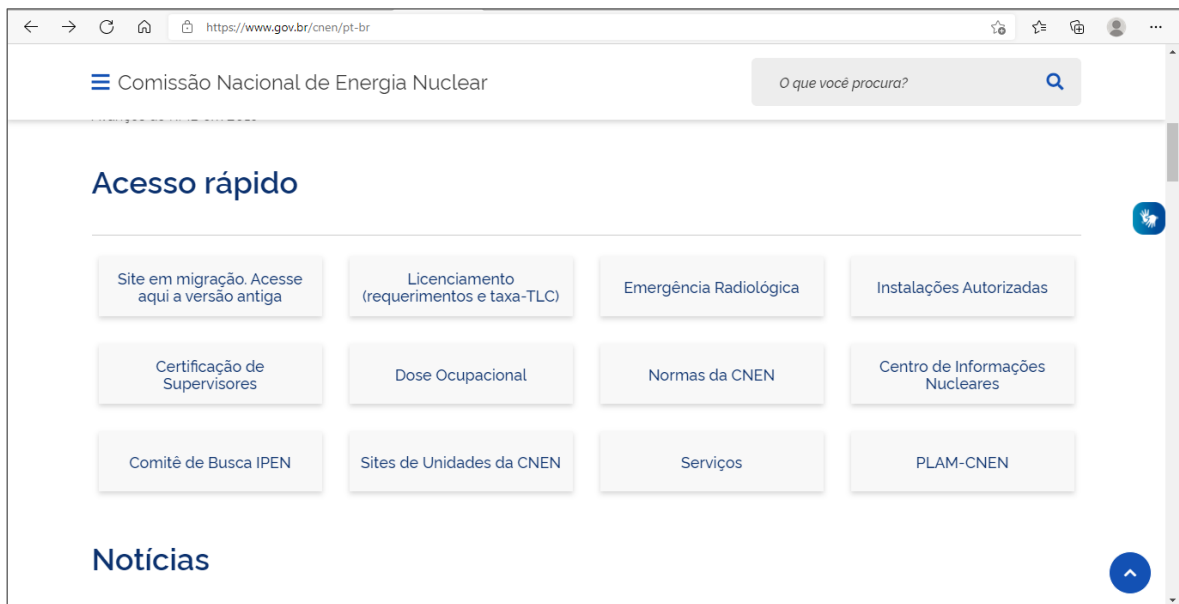


Figure 13. CNEN fast access topics.

Although CNEN does have a Facebook page, the level of activity is very low and has collected to date only negative feedback from the public. When unattended, a social media page can become a potential source of misinformation and/or of conflict between the organization and the general public.

This clearly illustrates that organizations need to have the necessary resources not only to create channels of communication, but also to maintain the levels of activity and monitor feedback.

In the case of Portugal, the integration of the Regulatory Body within an Environmental Agency gives rise to very specific challenges in the field of radiological and nuclear risk and emergency communication.

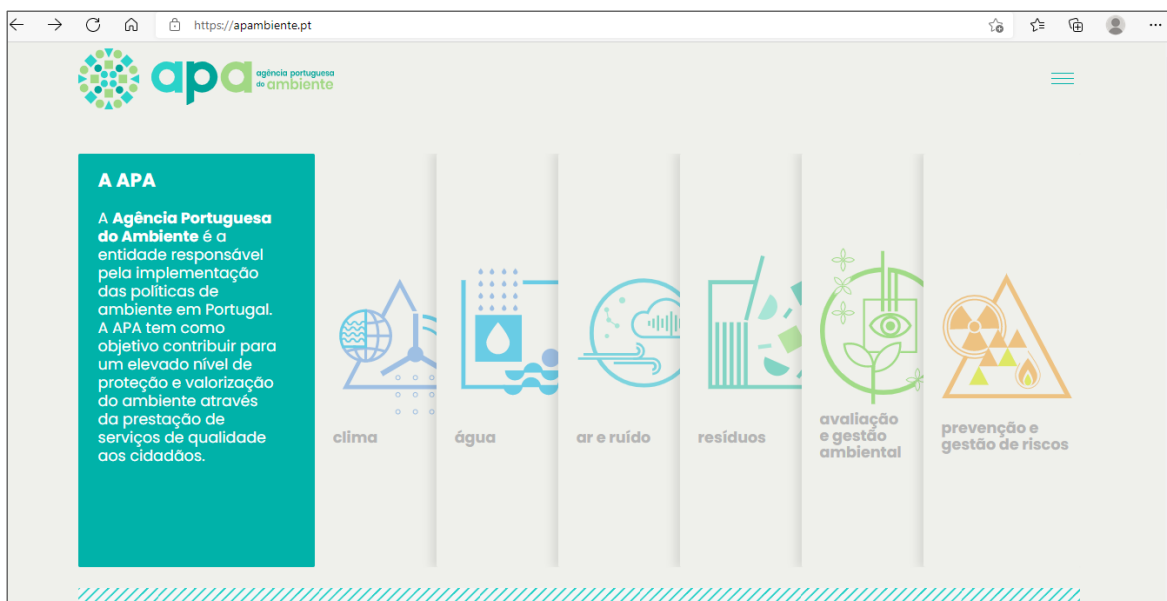


Figure 14. APA Homepage.

As the image above illustrates, radiological and nuclear are not explicitly addressed. Access to radiological emergencies is not immediately identifiable and the keyword «nuclear» is not used. Messages and information are carefully tailored in a clear attempt, from the viewpoint of TIM, to actively contribute to a more informed nuclear narrative. TIM also demonstrates that there is still a prevalence of a centralized approach whereby the dynamics remains essentially from the accredited expert to the public. As discussed previously, APA operates in an ecosystem which is predominantly hostile to the nuclear topic, leaving social media with an arena where the pendulum between quadrants clearly illustrates how the Lower Left Quadrant of values, beliefs, meanings, can strongly impact on the collective ability to relate and discuss topics which are informed by associative meaning. In the case of APA, this results in the delivery of highly technical information combined with the need to remain aligned with the overall organization values which aim at providing a high level of protection and valorization of the environment: “A APA tem como objetivo contribuir para um elevado nível de proteção e valorização do ambiente através da prestação de serviços de qualidade aos cidadãos.” (APA, n.d.).⁹

⁹ “APA aims to contribute to a high level of protection and enhancement of the environment through the provision of quality services to citizens.”

The strong environmental focus will necessarily have implications on associative meaning as «risk», «safety», «protection» will co-occur with other terms and concepts available for translation purposes.

ANEA has an informative site which aims at providing definitions on fundamental concepts and procedures which assist in the regulation, licensing and supervision of activities with radiological and nuclear risk. The site does not have an English version and/or a version in other languages.



Figure 15. ANEA website.

ANEA is the only organization which invites the general public to follow it on social media, namely on Facebook.

From the TIM perspective, the following findings are relevant considering that Websites are the preferred channel of communication with the general public:

Table 13. Comparison of Participating Organizations’ websites.

Comparison of websites
<ol style="list-style-type: none"> 1. Organizational websites remain aligned with the traditional “accredited expert” model. 2. Communication using other social media platforms remains incipient 3. The organizations websites do not have readily available information in foreign languages, with the exception of APA 4. CNEN has integrated accessibility mechanisms (namely through sign language) encouraging the participation and dialogue with more sectors of the public 5. The combined analysis of the 4A-Framework and TIM demonstrate that there is an awareness that dialogue with the public is important, materialized in FAQs, contact lines, emails, submission of forms, etc. yet it is clear that the communication remains from the direction of the Regulatory Body to the public 6. The nature of the information available demonstrates different national approaches to «nuclear» varying from the already extensive active nuclear programme in Brazil, to the regulation of specific practices and activities in Mozambique, to the integration of the topic of nuclear within an environmental oriented programme.

These findings are relevant from the TIM perspective because the model can inform the organizations on the direction they are navigating towards and the potential inconsistencies which can result from certain options.

In the case of Mozambique, for example, the organizational website requires complementary materials (pamphlets, newspapers, magazines, among others) in order to inform populations with low or inexistent levels of scientific and technological literacy about radiological and nuclear risks. Hence the challenge of communicating about a risk which “cannot be seen or smelled” and where, for example, in water deprived communities prohibiting the consumption of potentially contaminated water would undoubtedly create additional levels of concern. While the formal criteria are accomplished through the creation of a website for example, effective emergency response relies heavily on the population being risk literate.

It is worth noting that during the development of this research, both APA and CNEN reformulated and updated their websites with the aim of improving communication channels with the public.

Table 14. 4A Framework Standard Analysis of the Participating Organizations’ websites.

4A Framework Standards Analysis of Organizations’ Websites			
Standard	Brazil	Mozambique	Portugal
Availability	NO	NO	NO
Accessibility	YES	YES	NO
Acceptability	N/A	YES	N/A
Adaptability	YES	N/A	N/A

The use of the 4A-Framework was an interesting exercise because as defined by Federici et al. (2018), the adapted standards for translation are more directed to emergency communication procedures and require, in our opinion, a revision, to include the preparedness stage.

Interestingly, in the case of Brazil, although the standard “Accessibility” was not materialized on the CNEN site as a foreign language, the site meets, to an important degree, the requirement of accessibility in the case of individuals with specific needs, namely visual and auditory needs. The site is, when compared with the APA and ANEA websites, the most informative with regards to the broadness of the spectrum of activities related to nuclear, with direct open channels to interact with different stakeholders in all the areas of the organization, serving not only as an opportunity facilitator (training, seminars, information updates, publication releases, among others) but as a continuous information provider on the topic of nuclear energy. Also, it is the only site that provides an emergency contact number.

5.3. Discussion of findings

As mentioned in the contextualization and relevance of this work, translation and interpretation remain understudied areas in the field of multilingual and multicultural risk, crisis and emergency communication as stated by O’Brien and Federici (2020, p. 129), “(...) the breadth of social and economic impact of communication in multilingual, transborder as well as national crises remains understudied.”. O’Brien and Federici (2020), supported by the research of other scholars in the field of crisis translation, have contributed to highlight the impacts of the myth that English is “understood by everyone.” The data provided by the New Zealand government as a result of the Grenfell Tower fire, states that the “overreliance on everybody’s (degrees of) competence in English delays engaging with the ‘perennial issue’ of crisis communication among international responders and with the crisis-affected communities (New Zealand Government)” (O’Brien & Federici, 2020, p. 130). The assumption that English is a language the majority of individuals is

familiar with is a risk which is amplified in a crisis and emergency. By placing translation and interpretation within Alexander and Pescaroli's "cascading disaster" paradigm, O'Brien and Federici insist on the "how the study of communication in crises settings has to be a cross-disciplinary endeavour through which the impact on all subsystems can be assessed to address some vulnerabilities." (O'Brien & Federici, 2020, p. 3). Adapting the work of Sellnow and Seeger, O'Mathúna and Hunt (2020) define crisis translation "as the act of transferring meaning and cultural encodings from one language/cultural system to another, either in written, oral, or signed modes, before, during or after a crisis" (O'Mathúna & Hunt, 2020, p. 176). The INTERnAtional network on Crisis Translation (INTERACT) contributes with a definition very much aligned with that of the previous authors where CT is understood as:

(...) the translation of written information from one linguistic and cultural system to another in the context of a crises scenario, with a view to enabling affected communities and responders to be prepared for crises, improve resilience and reduce the loss of lives. (European Commission, n.d.)

Here, INTERACT proceeds to state that:

Due to the transboundary nature of modern day crises, crisis communication must be multilingual and multilingual crisis communication is enabled through translation. Multilingual information access through translation addresses work programme aims such as social fairness and democratic access to essential information for all. (European Commission, n.d.)

Prior studies have contributed to through case-studies to highlight translation and interpretation in real-life scenarios, supporting the argument for more explicit and formal institutional attention to the role of translation and interpretation. In the comparative analysis of five national approaches to language translation during a disaster, O'Brien et al (2018) focus on the importance of including translation and interpretation in national policy as a right and proposing the training of local volunteer translators and interpreters as an emergency response and mitigation approach. For this purpose, the 4-A model is presented. Cadwell & O'Brien (2016) contribute to the field with a case-study that proposes an ecosystemic ICT model for translation in disaster settings that models the relationships between culture, language and translation, using the empirical data from the 2011 Great East Japan Earthquake. Todorova (2018) discusses the role of translation in the post-war context of countries of South East Europe. Here, the appearance of new actors such as civil-society organizations gave rise to specific challenges with the public with regards to the notion of "civil society". Todorova argues to this respect that "the dissemination of the basic

concepts of civil society is not simply a matter of conceptual and discursive import from the West and adjustment to it by CSO actors in the East". Public perception is also related "with the fact that its transitional political discourse was one of translation." (Todorova, 2016, p. 353).

Although prior studies and ongoing research continue to substantiate the importance of translation and interpretation in the context of risk, crisis and emergency communication, little was found regarding how organizations can integrate and operate existing translation and interpretation theories into their practices and procedures within and across the organizations. A gap was also found on how TSOs could explicitly consider associative meaning within risk, crisis and emergency planning.

This study set out to address the abovementioned gaps through the lens of the Translation-Integration Model (TIM).

The findings in this study suggest that the translation and interpretation challenges described by the participants reflect differences between levels (different layers of expansion), lines (directions of development and growth), states (temporary phase of reaction and interaction with a given reality) and types (an instance which is not open to change).

Type here is represented by IAEA membership requirements, i.e., to be an IAEA Member-State entails acceptance of the relational requirements in order to belong to a given community. From the viewpoint of T&I, this implies accepting non-representation through language, other than through translation and interpretation, for the countries that have official languages that are not those of the 6 IAEA official working languages. The outcome of such a choice therefore involves taking responsibility for the aspects which can be compromised and/or compromise community relationship. From this viewpoint, the specificities of each Member-States will surface through language in ways that are coincidental with the level, line and state of each country. The prevalence of English as the language of IAEA publications (Table 6) is also determined by the IAEA status as the world's centre for collaboration on issues of nuclear energy. Also, the narrative of "atoms for peace" becomes not only an individual organizational perspective, but also the collective narrative of its members.

Another important finding was related to the outcome of IAEA membership for the Portuguese-speaking Regulatory Authorities (RAs) with regard to competence in foreign languages. IAEA membership requires communication agility, i.e., communication strategies that enable the RAs to uphold their relational obligations, in, at least, Portuguese and English (Graph 3). However, as seen in the findings, RAs need to hold capabilities in more than these two languages (Graph 4)

because any one of the official languages may be used by the IAEA to disseminate information and knowledge. Informal meetings with the participants further added that translations that were made available in other languages (either by the IAEA or by other Member-States) were also consulted to clarify doubts resulting from the English versions because access in a timely manner to translations impacted on the RAs' activity (Graph 8). This fact ties into the findings from O'Brien et al. (2020) regarding the generalized belief that English is a language spoken and/understood by most people. Such an assumption holds risks of its own because, in the case of the participants in this study, competency in foreign languages is not an organizational requirement (Graph 7). From the TIM perspective, it is possible to suggest that the lack of foreign language competency may result in misaligned T&I expectations which tie into the data from Graph 12 which indicates that none of the organizations possess strategies or tools to assist people with individual foreign language challenges. The contexts and situations in which foreign languages are used were clearly indicated as being of an institutional nature and predominantly for the IAEA as listed in the results from question 16.

Results also point towards an objective and external perception of T&I by RAs because respondents tended to assess T&I according to the accuracy with which conceptual meaning was conveyed. This result was elicited from the answers to questions 21-25. Respondents repeatedly mentioned "technical terms and definitions", "terminologies", "concepts that fully adhere to the original texts", "better knowledge of nuclear science and technology terms", among others. With T&I being assessed at the level of conceptual meaning, it was however interesting, to compare the definitions of the concept of "ionizing radiation" where each country provided a different definition (Table 11). While it might be argued that experts would understand that all definitions refer to the same concept, from the view of T&I, consistency within the field is important in order to meet T&I expectations with regard to conceptual accuracy. Conceptual Metaphor Theory allows the overlapping of conceptual meaning and associative meaning to be identified on the borders of the Upper-Right and Lower-Right quadrants when RAs are required to communicate with the public. Responses to question 32 indicated that the main challenges the RAs face when communicating with public are the public's lack of awareness of the subject, the complexity of the topic (an assumption repeated frequently in IAEA publications), fear, among others. It seems possible to state that such challenges will prevail if the perceptions of effective communication strategies remain at the level of conceptual accuracy, consequently overlooking associative and its important role in identifying the areas where RAs can provide additional information, in this way increasing scientific literacy and risk perception. Complementing this finding is the fact that 75% of the

respondents indicated having already experienced difficulties in translating and/or interpreting IAEA information into their local realities. One of the respondents stated that the domain of radiological and nuclear energy was not only being translated into Portuguese but also transferred into the sphere of local knowledge, with one of the challenges consisting in the introduction of the notion of “invisibility” when addressing topics of contamination (Questions 32 and 33). Although the official language is Portuguese and therefore information can be exchanged, local and national acceptance and operationalization of the domain will be dependent on the local experience with the domain of radiological and nuclear energy.

The relevance of proposing tools and methods to assist in integrating associative meaning is further highlighted by the findings of the corpus analysis. Of the 29 IAEA publications analysed (Table 6), only 4 are available in the 6 official IAEA languages, 11 in Russian, 10 in French, 9 in Arabic and 5 in Chinese. While it was not possible to better understand IAEA translation decisions in this area, the opportunity to promote the ambitious growth and development of public knowledge of the field seems to be lost. Also, it might be suggested that there is the expectation that each Member-State will take on its responsibility to deal with the information provided by the IAEA as considered appropriate for national setting.

Overall, the results in this study indicate that the RAs have concrete opportunities to grow and enhance their communication strategies with models, tools and theories that materialize the developments in translation and interpretation research. Also, given that local and national organizations play a critical role in guaranteeing international cooperation, it is important that more research be developed in the field of associative meaning.

5.4. Conclusions

From the perspective of TIM, the findings in this study suggest that the translation and interpretation challenges reflect differences between levels (different layers of expansion), lines (directions of development and growth), states (temporary phase of reaction and interaction with a given reality) and types (an instance which is not open to change).

Type here is represented by IAEA membership requirements, i.e., to be an IAEA Member-State entails acceptance of the relational requirements in order to belong to a given community. From the viewpoint of T&I, this implies accepting non-representation through language, other than through translation and interpretation, for the countries that have official languages that are not

coincident with the 6 IAEA official working languages. The outcome of such a choice therefore involves taking responsibility for the aspects which can be compromised and/or compromise community relationship. From this viewpoint, the specificities of each Member-States will surface through language in ways that are coincidental with the level, line and state of each country. The prevalence of English in this context is therefore a choice of the IAEA and the narrative of “atoms for peace” becomes not only an individual organizational perspective, but also the narrative of its members.

Another important finding was related to the impact of IAEA membership on the Portuguese-speaking Regulatory Authorities (RAs) from the perspective of language. IAEA membership requires communication agility, i.e., communication strategies that enable the RAs to uphold their relational obligations, in, at least, Portuguese and English. However, RAs need to hold capabilities in more than these languages because any of the official languages may be used to disseminate information and knowledge.

Apparent from the results is also the lack of clarity on how to approach translation and interpretation in the context of each RA. Although the RAs may reflect different directions of development and growth within the field of nuclear energy, the varied responses around expectations regarding T&I suggest that the developments in the field of translation and interpretation studies are struggling to reach contexts in which they can be applied.

Summary

Chapter 5 presented the findings from the case-study which focused on the translational relationship between the IAEA and the Portuguese-speaking Regulatory Authorities from Brazil, Mozambique and Portugal and some potential outcomes for the general public.

The key findings suggest that translation and interpretation challenges reflect relational expectations, obligations and responsibilities between organizations and their roles as members in communities such as the IAEA. One such relational expectation, obligation and responsibility is that of translation and interpretation. Each Member-State will need to take responsibility to ensure that the information and knowledge disseminated by the IAEA is integrated, as needed, into the reality of local and national realities. This responsibility pushes Member-State’s to endeavour to grow and develop according to their chosen directions of development and growth within the field of

radiological and nuclear energy. However, IAEA membership binds the RAs in their response capabilities should international cooperation be called upon.

TIM contributed to address the complexity of TSO translational exchanges by highlighting critical points and indicating potential transversal effects and outcomes, allowing translation and interpretation theories to potentially become an option in the practical settings in which Regulatory Authorities are required to make language-based decisions.

Conclusions

This chapter will conclude the study by summarising the key research findings in relation to the research aims and questions proposed as the motivation for this research. Then, the contributions and value of this work to the field of crisis translation and risk, crisis and emergency communication will be discussed. Lastly, the limitations of the work will also be presented, along with opportunities for future paths of research.

This thesis aimed to answer the following research questions:

1. How can translation and interpretation contribute to enhance communication strategies within and across technological and scientific organizations and, in due course, with the non-specialist public?
2. How can risk, crisis and emergency planning benefit from tools and models that address associative meaning?

To answer these questions which acknowledged the inherently complex nature of international and national technological and scientific translational exchanges, i.e., between experts and with the non-specialist public, a Translation-Integration Model (TIM), based on Integral Theory (i.e., the AQAL map) was proposed. By using the quadrant approach to identify the subjective/objective and individual/collective dimensions of a phenomenon, the expectation was that TIM would contribute to identify relationships, connections and areas where different methodologies, tools and theoretical approaches and perspectives could assist in designing more holistic and comprehensive communication solutions. To assess the applicability of TIM in such circumstances, a case-study approach was selected with the intention of analysing real challenges that TSO faced in multilingual and multicultural risk, crisis and emergency communication. The field of radiological and nuclear expertise was chosen as an illustrative example of how the intricacy of language relationships and behaviours surfaces in and through the processes of translation and interpretation where agency and practical outcomes are the objectives. The case-study therefore included the International Atomic Energy Agency (IAEA) and the Regulatory Authorities (RAs) of three countries that have Portuguese as their official language: Brazil, Mozambique and Portugal.

The study has shown that there are different stances with regard to the role of translation and interpretation at the levels of the relationships between the IAEA and the Regulatory Authorities, and at the level of freedom to choose the language in which to communicate. The IAEA disseminates information and knowledge in six official languages, with a significant prevalence of

English over the other five languages, and has the authority (as the world's centre for cooperation on nuclear issues) to determine which language is to be used by IAEA Member-States to communicate with the Agency. The RAs, on the other hand, by opting to become an IAEA Member-State, acknowledge that there will be the need to integrate information and knowledge in English and, when available, through the other five official languages, whenever the official language of their country is not one of the IAEA official working languages. The outcome for these Member-States is not negotiable and actually entails the need to create local and national capabilities to participate in and maintain the institutional relationship.

The findings regarding the RAs capabilities in accommodating the integration of information and knowledge in foreign languages suggest that the role of translation and interpretation is miscellaneous. The RAs continue to perceive translation and interpretation as objective, external processes with the overall purpose of guaranteeing the accuracy of conceptual meaning between languages. The lack of clarity on what to look for in a translator and/or interpreter suggests that expectations will be harder to meet because the only reference, on this matter, provided by the IAEA, for example, is the indication to adapt IAEA material into local and national languages.

One of the most surprising findings to emerge from this study was the general absence of explicit reference to translation and interpretation in the IAEA publications dedicated to "Communication". The explicit mention with regard to language usage encountered in the IAEA publications that were analysed was the indication of the need to use English to communicate with the Agency.

The most obvious finding to emerge from the results of the study is that Member-States whose official languages(s) are not the official working language of international organizations can benefit from defining explicit language policies, where translation and interpretation are optimized, with the additional contribution of language-based research. TIM, for example, can assist in enhancing communication strategies within and across the TSOs but also identify the areas where greater tensions and conflicts may lay either at the level of language, or at the level of the relationship between the TSOs, by affording a clearer understanding of the RAs language status, capabilities, and the costs involved in participating in organizational relationships such as those fomented by the IAEA.

Regarding the benefits of tools and models which optimize associative meaning for risk, crisis and emergency purposes, TIM allowed the relational and collective subjective dimensions between the IAEA and the RAs to surface and to be discussed in a more tangible manner. Greater clarity on

the relational aspects, namely the impact of hierarchy, generated more focused discussions. However, it was not yet possible to clearly demonstrate how effective TIM would be to this end because it was not possible to test the model in a real context. This is, however, the next step this research would like to take.

This study contributes to the field of crisis translation by proposing the Translation-Integration Model (TIM) as one of the approaches to address the complexity of dynamic relationships between organizations that are required to cooperate internationally, in order to effectively respond to local and national emergencies. From the viewpoint of its practical outcomes, TIM's quadrant-approach has the potential to assist TSOs in defining and refining communication strategies based on a view of the broader outcomes of language-related decisions.

In addition to TIM, a specialized bilingual glossary was compiled for APA by drawing on the terms defined in the 2018 Decree-law that established APA as the Regulatory Authority for Portugal, and aligning it with the IAEA Safety Glossary. The glossary was validated by APA, and it provides an opportunity for collaborative exchanges and an opportunity for the parties involved to share the developments in each person's field of expertise. The glossary is an open tool with the potential to grow with the organization's needs, to integrate term equivalents and synonyms from other Portuguese speaking countries.

By creating diverse tools and integrating the variants from different Portuguese-speaking cultures into this glossary, an opportunity arises for other applications of this knowledge, for instance, in the localization of technology or in technical writing in the field. Instruments of this nature provide opportunities for individuals who are competent in their local and national setting to be able to operate under more varied circumstances because the terms have been made available in the country's language(s). This need is all the more cogent when we consider the strong migrational flows among Portuguese-speaking countries and how competence in English is very often faulty and variation in Portuguese needs to be considered.

The benefits for risk, crisis and emergency response also increase, represented in TIM by the spiral dynamic between quadrants.

The compilation of the corpus for this study can also be optimized to align RAs communication responses with the IAEA and also an interesting starting point for technological applications which can assist is providing faster feedback both to the IAEA in English, and also to different Portuguese-speaking stakeholders.

While this study focuses on the findings from only three countries, these participants are relevant from the viewpoint of the IAEA community and of the CPLP. Here too, in the case of the CPLP, by integrating a subjective, individual and collective dimension into Portuguese-speaking response the entire CPLP is involved, because access to new sources of knowledge are necessarily activated when, within the same language, different variants are considered, to address the same phenomenon.

Finally, a certain number of limitations to the study need to be considered. The first, and maybe the most important limitation of the work is the attempt to design and operate a model to concentrate on the complex realities of crisis translation from an all-encompassing viewpoint. The integral approach can make it difficult to decide which theories, models and perspectives to include, and which to leave out without compromising the goals of the research. This was particularly challenging when addressing associative meaning the analysis of which, ideally, should be applied to texts that are more geared towards the general public and richer in register variance, so that generalisable results can be found.

Another limitation is related to data collection and analysis techniques. As proposed by Integral Methodological Pluralism, the results of the study would have benefitted from a broader sample of participants and additional sources of information. In addition to finding the balance between the number of paths that appear when using TIM, an opportunity to test TIM within the context of the RAs would also have been advantageous. The constraints resulting from the COVID pandemic limited the opportunities for fieldwork which would have been valuable for the outcomes of this work.

A third limitation of the study is the potential bias of the researcher whose translation and interpretation experience in the field of radiological and nuclear energy may be overlooking aspects that need to be further explored, in order to make TIM a more valuable asset to TSO, translators and interpreters, and therefore allowing TIM to become a more generalisable model.

Notwithstanding these limitations, the study suggests that there are opportunities to develop collaborative practices in the field of language with organizations such as the Regulatory Authorities that participated in the case-study. The opportunities will be pursued in the hope that TIM can be transferred and applied in real settings.

This research has generated more questions in need of investigation, namely on how to further address and integrate the individual/collective and internal/external aspects of viewpoints from non-western cultures into risk, crisis and emergency response. In the case of this work, an

attempt was made to carry out a cross-national study to compare the Regulatory Bodies. More research is needed, however, to determine how the specificities of the experience of the individual RAs can contribute to leverage the multicultural and multilingual response capabilities from the perspective of the CPLP.

The practical implementation of TIM also requires additional research to determine whether it can be applied to education and for training purposes in preparing translators and interpreters and also for non-linguist specialists, like health workers, who are required to communicate in risk, crisis and emergency settings.

This research was carried out at a time when multilingual and multicultural risk, crisis and emergency communication and translation were pushed to the forefront internationally as a result of the COVID-19 health pandemic. The fact that the pandemic was a global experience which people can relate to, individually and collectively, encourages the thought that there will be greater disposition to promote more in-depth discussions on the integration of technical, technological and scientific knowledge as one of the knowledge systems to address in risk, crisis and emergency communication and crisis translation.

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Annexes

ANNEX 1 – Regulatory Authority Survey (in English)

Questionnaire for Nuclear and Radiological Regulatory Bodies

1. Which of the following best describes your organization?

- Regulatory Body
- Association
- Department
- Laboratory
- Other (please specify)

2. In your organization, how many professionals work in the sector dedicated to Radiological Prevention and Nuclear Safety?

- 0-5
- 6-15
- +20
- +50

3. What are the main responsibilities of the organization?

4. How many professionals are dedicated to radiological and nuclear emergency response planning?

- 0-5
- 6-15
- +20
- +50

5. Who are the organization's target audiences regarding radiological protection and nuclear safety?

- Legislators
- Public industry
- Private industry
- Health service providers (hospitals, health centres,...)
- Public order and safety authorities (firefighters, civil protection, armed forces, police,...)
- Schools and other education entities
- Other (specify)

6. What are the main communication channels used by the organisation to communicate about radiological protection and nuclear safety?

- Institutional website
- Social networks (Facebook, Instagram, Whatsapp, Twitter, newsletter,...)
- Publications (newspapers, magazines, pamphlets, brochures,...)
- Community entities and representatives (religious meetings, community councils and other local organisations)
- Schools and other education entities

- Cultural events (theatre, art exhibitions and other artistic forms of expression)
7. Does the organisation have a specific communication plan for radiological and/or nuclear crisis and emergency situations?
- Yes
 - No
 - Other (specify)
8. Does the organisation have a communication team trained to interact with the different audiences in the case of radiological and/or nuclear crises and/or emergencies?
- Yes
 - No
9. Does the organization have a Public Information Officer (PIO) for crisis and emergency scenarios?
- Yes
 - No
 - Other
10. What are the organisation's communication risks?
11. How does the organization plan to mitigate the risks listed in question 10?
12. What are the primary communication challenges the organization faces?
13. How does the organization overcome, or plan to overcome, the challenges listed in question 12?
14. Does the organisation depend on information in foreign languages to carry out its activities? Please provide some examples (legislation, guidelines, agreements, etc.)
- Yes
 - No
15. Which IAEA working languages does the organisation use to access the information it needs?
- Arabic
 - Chinese
 - Spanish
 - French
 - English
 - Russian
 - Other (please specify)
16. Which situations require the organisation to communicate or produce information in foreign languages?
17. Does the organisation use translation services?
- Yes
 - No

18. Does the organisation use interpretation services?

- Yes
- No

19. Does the organisation have a language policy regarding levels of proficiency in foreign languages that may determine admission into the organisation?

- Yes
- No

20. Does access to timely translations impact on the organisation's activities?

- Yes. Why?
- No. Why not?

21. What are the main communication challenges the organization faces when receiving information in foreign languages? Select all that apply.

- Inappropriately translated/interpreted message
- Target audience's perceptions of the topic
- Inability to translate/interpret a message for a particular target audience
- Different interpretations of basic concepts
- Other (please specify)

22. Please list 5 essential requirements when choosing a translator.

23. Please list 5 essential requirements when choosing an interpreter.

24. What are the main translation challenges in the field of Radiological Protection and Nuclear Safety?

25. What are the main interpretation challenges in the field of Radiological Protection and Nuclear Safety?

26. How does translation/interpretation contribute to the development of communicative strategies and emergency plans?

27. Are there professional translators in the organisation?

- Yes
- No

28. Are there professional interpreters in your organisation?

- Yes
- No

29. Does the organisation have tools and procedures aimed at helping employees overcome foreign language challenges?

- Yes
- No

30. What kind of added value can language professionals bring to the organisation?

31. Does the organisation carry out information campaigns on Radiological Protection and Nuclear Safety?

- Yes. Please provide some examples.
- No. Why not?

32. What are the main challenges the organisation faces when looking to communicate with the public on radiological protection and nuclear safety issues?

33. Has the organisation ever been faced with the challenge of translating and/or interpreting a reality of IAEA standards into the local reality of the country?

- Yes. Please provide some examples.
- No

34. Should there be any additional information that has not been addressed in this questionnaire and that you consider important for the current study, please use the space below for that purpose.

Thank you very much for your collaboration.

ANNEX 2 – Regulatory Authority Survey (in Portuguese)

Questionário Entidades Reguladoras

1. Qual das seguintes designações melhor descreve a sua organização?
 - Entidade reguladora
 - Associação
 - Departamento
 - Laboratório
 - Outro (especifique)

2. Na sua organização, quantos profissionais trabalham no setor dedicado à Prevenção Radiológica e Segurança Nuclear?
 - 0-5
 - 6-15
 - +20
 - +50

3. Quais são as principais responsabilidades da organização?

4. Quantos profissionais estão dedicados ao planeamento de resposta a emergências radiológicas e nucleares?
 - 0-5
 - 6-15
 - +20
 - +50

5. Quem são os públicos-alvo da organização no que se refere a proteção radiológica e segurança nuclear?
 - Legisladores
 - Indústria pública
 - Indústria privada
 - Prestadores de serviço de saúde (hospitais, centros de saúde,...)
 - Autoridades de ordem e segurança pública (bombeiros, proteção civil, forças armadas, polícia,...)
 - Escolas e outras entidades de ensino
 - Outro (especifique)

6. Quais são os principais canais de comunicação utilizados pela organização para comunicar sobre proteção radiológica e segurança nuclear?
 - Site institucional
 - Redes sociais (Facebook, Instagram, Whatsapp, Twitter, newsletter,...)
 - Publicações (jornais, revistas, panfletos, brochuras,...)

- Entidades e representantes comunitários (reuniões religiosas, juntas comunitárias e outras organizações locais)
 - Escolas e outras entidades de ensino
 - Eventos culturais (teatro, exposições de arte e outras foras de expressão artística)
7. A organização possui um plano de comunicação específico para situações de crise e emergência radiológicas e/ou nucleares?
- Sim
 - Não
 - Outro (especifique)
8. A organização tem uma equipa de comunicação treinada para interagir com os diferentes públicos em caso de crises e/ou emergências radiológicas e/ou nucleares?
- Sim
 - Não
9. A organização possui um Oficial para a Comunicação Pública (Public Information Officer – PIO) para cenários de crise e emergência?
- Sim
 - Não
 - Outro
10. Quais são os riscos comunicativos da organização?
11. De que forma planeia a organização mitigar os riscos listados na pergunta 10?
12. Quais são os principais desafios comunicativos que a organização enfrenta?
13. De que forma é que a organização ultrapassa, ou planeia ultrapassar, os desafios listados na pergunta 12?
14. A organização depende de informação em línguas estrangeiras para desenvolver as suas atividades? Por favor, indique alguns exemplos (legislação, linhas orientadoras, acordos, etc.)
- Sim
 - Não
15. Quais são as línguas de trabalho da AIEA a que a organização recorre para aceder à informação de que necessita?
- Árabe
 - Chinês
 - Espanhol
 - Francês

- Inglês
 - Russo
 - Outro (especifique)
16. Quais são as situações que exigem que a organização comunique ou produza informação em línguas estrangeiras?
17. A organização recorre a serviços de tradução?
- Sim
 - Não
18. A organização recorre a serviços de interpretação?
- Sim
 - Não
19. A organização possui uma política de línguas referente a níveis de proficiência em línguas estrangeiras que possa determinar a admissão na organização?
- Sim
 - Não
20. O acesso a traduções em tempo útil tem impacto nas atividades da organização? Porquê?
- Sim
 - Não
 - Porquê?
21. Quais são os principais desafios comunicativos ao nível da receção de informação em línguas estrangeiras que a organização enfrenta? Selecione todos os que se aplicam.
- Mensagem inapropriadamente traduzida/interpretada
 - Perceções do público-alvo a respeito do tópico
 - Impossibilidade de traduzir/interpretar uma mensagem para um determinado público-alvo
 - Interpretações diferentes de conceitos de base
 - Outro (especifique)
22. Indique 5 requisitos essenciais para a escolha de um tradutor.
23. Indique 5 requisitos essenciais para a escolha de um intérprete.
24. Quais são os principais desafios de tradução na área da Proteção Radiológica e Segurança Nuclear?
25. Quais são os principais desafios de interpretação na área da Proteção Radiológica e Segurança Nuclear?
26. Qual o contributo da tradução/interpretação para o desenvolvimento de estratégias comunicativas e planos de emergência?

27. Existem tradutores profissionais na organização?
- Sim
 - Não
28. Existem intérpretes profissionais na organização?
- Sim
 - Não
29. A organização possui ferramentas e procedimentos que visam auxiliar os colaboradores a ultrapassar desafios em línguas estrangeiras?
- Sim
 - Não
30. Que tipo de mais-valia podem profissionais de línguas trazer à organização?
31. A organização desenvolve campanhas informativas sobre Proteção Radiológica e Segurança Nuclear?
- Sim. Por favor indique alguns exemplos.
 - Não. Porquê?
32. Quais os principais desafios que a organização enfrenta quando pretende comunicar com o público sobre questões de proteção radiológica e segurança nuclear?
33. A organização alguma vez foi confrontada com o desafio de traduzir e/ou interpretar uma realidade adas normas da AIEA para a realidade local do país?
- Sim. Por favor indique alguns exemplos.
 - Não.
34. Caso exista qualquer informação adicional que não tenha sido abordada neste questionário e que considera ser importante para o estudo em curso, por favor, utilize o espaço abaixo para o efeito.

Muito obrigada pela sua colaboração.

ANNEX 3 - Deliverables

I - New legal framework for radiological protection

1. Alterations to the legal framework for radiological protection

Decree-Law no. 108/018

Decree-law no. 108/2018, published on 03/12/2018, proceeds to transpose Directive 2013/59/EURATOM, which lays down basic standards for protection against radiation.

This diploma updates the national legal framework according to the European Union's most recent **impositions** on the matter of protection against the dangers arising from the exposure to ionising radiation.

This decree-law appoints one competent regulatory authority and one inspection authority and their respective powers on the matter of protection against radiation, enhancing greater effectiveness in the exercise of regulatory competences previously assigned to different ministerial entities.

The diploma updates the legal framework which regulates the activities involving ionising radiation in all sectors of medicine, industry, research and education.

Reflecting the international guidelines on the matter, the new legal framework considers three situations of exposure to ionising radiation:

Situations of planned exposure - situations generated by the planned operation of a radiation source or by human activity which causes exposure of people or of the environment. This situation of exposure includes the use of ionising radiation in medicine or in industry arising from planned activities.

Situations of existing exposure - situations in which exposure to radiation already exists when the decision to submit to regulatory control is made. These situations do not require the adoption of **urgent measures**. An example of this situation of exposure is the environmental liability created by previous human activity, which might result in the increase of the concentration of certain radioisotopes on the site, even if of natural origin.

Situations of emergency exposure - result from situations of radiological emergency, requiring **emergency measures**.

In each of these situations of exposure, the type of exposure of the public, of professionals and, when applicable, of patients, is still taken into account.

The competences associated to the regulatory authority will be appointed to the Portuguese Environment Agency (APA), that will become the competent authority for radiological protection regulation. APA will therefore have the competences previously assigned to other entities of the regulatory system created by Decree-Law no. 165/2002, which is hereby repealed.

The General-Inspection of Agriculture, Sea, Environment and Territorial Planning (IGAMAOT) is now the inspection authority under the new legal framework, taking on the competences previously assigned to Regional Health Administrations and by IAPMEI in compliance with Decree-law no. 165/2002. IAGAMOT will exercise the powers of inspection for all provisions of the diploma, in all sectors of activity, namely in the field of medicine, industry, research and education.

Frequently asked questions on the topic of the transition of competences are provided below:

Frequently Asked Questions

About the regulatory system

1. What happens to the competences of the General Directorate for Health (DGS), of Técnico Higher Institute (IST) and of the Regulatory Commission for the Safety of Nuclear Installations (COMRSIN)?

The regulatory competences for radiological protection and nuclear safety and security held by the General Directorate for Health (DGS), by Técnico Higher Institute (IST) and by the Regulatory Commission for the Safety of Nuclear Installations (COMRSIN) are transferred to the Portuguese Environment Agency (APA) as of April 2, 2019. As of that date, APA will be the entity responsible for the authorisation of practices and licences for radiological installations.

2. Which entities should I contact with regards to radiological protection?

The Portuguese Environment Agency (APA) will be the entity responsible for regulatory matters of radiological protection.

The General-Inspection of Agriculture, Sea, Environment and Territorial Planning (IGAMAOT) is now the inspection authority.

3. What is “prior administrative control”?

Prior administrative control corresponds to the previous prior authorization mechanism. Under the current version, a graded approach is adopted, with two levels of growing complexity: registration and licensing. Some practices are subject to registration and the presentation of a limited set of documents to APA is mandatory; other practices are subject to licensing and require the presentation of a complete set of documents.

Both in the case of a registration and of a licence, the **holder** is obliged to observe the duties in the diploma and is subject to an inspection by IGAMAOT.

4. What fees are involved?

The new fees involved will be published in the Ministerial Orders of the Ministries of Finance and Environment and Energy Transition

5. When does it come into force?

The new framework came into force on April 2 of 2019, 120 days following the publication date of Decree-Law no. 108/2018.

About the use of radiation sources

6. What happens to my operating licence?

Under the current legal framework, the licenses issued by DGS remain valid until the end of their original expiry dates (cf. art. 195). However, after the entry into force of the new framework, the **holder** of the sources is obliged to comply with the new duties, and should, therefore, adjust accordingly.

In the case of practices which are no longer subject to licensing and are, now, only subject to registration, automatic conversion takes place on the date the new legal framework enters into force.

When licences issued by DGS reach their expiry date, the **licensee** must request a new licence or registration from APA, as applicable.

7. I currently have a licence request running with DGS. What happens?

The licence requests running with DGS on the date the new framework enters into force will transition from DGS to APA (cf. art. 194). These requests will acknowledge the administrative acts already practised to date,

namely, settled fees, and will be analysed in accordance with the new framework. If necessary, APA will request additional information.

Regarding the medical field, Decree-Law no. 180/2002 will be repealed on the date the new legal framework enters into force. The criteria for radiological installation acceptability will be defined by APA regulation impositions.

The regulation required for the new framework will be prepared and operational until the date of its entry into force.

8. I have an intraoral dental or bone densitometry radiological equipment. Am I exempt from authorization?

No. You will be exempt from the obtention of a licence, but you must register the equipment with APA, prior to its use (cf. art. 22). Registration corresponds to a simplified form of the authorization procedure.

9. What about an orthopantomograph?

A radiological installation containing an orthopantomograph equipment requires a licence from APA (cf. art. 22).

10. What technical requirements do I need to comply with?

The technical criteria will be determined by APA regulation. The regulation required for the new framework will be prepared and operational until the date of its entry into force (cf. art. 36).

11. What fees are involved?

See question 4.

12. What is a Radiation Protection Officer (RPO)? Will I need to hire one?

A Radiation Protection Officer (RPO) is an individual with technical competences in the field of protection against radiation recognised by APA, who is suitable to supervise or proceed with the application of the protection measures against radiation in a specific practice. The RPO supervises or carries out the tasks of radiological protection within a radiological installation. The Radiation Protection Officer answers directly to the **holder** who designates them and who must provide all the necessary means to carry out their tasks (cf. art 159).

The Radiation Protection Officer must hold a level 1 or 2 professional qualification as per Decree-Law no. 227/2008, issued November 25, according to conditions defined for this purpose in APA regulation. During a period of 3 years, APA may determine alternative competences.

All practices must have a Radiation Protection Officer, according to their level of complexity.

About equipment and radiological installations

13. What are the duties of manufacturers and distributors of equipment which produce or use radiation?

The manufacturer or distributor of equipment which contains radioactive sources or which generates radiation must provide information on the potential radiation risks, its correct use, tests and maintenance, as well as a demonstration that the design can limit exposure to a level as low as reasonably possible (cf. art. 25).

In the case of medical radiological equipment, additional information must be provided concerning the assessment of risks to patients and the elements available regarding clinical evaluation.

This information must be detailed, must be written in Portuguese and made available prior to the delivery of the equipment. The manufacturer or importer or distributor must provide all additional clarifications considered necessary.

Additionally, the manufacturer or importer must provide technical information to equipment users in order to guarantee their adequate knowledge on how to operate the equipment.

14. What are the minimum acceptability criteria for radiological installations?

The technical criteria will be determined by APA regulation (cf. art. 36). The regulation required for the new framework will be prepared and operational until the date of its entry into force. Until the publication of the referred regulation, the minimum criteria for acceptability of radiological equipment and installations for use in the medical field will be based on the recommendations published in the document by the European Commission: [RADIATION PROTECTION N° 162 "Criteria for Acceptability of Medical Radiological Equipment used in Diagnostic Radiology, Nuclear Medicine and Radiotherapy"](#).

15. My company maintains equipment which produce or emit ionising radiation. What are my obligations?

If the radioactive sources are sealed, the duties and obligations of the **owner** of the sources will be applied, namely those regarding authorization (cf. art. 4)

About inspection

16. Who is going to supervise?

The General-Inspection of Agriculture, Sea, Environment and Territorial Planning (IGAMAOT) is now the inspection authority. IGAMAOT will be responsible for supervising the provisions of the new framework in all sectors of activity.

17. What penalties are applied?

The penalties applied within the new framework are associated to environmental offences (cf. art. 184), defined in Law 50/2006, as currently worded:

- i. **Minor/light** offenses are corrected with the following fines:
 - a) If practiced by a natural or legal person, from (euro) 200 to (euro) 2 000 in the case of negligence and from (euro) 400 to (euro) 4 000 in cases of intent;
 - b) If practiced by corporate entities, from (euro) 2 000 to (euro) 18 000 in the case of negligence and from (euro) 6 000 to (euro) 36 000 in cases of intent.
- ii. **Severe** offences are corrected with the following fines:
 - a) If practiced by a natural or legal person, from (euro) 2 000 to (euro) 20 000 in the case of negligence and from (euro) 4 000 to (euro) 40 000 in cases of intent;
 - b) If practiced by corporate entities, from (euro) 12 000 to (euro) 72 000 in the case of negligence and from (euro) 636 000 to (euro) 216 000 in cases of intent.
- iii. **Extremely severe** offences are corrected with the following penalties:
 - a) If practiced by a natural or legal person, from (euro) 10 000 to (euro) 100 000 in the case of negligence and from (euro) 20 000 to (euro) 200 000 in cases of intent;
 - b) If practiced by corporate entities, from (euro) 24 000 to (euro) 144 000 in the case of negligence and from (euro) 240 000 to (euro) 5 000 000 in cases of intent.

IGAMAOT may still determine the temporary apprehension of goods and documents and order corrective measures, including the change, temporary or definite close down of the installations.

About importation and exportation

18. I need to import/export an X-ray equipment. Do I need to request authorization?

Yes. The import/export of such equipment requires the prior obtention of a licence from APA (cf. art. 22).

19. And if the equipment contains sealed radioactive sources?

Yes. The import/export of such equipment requires the prior obtention of a licence from APA (cf. art. 22).

20. And what about radiopharmaceuticals or other unsealed radioactive sources?

Yes. The import/export of such materials requires the prior obtention of a licence from APA (cf. art. 22).

21. Does transportation require authorization?

The transportation of any radioactive source on national territory, regardless of its origin and final destination, must be previously authorized by APA (cf. art. 176).

22. What fees are involved?

See question 4.

About service providing companies

23. My company provides radiological protection services. Do I need a licence?

The provision of radiological protection services will no longer be subject to a licence, as foreseen in Decree-Law no. 17/2002 (repealed) and will be covered by a prior recognition by APA. This prior recognition will continue to be mandatory (cf. art. 161).

24. I have a licence for the provision of radiological protection services. What happens to it?

The licences issued by DGS, under the current legal framework, will automatically be converted into recognitions on the date the new framework enters into force and will maintain the original period of validity (cf. art. 194). However, after the new framework enters into force, companies become obliged to comply with the new obligations, having therefore to adjust accordingly.

When the validity of the licences issued by DGS expires, the **holder** must request a new recognition from APA.

25. What fees are involved?

See question 4.

About the recognition of professional qualification

26. I am recognized by DGS as a Qualified Expert or Qualified Technician. Is my certificate still valid?

Yes. The professional qualification certificates issued by DGS will maintain their period of validity (cf. art. 194).

27. I was not previously recognised because I did not have the required professional experience in 2008. Can I be recognised now?

The entry into force of the new legal framework extends the transitional provision which allows for recognition by means of curricular evaluation until April 2 of 2019 for active professionals. Active professionals who met the necessary requirements until that date may be recognised by APA through curricular evaluation. The transitional disposition ended on April 2 of 2019.

The standard recognition procedure will continue to be through the attendance of approved courses, as per the terms of Decree-Law 227/2008, which remains in force.

28. What fees are involved?

See question 4.

About the recognition of the medical physics expert

29. What will be the procedure for the recognition as a medical physics expert?

Central Administration of the Health System (ACSS,I.P.- Administração Central do Sistema de Saúde I.P.) will continue to be the authority for the recognition of medical physics experts (cf. art. 161).

30. How can qualifications as a medical physics expert be obtained?

ACSS will present a proposal for the recognition of new professionals, to be approved through ministerial order of the members of the Government responsible for the areas of health, of the environment, of higher education, of labour and of Public Administration (cf. art. 161).

The proposal must include the training program in compliance with the applicable european guidelines, as well as the fees regarding the recognition procedure.

31. I am a medical physics expert. Do I need to have personal liability insurance?

Yes. Medical physics experts are required to have personal liability insurance which covers any damage resulting from the exercise of their activity (cf. art. 161).

This obligation may be exempted in the cases in which the professional liability of the medical physics experts is already covered by the indemnity insurance of the healthcare unit where they work.

The minimum capital covered and the conditions of the liability insurance will be published in the ministerial order of the members of the Government responsible for the areas of health and finances.

About building materials

32. My company produces building material. What do I need to do?

The companies which produce building materials based on the raw materials listed below are subject to the obligations of the new legal framework (cf. art. 154):

a) Natural materials:

i) Alumina schist;

b) Building materials or additives of natural igneous origin, such as:

i) Granitoids, such as granite, syenite and orthogneiss;

ii) Porphyries;

iii) Tuft;

iv) Pozzolan, namely pozzolanic ashes;

v) Lava;

c) Materials which incorporate waste from industries which process natural radioactive material, such as:

i) Fly ash;

ii) Phosphogypsum;

iii) Phosphorus slag;

iv) Tin slag;

v) Copper slag;

vi) Red mud, namely the waste from aluminium production;

vii) Waste from steel production;

d) Others identified by APA.

Prior to placement on the market of any building materials containing any of the abovementioned, the company must determine, through laboratory tests, the activity concentration ratio of the radionuclides specified in annex III of the referred diploma (cf. art. 155).

This study should be carried out prior to the first introduction on the market and whenever there are alterations to the factors which influence the parameters measured.

Whenever the activity concentration ratio exceeds value 1, APA must be informed in order to then proceed to estimate the doses involved. Whenever the construction materials are susceptible of producing doses above the reference level, APA will determine the appropriate measures to be adopted which might include specific requirements in building standards or restrictions of the uses foreseen for such materials.

If the activity concentration ratio is less than 1, the company must save the results to an archive, and make them available to APA or to AGAMAOT whenever requested.

About radiological emergency response

33. What happens to the Technical Intervention Authorities for radiological emergencies?

APA will be the only Technical Intervention Authority for radiological emergency situations. This Agency holds all competences previously shared with the General-Directorate for Health (DGS) and Técnico Higher Institute (ST).

In the case of a radiological emergency, the National Authority for Civil Protection (Autoridade Nacional de Proteção Civil) must be contacted in the case of emergency situations within the scope of the Integrated System of Protection and Relief Operations (Sistema Integrado de Operações de Proteção e Socorro), as foreseen in the Basic Civil Protection Law.

APA is responsible for the preparation and response to radiological emergencies whenever the effects for workers, for the general public and for the environment are not defined as an emergency to be coordinated by the competent civil protection authorities.

DGS will continue, as the Authority for National Health, to be a part of the National Commission for Radiological Emergencies (Comissão Nacional para Emergências Radiológicas), as will IST, the consultative organ for the National Authority for Civil Protection.

These notes do not dispense the integral reading of Decree-Law no. 108/2018, available at: <https://data.dre.pt/eli/dec-lei/108/2018/12/03/p/dre/pt/html>

II - Updates on Brexit

The United Kingdom announced its intention to exit the European Union on March 29 of 2017, according to the terms of article 50 of the European Union Treaty. This fact means that, unless an agreement is negotiated between the two parties, as of October 31 of 2019, the United Kingdom will become a Third Country.

The **negotiation** process regarding the exit of the United Kingdom is under **negotiation**. Regardless of the final outcome, the preparation of the new reality which will develop as of that date is a complex process, both at a european and national level, and also with direct consequences for private entities.

In this context, the European Commission has a set of announcements to *stakeholders* within the various sectors, which can be consulted at :http://ec.europa.eu/info/brexit/brexit-preparedness_en.

With the purpose of disseminating at a national level and to inform of the need to develop preparedness measures on all fronts, APA considers it pertinent to share information available to date regarding its areas of competency and related areas.

Without prejudice to any transitory agreement which might come to be part of the final withdrawal agreement, it is foreseeable that, as of October 31 of 2019, the United Kingdom will no longer participate in the majority of the dispositions of the Euratom treaty, with special impact on the areas described below:

- Radioactive Waste

Directive 2011/70/EURATOM which establishes the framework for the safe and responsible management of spent fuel and of radioactive waste defines rules for the transfer of State Members' radioactive waste for elimination in third countries, which have been transposed to national law by Decree-Law no. 156/2013.

As of October 31, of 2019, the United Kingdom will be a Third Country, and therefore dispositios foreseen in no. 2 of article 5 of Decree-law 156/2013 with regards to the shipment of radioactive waste is therefore applicable.

1. The country of destination must have celebrated an agreement with the European Union which covers the management of spent fuel and radioactive waste, or be a part of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management («Joint Convention»);
2. The country of destination must have programs for the management and disposal of radioactive waste, whose goals aim at a high level of safety and are equivalent to those foreseen in Decree-Law 156/2013;
3. The disposal installation in the country of destination to which the radioactive waste is to be transferred must demonstrate that it owns authorization for its operation and that it will be managed in compliance with the requirements established in that country's program for the management and disposal of radioactive waste.

- Supply of nuclear materials

As of October 31, of 2019, the United Kingdom will cease to participate in the Euratom Supply Agency, therefore, henceforth, contracts for the supply of nuclear materials with the United Kingdom will cease to have effect.

- Export of nuclear materials

The export of nuclear materials produced in Member Countries of the European Union to Third Countries requires prior authorization from the European Commission. Therefore, as of October 31 of 2019, this provision will also apply to exportations to the United Kingdom.

- Radiological Protection

Directive 2013/59/EURATOM, which establishes the basic safety standard for protection against radiation and transposed to the national legal framework by Decree-law no. 108/2018, applies to the import and export of radioactive materials to and from the European Community. Therefore, as of October 31 of 2019, the United Kingdom will become a Third Country also within the scope of this Directive, and specifically the following provisions will apply:

1. The importation by third countries of consumer products which contain radioactive materials must be subject to regulatory control, therefore requiring their declaration and licensing;
2. Building materials covered by the Directive provisions, originating from the United Kingdom and placed on European Union market, must comply with the Directive provisions for these materials, namely prior radiological characterization;
3. The Directive foresees that Member-States will encourage the installation of systems for the detection of radioactive contamination of metal products coming from Third Countries (e.g. situated at important nodal transit points). This requirement will be applicable to cargo coming from the United Kingdom.

III - FAQ – MEDICAL FIELD

Frequently Asked Questions

Practices involving medical exposures

1. About the Justification on medical radiological exposures

The Justification principle determines that a practice (activity involving ionising radiation) must only be carried out if the benefit resulting from that practice, for the individual and for society, outweighs the detriment to health which might result from the practice.

Applied to medical exposures, the Justification process determines if patient exposure should occur or not. The purpose of the justification is to avoid unnecessary radiological procedures which result in unnecessary exposure of patients to ionising radiation, increasing their potential risks without adding value to their diagnosis.

Medical exposure must, therefore, show a sufficient net benefit, weighing the total potential diagnostic or therapeutic benefits it produces, including direct benefits to health of an individual and the benefits to society, against the individual detriment that the exposure might cause, taking into account the efficacy, benefits and risks of available alternative techniques having the same objective but involving no or less exposure to ionising radiation.

This analysis corresponds to the first level of Justification, of a general nature, for the practice to be carried out. In the case of medical exposures, 3 levels of Justification must be taken into account:

- First level: General justification of the practice
- Second level: Justification of the procedure
- Third level: Justification for individual patient exposure.

In the second level, the medical radiological procedure itself must be justified. This level of justification is applicable to new technology and techniques to be introduced, and must be carried out in cooperation with the health authorities and relevant professional societies. A justification of a medical procedure is an approach based on the evidence of the choice of the best test for a specific clinical scenario, considering the diagnosed effectiveness of the proposed radiological procedure, as well as of alternative procedures which do not use ionising radiation, for example, ultrasounds, MRIs or endoscopy.

Medical radiological exposures additionally require the third level justification, applied to each individual patient. This level of Justification must be carried out by means of an appointment between the referring medical practitioner and the radiological medical practitioner (cf. article 99 (3) of Decree-Law 108/2018). The prescription of a radiological exam should be considered as a request for a professional appointment or opinion, and not an instruction or order to carry out the exposure. The referring medical practitioner has the knowledge of the medical context and patient history for the decision process, while the radiological medical practitioner has the specialized knowledge concerning the radiological procedure. Therefore, this joint approach is necessary for the justification and the joint decision with regards to the individual patient, considering:

- The adequacy of the request;
- The urgency of the procedure;
- The characteristics of the exposure and of the individual patient;
- The relevant information of any previous procedure;
- The relevant prescription guidelines.

Professional societies and health authorities can provide useful tools to support the decision-making process through prescription guidelines which take into consideration the main Justification. These can be included in

the decision-making support systems which should correctly reflect the legal requirements for the justification, especially with regards to the roles and responsibilities for its completion.

In other words, in order to determine the adequacy of the radiological procedure for a specific patient, the referring medical practitioner must answer the following questions:

Has it already been done?

- Is it necessary?
- Is it necessary now?
- Is this the best research to respond to the clinical question?
- Was the clinical problem explained to the radiological medical practitioner?

For purposes of Registration or Licensing a practice which involves medical exposures, the **holder** should present the following in the corresponding section in the request:

1. An assessment of the general Justification (first level) applied to the practice which they intend to exercise. This general Justification must briefly examine the risks and benefits of the medical exposure to ionising radiation which the practice involves and deliberate on their acceptability.
2. A clear and concise procedure to proceed with the Justification of each patient exposure (third level). This procedure must describe each step of the decision-making process and demonstrate how the associated evidence is sustained. It must also demonstrate evidence of conformity regarding informed patient consent, explicitly providing information about the risks and benefits of their exposure to radiation (cf. article 101 of Decree-Law 108/2018).

For more information on the Justification, please consult:

VIDEO

AIEA – [Radiation Protection of Patients](#)

2. About Prior Safety Evaluation

For practices subject to Licensing, the **holder** must present a Prior Safety Evaluation document with the request. This document must be drafted by a recognised entity as per article 163 (2) (a) of Decree-Law no. 108/2018 or by a radiological protection expert recognised under the terms of article 157 of the same diploma - when this mechanism is used, the expert acts within the scope of that described in article 158 of the referred diploma, which foresees, among other aspects, their role in the prior critical analysis of the projects and the entry into service of radiation sources.

In any of its forms, the Prior Safety Evaluation document corresponds to a critical evaluation of the holder's safety and protection provisions to exercise the practice. The document must also demonstrate compliance with the applicable legal requirements, as well as with the regulation and other guidelines provided by APA in this respect.

Without prejudice of the publication or the specific regulation in this respect, the Prior Safety Evaluation document must follow the structure and content described below:

1. Executive summary
2. Introduction
 - a. Include the description of the practice to be exercised, description of the installation and related equipment.
3. Results of radiation source acceptance tests.
 - a. Presentation of the results of all the radiation source acceptance tests, with attached detailed results, with dates of measurements. In the case of practices which involve medical exposures, these must demonstrate compliance with the requirements in no. 162 of the Radiation Protection "Criteria

for Acceptability of Medical Radiological Equipment used in Diagnostic Radiology, Nuclear Medicine and Radiotherapy”.

- b. Critical evaluation of the results.
4. Estimate of the exposures of workers and of the public under normal operating conditions.
 - a. Description of scenarios of occupational and general public exposures under installation’s normal operating conditions. A quantification of the respective expected doses for the different professional profiles and for the public must be included.
 - b. If the practice includes authorised discharges, the abovementioned estimate must consider the corresponding channels of exposure.
5. Identification of the form in which potential exposures or accidental medical exposures and medical exposures which do not occur as planned may occur, when applicable.
 - a. Description of the scenarios of potential exposure and projection of situations which can originate exposures which do not occur as planned.
6. Estimate, when reasonably possible, of the probability of occurrence of potential exposure and respective magnitude.
 - a. For each scenario described in the previous section, provide the quantification of the expected dose and the respective probability of occurrence.
 - b. If the practice includes authorised discharges, the abovementioned estimate must consider the corresponding channels of exposure.
7. Evaluation of the quality and extension of the safety and protection dispositions, including engineering details and administrative procedures.
 - a. Include assessment of the holder’s internal organization, regarding internal administrative practices concerning safety.
 - b. Include assessment of training and qualifications of the professionals who provide services in the installation.
 - c. Assessment of the number of existing human resources versus installation needs, including radiological protection experts, medical physics experts (include calculation as per publication RP 174) and other professionals.
 - d. Description of the medical surveillance program of exposed workers, including assessment of the content and qualifications of the entities responsible for carrying out the program.
 - e. Assessment of the financial resources allocated to radiological safety and protection.
 - f. Assessment of the adequacy of the existing individual protection equipment.
 - g. Assessment of the means of radiation detection available in the installation and about its metrological verification.
 - h. Assessment of the effectiveness and adequacy of the monitoring of workers according to the existing risks (external radiation, **incorporation of radionuclides**, etc.)
8. Definition of the operational limits and operating conditions.
 - a. Study of shieldings according to the NCRP 47 or 151 method, depending on the type of radiation source, and considering the corresponding dose constraint defined by the **holder**. Include the details of all calculations performed, for each radiation source, as well as the assessment of the results.
 - b. Determination of the peak work load of each radiation source related to the practice, in the appropriate units. For practices involving unsealed radiation sources, determination of the maximum activity to be manipulated both annually and per procedure.

- c. Results of the verification of shield effectiveness and respective critical assessment, with the description of the methodology and identification of the equipments used.
 - d. Critical assessment of the classification of implemented areas and respective signage, as well as the effectiveness of access control.
 - e. Description and assessment of the stipulated quality assurance program and of the adequacy of the latter regarding the practice to be exercised and the qualifications of the entities responsible for its execution, including the detection of incompatibilities.
9. Evidence that adequate protection is in place against any radioactive exposure or contamination susceptible of going beyond the installation's perimeter, or against any radioactive contamination susceptible of reaching the soil on which the installation is implemented.
- a. For practices involving unsealed radioactive sources, include the analysis of the ventilation system and other confinement devices, and their effectiveness in stopping any radioactive contamination.
10. Definition of the plans for the discharge of radioactive effluents, when applicable.
- a. Description of the plan, with an assessment of the foreseeable effects for the environment and for the public.
 - b. Description and critical assessment of the authorized discharge monitoring methodology and storage of results.
11. Description of the measures to control public access to the installation.
- a. Critical assessment of the installation's existing physical protection measures, considering access restriction, as well as intrusion deterrence, delay and response.
12. Conclusions and recommendations
- a. Conclude on holder's security provisions, regarding radioactive sources present.
 - b. Describe any possible recommendations regarding radiological protection.
13. Author's signature

3. About specific aspects of the Justification in dental radiology

The considerations described in Question 1 are also applicable to dental radiology.

The dentist or stomatologist must certify that the x-rays are prescribed for each patient based on a specific clinical need.

"Routine" prescriptions of X-rays must be avoided and individual exposure must proceed with the Justification. The prescription of radiological exams, as with the prescription of medication, must be adequate to the patient's diagnosis or treatment - therefore, any radiological examination must be carried out in accordance with a clinical need.

A warning that the use of "routine" panoramic dental x-rays to follow paediatric patient growth is not considered justified. The x-ray may be considered only when there is evidence after carrying out a clinical examination.

For purposes of Registration or Licensing a practice which involves dental radiology, the **holder** must present the elements described in Question 1, in the corresponding section of the request, namely:

1. An assessment of the general Justification (first level) applied to the intended practice to be exercised. This general Justification must briefly examine the risks and benefits of the medical exposure to ionising radiation which the practice involves and deliberate on their acceptability.
2. A clear and concise procedure to proceed with the Justification of the exposure of each patient (third level). This procedure must describe each step of the decision-making process and demonstrate how

the associated evidence is sustained. It must also demonstrate evidence of conformity regarding informed patient consent, explicitly providing information about the risks and benefits of their exposure to radiation (cf. article 101 of Decree-Law 108/2018).

For more information on Radiological Protection of patients in dental radiology, please consult:

VIDEO

AIEA – [Radiation Protection of Patients](#)

4. About the use of portable equipment in dental radiology

Portable intraoral dental radiology equipment must only be used to carry out exams when it is impossible or clinically unacceptable to transfer a patient to a stationary unit, or for specific applications, such as forensic sciences or field hospitals.

The use of portable x-ray equipment in other environments (for example, for daily use in dental clinics) is discouraged.

For purposes of Registration of a practice which involves the use of portable dental radiological equipment, the **holder** should present detailed considerations about the intended usage, in the corresponding sector of the Justification; the section concerning individual protection equipment must explicitly foresee positioning systems.

For more information about Radiological Protection for dental radiology professional, please consult:

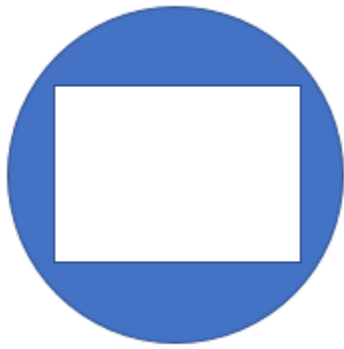
AIEA – [Radiation Protection of Patients](#)

5. About the use of rectangular collimators in intraoral dental medicine

The criteria of acceptability adopted for medical practices corresponds to those proposed by the European Union's RP 162 Publication. These acceptability criteria determine that it is not acceptable to use circular collimators in intraoral dental radiology without the special Justification procedure accepted by APA as the competent authority.

The requirement for the use of rectangular collimators results directly from the application of the Optimization Principle described in article 6 of Decree-Law no. 108/2018, according to which the levels of doses for patients must remain at the lowest level reasonably possible, as long as they allow the necessary medical information to be obtained, considering economic and social factors.

Given that image receptors have a rectangular form, with inferior dimensions to those of the circular collimators commonly used in intraoral dental radiology, its use results in an unnecessarily higher dose for the patient. Consider the example of the following figure: with the use of the circular collimator, the entire area around the image receptor is radiated, without that resulting in an improvement of the image to be received, given that it is only captured in the usable area of the image receptor.



The use of rectangular collimation with dimensions close to those of the image receptor guarantees that the patient is only radiated on the area which requires radiation. It should be noted that the image is only captured in the area occupied by the respective receptor.

The use of positioning systems also improves the alignment of the radiation beam with the image receptor, which is a clear added-value for the patient.

The use of rectangular collimators in intraoral dental radiology is not only a requirement to be complied with, but also a direct form of observing compliance of the Optimization Principle, with consequent gains for the patient.

The use of rectangular collimators, with positioning systems, must therefore always be preferred over circular collimators, which must only be considered in exceptional situations and require prior acceptance by APA. The use of these collimators must be accompanied by reinforced capacity building and training of the professionals in the application of the Optimization Principle, with the purpose of avoiding unnecessary repetition of exposures.

AIEA – [Radiation Protection of Patients](#)

6. About the written procedures in medical radiological practices

All medical radiological practices must be supported by previously defined protocols which guarantee the safety and protection of the patient and of the professionals.

The **holder** must establish written protocols for all types of standard medical radiological procedures for each equipment, considering the categorization of the patients.

The **holder** must, therefore, prior to the beginning of the practice, outline the necessary documents which contain the written protocol for each radiological equipment covered by the register or licence.

These written protocols must contain all the necessary procedures and parameters to carry out the medical exposures for each equipment and for each patient category.

The procedures must also adequately describe the stage in which the informed and clarified consent of the patient is obtained, as well as the detailed information concerning the process of Justification which allows the exposure to take place. The delivery of the report of the medical radiological procedures to the patient foreseen in article 102(2) of Decree-Law no. 108/018, containing the information regarding their exposure and examples of the referred information, must also be described.

7. About the Financial Resources Plan for practices subject to licensing

For practices subject to prior administrative control in the licensing modality, the **holder** must present a Financial Resources Plan aligned with the fulfilment of their obligations, together with the request, as per the terms of article 33(h) of Decree-Law no. 108/018.

Regarding this Financial Resources Plan, it is important, first of all, to highlight that the duties of the **holder** include, for example (cf. Article 24 of the same diploma):

- a) Maintenance of an optimal level of protection of workers, public and the environment;*
- b) Responsibility for the safety of radiation sources and practices, as well as the internal organization for safety and protection, namely by guaranteeing that any assignment of responsibility is duly documented;*
- c) Periodic drafting and revision of radiological safety evaluation for radiation sources and practices, namely covering the probability and magnitude of potential exposures, their likely consequences, the number of individuals which might be affected by the latter;*
- d) Implementation of a management system with safety and protection procedures and measures subject to periodic revision and updates, incorporating the lessons learnt.*
- e) Definition of the procedures for the register of incidents or accidents and respective report to the competent authority;*
- f) Securing all necessary measures within the scope of the practice or installation to reduce the consequences of an incident or accident;*
- g) Maintenance and periodic verification of the radiation sources to evidence that safety and protection requirements continue to be fulfilled, as described in the licensing request or register or conditions defined in them by the competent authority;*
- h) Safe management and control of radioactive waste produced and respective elimination according to legislation in force;*
- i) Approval, for entry into service, of adequate radiation measuring and evaluation equipment and processes regarding public exposure and radioactive contamination of the environment;*
- j) Verification of the effectiveness and maintenance of the equipment referred in the previous line and regular legal metrological control of the measurement instruments;*
- k) Consultation of experts in radiological protection for the abovementioned tasks."*

Considering the abovementioned obligations, the Financial Resources Plan must evidence the allocation of resources to the performance of the aforementioned tasks, together with the others foreseen in Decree-Law no. 108/018. This plan must forecast the period of the validity of the licence to be requested and detail the resources which the **holder** intends to use in the exercise of the activities related to radiological safety and protection.

In short, the Financial Resources Plan to be presented at the time of the licence application must detail the annual amounts, for a period of 5 years, which the **holder** intends to allocate to the areas related to safety. It should, for example, include costs such as:

- safety evaluation of the practice;
- quality assurance;
- equipment, preventive and corrective maintenance;
- monitoring of workers;
- worker training;
- purchase of individual protection equipment;
- verification of metrological equipment;

- management of radioactive waste and disused radioactive sources, whenever these are used in the practice to be exercised;
- consultation of experts;
- other activities related to safety **and security**;

8. About the medical physics expert

Any natural or legal person, legally responsible for a certain practice, activity or for a specific source of radiation is referred to as “**holder**”, for the purposes of Decree-Law no. 108/018.

Thereby, any entity (hospital, clinic, dental clinic,...) which exercises a practice must necessarily comply with the obligations of the **holder** foreseen in the abovementioned diploma. In the case of the practices involving medical exposure, the diploma foresees a specific set of obligations, with special reference to those in article 102, which determine:

“6 - The medical radiological practices must respect the human resources requirements determined by the competent authority and include the participation of a medical physics expert, proportional to the radiological risk of the practice under consideration, namely:

- a) During all phases of the procedure in radiotherapeutical practices, with the exception of the practices of nuclear medicine which follow standard procedures;*
- b) In nuclear medicine practices which comply with standard procedures, in practices of intervention radiology and radiodiagnosis which might involve high doses;*
- c) Through the consultation or advise in other medical radiological practices not foreseen in the previous section and in issues related to the protection from radiation resulting from medical exposures.”*

The role of the medical physics expert is later detailed in article 160 of the diploma, with a special focus on the following:

“2 - The medical physics expert is responsible for dosimetry, including the physical measurements for the evaluation of the dose administered to the patient and other individuals subject to medical exposure, and contributes, especially, to the following:

- a) Optimization of the protection against radiation for patients and other individuals subject to medical exposure, including the application and use of diagnostic reference levels;*
- b) The definition and application of the quality assurance of the medical radiological equipment;*
- c) The tests for the acceptability of medical radiological equipment;*
- d) The elaboration of technical specifications applicable to medical radiological equipment and to the conceptualization of the installations;*
- e) Monitoring of medical radiological facilities;*
- f) Analysis of the events which involve or which might involve accidental medical exposures or medical exposures which do not take place as planned;*
- g) The selection of the necessary equipment to carry out measurements of radiation protection;*
- h) Training of qualified professionals and other personnel regarding relevant aspects of radiation protection.”*

As a form of guaranteeing that the participation of medical physics experts is proportional to the radiological risk of the practice, this Agency has adopted the requirements proposed by the European Commission in its Publication [Radiation Protection 174 – European Guidelines on Medical Physics Expert \(RP174\)](#), as well as in [Annex 1](#) and [Annex 2](#).

This publication determines the level of participation, under the Full Time Equivalent of the medical physics expert for the different areas where medical exposures occur, anticipating distinct factors for the practices according to their level of complexity, adopting a graded approach.

In the case of the radiotherapy practices and nuclear medicine, the level of involvement of the medical physics expert is such that it requires their full-time presence and, in the majority of cases, with various professionals organized in a service of medical physics.

In the cases of radiology and dental radiology, given that the factors of the Full Time Equivalent are low, the **holder** is not required to employ a medical physics expert.

However, *in the licensing practices*, the **holder** must evidence that the consulting provided by the medical physics expert exists in the installation, and that it complies with the factors foreseen for that purpose, also calculated according to the abovementioned publication.

In other words, when the **holder** carries out practices which are subject to licensing, they should indicate which medical physics expert will provide the necessary consultancy for the abovementioned topics. The consultancy must cover the Full Time Equivalent, calculated as per the terms of publication RP174. The determination of the participation needs of the medical physics expert is one of the components of the forms for the licensing of practices which involve medical exposures, and is proportional to the risk associated to the practice.

For more information about the recognition of medical physics experts, consult:

[Administração Central do Sistema de Saúde \(Central Health System Administration\)](#).

9. About the Radiological Protection Officer (RPO)

Decree-Law no. 108/018 created a role which did not exist in the previous system: the Radiological Protection Officer (RPO). This professional, described in detail in article 159, is responsible for the supervision of the radiological protection tasks in the installation, namely:

- a) Guaranteeing that the works with radiation are carried out in compliance with the requirements of the procedures or local rules;*
- b) Supervise the application of the radiological monitoring program of the work location;*
- c) Keep adequate registers of all the radiation sources;*
- d) Periodically assess the state of the relevant safety and alert systems*
- e) Supervise the application of the individual monitoring program;*
- f) Guarantee the organization of the occupational health and safety services, guaranteeing that all workers are covered;*
- g) Provide new workers with an adequate initiation to the local rules and procedures;*
- h) Provide consulting services and formulate observations about work programs;*
- i) Establish the work programs;*
- j) Present reports to the local management structure;*
- k) Participate in the elaboration of provisions for the prevention, preparation and response to situations of emergency exposure;*
- l) Provide information and training to exposed workers;*

m) Articulate with the expert in radiological protection.”

The RPO is necessarily a professional with Level 1 or 2 professional qualifications in radiological protection, under the terms of Decree-Law no. 227/2008.

It is the **holder**'s responsibility to nominate the RPO for their installations, to carry out the abovementioned responsibilities. In the case of medical exposures, the clinical specialist can also be the RPO as long as they obtain a level 1 or 2 professional qualification in radiological protection. The role of the RPO can, therefore, be accumulated with other roles already carried out in the installation under the responsibility of the **holder**.

The **holder** is free to designate the RPO, as long as the qualification requirements are met and, whenever possible, this professional is an internal element of the installation, given that there are daily tasks to be carried out.

The obtention of these levels of professional qualification are described on this website, on the page [Recognitions](#).

Worth noting is that APA has another flexibility mechanism within this scope which is being applied, resulting from the provisions in article 207(2)(3) of Decree-Law no. 108/018. Considering that the RPO is a new position in the national legal framework, until 2022, APA accepts the nomination of a professional who does not possess the abovementioned qualifications, as long as they hold alternative training in the field of radiological protection. Should the **holder** wish to use this mechanism, the alternative training held by the designated professional must be described within the registration or licensing request to APA. APA will evaluate the request on a case-by-case basis (this analysis will take into account the practice to be exercised, as well as the training and experience in radiation protection described by the **holder** for the proposed RPO) and, should they be considered acceptable, the register or licence to be issued will be conditioned by the obtention of a level 1 or 2 qualification until 2022.

This information will be updated and complemented whenever considered pertinent.

IV - Practices involving non-medical exposures

1. About the Justification of non-medical radiological exposures

The Justification principle determines that a practice (activity involving ionising radiation) should only be carried out if the benefit resulting from that practice, for the individual and for society, outweighs the detriment to health which might result from the practice.

This analysis corresponds to the first level of Justification, of a generic nature, for the practice to be exercised. This level is applicable to practices which involve non-medical exposures.

For purposes of Registration or Licensing a practice which involves non-medical exposures, the **holder** must present an assessment of the general Justification (first level) in the corresponding section in the request with regards to the practice to be exercised. This general Justification must briefly analyse the risks and benefits for the individuals or for society, in using ionising radiation which the practice involves and deliberate if these are considered acceptable.

2. About Prior Safety Evaluation

For practices subject to Licensing, the **holder** must present a Prior Safety Evaluation document with the request. This document must be drafted by a recognised entity as per article 163 (2) (a) of Decree-Law no. 108/2018 or by a radiological protection expert recognised under the terms of article 157 of the same diploma - when this mechanism is used, the expert acts within the scope of that described in article 158 of the referred diploma, which foresees, among other aspects, their role in the prior critical analysis of the projects and the entry into service of radiation sources.

In any of its forms, the Prior Safety Evaluation document corresponds to a critical evaluation of the **holder's** safety and protection provisions to exercise the practice. The document must also evidence compliance with the applicable legal requirements, as well as with the regulation and other guidelines provided by APA in this respect.

Without prejudice of the publication or the specific regulation in this respect, the Prior Safety Evaluation document must follow the structure and content described below:

1. Executive summary
2. Introduction
 - a. Include the description of the practice to be exercised, description of the installation and related equipment.
3. Results of radiation source acceptance tests.
 - a. Presentation of the results of all the radiation source acceptance tests, with attached detailed results, with dates of measurements.
4. Estimate of the exposures of workers and of the public under normal operating conditions.
 - a. Description of scenarios of occupational and general public exposures under installation's normal operating conditions. A quantification of the respective expected doses for the different professional profiles and for the public must be included.
 - b. If the practice includes authorised discharges, the abovementioned estimate must consider the corresponding channels of exposure.
5. Identification of the form in which potential exposures or accidental medical exposures and medical exposures which do not occur as planned may occur, when applicable.

- a. Description of the scenarios of potential exposure and projection of situations which can originate exposures which do not occur as planned.
6. Estimate, when reasonably possible, of the probability of occurrence of potential exposure and respective magnitude.
 - a. For each scenario described in the previous section, provide the quantification of the expected dose and the respective probability of occurrence.
 - b. If the practice includes authorised discharges, the abovementioned estimate must consider the corresponding channels of exposure.
7. Evaluation of the quality and extension of the safety and protection provisions, including engineering details and administrative procedures.
 - a. Include assessment of the **holder's** internal organization, regarding internal administrative practices concerning safety.
 - b. Include assessment of training and qualifications of the professionals who provide services in the installation.
 - c. Assessment of the number of existing human resources versus installation needs, including radiological protection experts, medical physics experts (include calculation as per publication RP 174) and other professionals.
 - d. Description of the medical surveillance program of exposed workers, including assessment of the content and qualifications of the entities responsible for carrying out the program.
 - e. Assessment of the financial resources allocated to radiological safety and protection.
 - f. Assessment of the adequacy of the existing individual protection equipment.
 - g. Assessment of the means of radiation detection available in the installation and about its metrological verification.
 - h. Assessment of the effectiveness and adequacy of the monitoring of workers according to the existing risks (external radiation, **incorporation of radionuclides**, etc.)
8. Definition of the operational limits and operating conditions.
 - a. Study of shieldings according to the NCRP 47 or 151 method, depending on the type of radiation source, and considering the corresponding dose constraint defined by the **holder**. Include the details of all calculations performed, for each radiation source, as well as the assessment of the results.
 - b. Determination of the peak work load of each radiation source related to the practice, in the appropriate units. For practices involving unsealed radiation sources, determination of the maximum activity to be manipulated both annually and per procedure.
 - c. Results of the verification of shield effectiveness and respective critical assessment, with the description of the methodology and identification of the equipments used.
 - d. Critical assessment of the classification of implemented areas and respective signage, as well as the effectiveness of access control.
 - e. Description and assessment of the stipulated quality assurance program and of the adequacy of the latter regarding the practice to be exercised and the qualifications of the entities responsible for its execution, including the detection of incompatibilities.
9. Evidence that adequate protection is in place against any radioactive exposure or contamination susceptible of going beyond the installation's perimeter, or against any radioactive contamination susceptible of reaching the soil on which the installation is implemented.

- a. For practices involving unsealed radioactive sources, include the analysis of the ventilation system and other confinement devices, and their effectiveness in stopping any radioactive contamination.
- 10. Definition of the plans for the discharge of radioactive effluents, when applicable.
 - a. Description of the plan, with an assessment of the foreseeable effects for the environment and for the public.
 - b. Description and critical assessment of the authorized discharge monitoring methodology and storage of results.
- 11. Description of the measures to control public access to the installation.
 - a. Critical assessment of the installation's existing physical protection measures, considering access restriction, as well as intrusion deterrence, delay and response.
- 12. Conclusions and recommendations
 - a. Conclude on **holder's** security provisions, regarding radioactive sources present.
 - b. Describe any possible recommendations regarding radiological protection.
- 13. Author's signature

3. About the Financial Resources Plan for practices subject to licensing

For practices subject to prior administrative control in the licensing modality, the **holder** must present a Financial Resources Plan aligned with the fulfilment of their obligations, together with the request, as per the terms of article 33(h) of Decree-Law no. 108/018.

Regarding this Financial Resources Plan, it is important, first of all, to highlight that the duties of the **holder** include, for example (cf. Article 24 of the same diploma):

- a) Maintenance of an optimal level of protection of workers, public and the environment;*
- b) Responsibility for the safety of radiation sources and practices, as well as the internal organization for safety and protection, namely by guaranteeing that any assignment of responsibility is duly documented;*
- c) Periodic drafting and revision of radiological safety evaluation for radiation sources and practices, namely covering the probability and magnitude of potential exposures, their likely consequences, the number of individuals which might be affected by the latter;*
- d) Implementation of a management system with safety and protection procedures and measures subject to periodic revision and updates, incorporating the lessons learnt.*
- e) Definition of the procedures for the register of incidents or accidents and respective report to the competent authority;*
- f) Securing all necessary measures within the scope of the practice or installation to reduce the consequences of an incident or accident;*
- g) Maintenance and periodic verification of the radiation sources to evidence that safety and protection requirements continue to be fulfilled, as described in the licensing request ou register or conditions defined in them by the competent authority;*
- h) Safe management and control of radioactive waste produced and respective elimination according to legislation in force;*
- i) Approval, for entry into service, of adequate radiation measuring and evaluation equipment and processes regarding public exposure and radioactive contamination of the environment;*
- j) Verification of the effectiveness and maintenance of the equipment referred in the previous line and regular legal metrological control of the measurement instruments;*

k) Consultation of experts in radiological protection for the abovementioned tasks."

Considering the abovementioned obligations, the Financial Resources Plan must evidence the allocation of resources to the performance of the aforementioned tasks, together with the others foreseen in Decree-Law no. 108/018. This plan must forecast the period of the validity of the licence to be requested and detail the resources which the **holder** intends to use in the exercise of the activities related to radiological safety and protection.

In short, the Financial Resources Plan to be presented at the time of the licence application must detail the annual amounts, for a period of 5 years, which the **holder** intends to allocate to the areas related to safety. It should, for example, include costs such as:

- safety evaluation of the practice;
- quality assurance;
- equipment, preventive and corrective maintenance;
- monitoring of workers;
- worker training;
- purchase of individual protection equipment;
- verification of metrological equipment;
- management of radioactive waste and disused radioactive sources, whenever these are used in the practice to be exercised;
- consultation of experts;
- other activities related to safety **and security**;

4. About the Radiological Protection Officer (RPO)

Decree-Law no. 108/018 created a role which did not exist in the previous system: the Radiological Protection Officer (RPO). This professional, described in detail in article 159, is responsible for the supervision of the radiological protection tasks in the installation, namely:

- a) Guaranteeing that the works with radiation are carried out in compliance with the requirements of the procedures or local rules;*
- b) Supervise the application of the radiological monitoring program of the work location;*
- c) Keep adequate registers of all the radiation sources;*
- d) Periodically assess the state of the relevant safety and alert systems*
- e) Supervise the application of the individual monitoring program;*
- f) Guarantee the organization of the occupational health and safety services, guaranteeing that all workers are covered;*
- g) Provide new workers with an adequate initiation to the local rules and procedures;*
- h) Provide consulting services and formulate observations about work programs;*
- i) Establish the work programs;*
- j) Present reports to the local management structure;*
- k) Participate in the elaboration of provisions for the prevention, preparation and response to situations of emergency exposure;*
- l) Provide information and training to exposed workers;*
- m) Articulate with the expert in radiological protection."*

The RPO is necessarily a professional with Level 1 or 2 professional qualifications in radiological protection, under the terms of Decree-Law no. 227/2008.

It is the **holder's** responsibility to nominate the RPO for their installations, to carry out the abovementioned responsibilities. In the case of medical exposures, the clinical specialist can also be the RPO as long as they obtain a level 1 or 2 professional qualification in radiological protection. The role of the RPO can, therefore, be accumulated with other roles already carried out in the installation under the responsibility of the **holder**.

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Table 15. Terms defined in Legislation

TERM PT	Abbreviation	DEFINITION PT	TERM EN	DEFINITION EN	Source
abordagem graduada		o processo ou método, aplicado ao sistema regulador ou sistema de segurança, proporcional, tanto quanto possível, à probabilidade de ocorrência de um evento, suas possíveis consequências, e ao nível de risco associado, em caso de perda de controlo.	graded approach	For a system of control, such as a regulatory system or a safety system, a process or method in which the stringency of the control measures and conditions to be applied is commensurate, to the extent practicable, with the likelihood and possible consequences of, and the level of risk associated with, a loss of control.	IAEA Safety Glossary. Terminology Used in Nuclear Safety and Radiation Protection, 2018 Ed.p. 104.
acelerador		um equipamento ou instalação onde são aceleradas partículas e que emite radiações ionizantes com energia superior a 1 megaeletrão -volt (MeV).	accelerator	equipment or installation in which particles are accelerated, emitting ionising radiation with energy higher than 1 mega-electron volt (MeV).	COUNCIL DIRECTIVE 2013/59/EURATOM
acidente		qualquer ocorrência não intencional cujas consequências ou potenciais consequências sejam significativas, do ponto de vista da proteção contra radiações ou da segurança nuclear.	accident	(1) Any unintended event, including operating errors, equipment failures and other mishaps, the consequences or potential consequences of which are not negligible from the point of view of protection and safety.	IAEA Safety Glossary. Terminology Used in Nuclear Safety and Radiation Protection, 2018 Ed.p. 12
aprendiz		a pessoa que recebe formação ou instrução numa entidade com vista ao exercício de competências específicas	apprentice	a person receiving training or instruction with a view to undertaking with a view to exercising a specific skill.	COUNCIL DIRECTIVE 2013/59/EURATOM
armazenagem		a conservação de material radioativo, incluindo combustível irradiado, uma fonte radioativa ou resíduos radioativos numa instalação, com intenção de os recuperar.	storage	the holding of radioactive material, including spent fuel, a radioactive source or radioactive waste, in a facility with the intention of retrieval.	COUNCIL DIRECTIVE 2013/59/EURATOM
aspectos práticos dos procedimentos médicos radiológicos		a realização física de uma exposição médica e quaisquer aspetos acessórios, incluindo a manipulação e utilização de equipamento radiológico médico, a avaliação dos parâmetros técnicos e físicos, incluindo a avaliação das doses de radiação, a calibração e manutenção do equipamento, a preparação e administração de radiofármacos e o processamento de imagens.	practical aspects of medical radiological procedures	the physical conduct of a medical exposure and any supporting aspects, including handling and use of medical radiological equipment, the assessment of technical and physical parameters (including radiation doses), calibration and maintenance of equipment, preparation and administration of radio-pharmaceuticals, and image processing.	COUNCIL DIRECTIVE 2013/59/EURATOM
ativação		o processo pelo qual um nuclídeo estável é transformado num radionuclídeo através da irradiação do material em que está contido com fótons de alta energia ou com partículas.	activation	a process through which a stable nuclide is transformed into a radionuclide by irradiating with particles or high-energy photons the material in which it is contained.	COUNCIL DIRECTIVE 2013/59/EURATOM

TERM PT	Abbreviation	DEFINITION PT	TERM EN	DEFINITION EN	Source
atividade	A	(A), corresponde à quantidade de um radionuclídeo num determinado estado energético e num dado momento; é o quociente entre dN por dt, onde dN é o valor esperado do número de transformações nucleares a partir desse estado energético no intervalo de tempo dt.	activity	(A) is the activity of na amount of radionuclide in a particular energy state ata given time. It is the quotient of dN by dt,where dN is the expectation value of the number of nuclear transitions from that energy state in the time interval dt: insert formula	COUNCIL DIRECTIVE 2013/59/EURATOM
auditoria clínica		uma análise ou revisão sistemática dos procedimentos radiológicos médicos com o objetivo de melhorar a qualidade e os resultados dos cuidados prestados ao paciente, através de uma revisão estruturada em que as práticas, procedimentos e resultados radiológicos médicos são examinados em função de normas aprovadas de bons procedimentos radiológicos médicos, e que dá lugar à alteração das práticas em causa, se for caso disso, e à aplicação, se necessário, de novas normas.	clinical audit	a systematic examination or review of medical radiological procedures which seeks to improve the quality and outcome of patiemt care through structured review, whereby medical radiological practices,procedures and results are examined against agreed standards for good medical radiological procedures, with modification of practices, where appropriate, and the application of new stadnards if necessary;	COUNCIL DIRECTIVE 2013/59/EURATOM
			Authorisation	the registration or licensing of a practice.	COUNCIL DIRECTIVE 2013/59/EURATOM
autoridade competente		entidade com competências e atribuições no domínio da proteção radiológica e da segurança nuclear, a quem compete, nos termos da legislação aplicável, nomeadamente o controlo regulador das atividades e práticas abrangidas pelo presente decreto-lei, a coordenação do respetivo procedimento e a emissão da licença e registo para a instalação e alteração dessas atividades e práticas.	competent authority	an authority or system of authorities designated by Member States as having legal authority for the purposes of this Directive;	COUNCIL DIRECTIVE 2013/59/EURATOM
			Inspection	(a) An examination, observation, surveillance, measurement or test undertaken to assess structures, systems and components and materials, as well as operational activities, technical processes, organizational processes, procedures and personnel competence (a1) in-service inspection. Inspection of structures, systems and components undertaken over the operating lifetime by or on behalf of the operating organization for the purpose of identifying age related degradation or conditions that, if not addressed, might lead to the failure of structures, systems or components. i Inspection of operational	IAEA Safety Glossary. Terminology Used in Nuclear Safety and Radiation Protection, 2018 Ed.p. 115

TERM PT	Abbreviation	DEFINITION PT	TERM EN	DEFINITION EN	Source
				activities, processes, etc., by or on behalf of the operating organization would normally be described by terms such as self-assessment and audit. (a2) regulatory inspection. Inspection undertaken by or on behalf of the regulatory body.(b) An evaluation of the conformity to a requirement.	
autoridade inspetiva		entidade a quem compete a fiscalização do cumprimento do presente decreto -lei, sem prejuízo dos poderes de fiscalização e polícia que competem às demais autoridades públicas, nomeadamente a autoridade competente.	inspection authority		
becquerel	Bq	(Bq), a designação especial da unidade de atividade. Um becquerel equivale a uma transformação nuclear por segundo: 1 Bq = 1 s ⁻¹ .	becquerel	(Bq) is the special name of the unit of activity. One becquerel is equivalent to one nuclear transition per second: 1 Bq = 1 s ⁻¹ .	COUNCIL DIRECTIVE 2013/59/EURATOM
bem de consumo		um dispositivo ou artigo fabricado em que foram intencionalmente incorporados ou produzidos por ativação um ou mais radionuclídeos, ou que produz radiação ionizante, e que pode ser vendido ou disponibilizado sem especial vigilância ou controlo regulador após a venda.	consumer product	a device or manufactured item into which one or more radionuclides have deliberately been incorporated or produced by activation, or which generates ionising radiation, and which can be sold or made available to members of the public without special surveillance or regulatory control after sale.	COUNCIL DIRECTIVE 2013/59/EURATOM
contaminação		a presença indesejável de substâncias radioativas em superfícies ou em sólidos, líquidos ou gases ou no corpo humano que, no caso específico do corpo humano, inclui a contaminação externa cutânea e a contaminação interna, independentemente da via de incorporação.	contamination	the unintended or undesirable presence of radioactive substances on surfaces or within solids, liquids or gases or on the human body.	COUNCIL DIRECTIVE 2013/59/EURATOM
contentor da fonte		conjunto de componentes destinado a garantir a contenção de uma fonte radioativa selada que não constitui parte desta, mas contribui para a sua blindagem durante o transporte e o manuseamento.	source container	an assembly of components intended to guarantee the containment of a sealed source, where it is not an integral part of the source but is meant for shielding the source during its transport and handling.	COUNCIL DIRECTIVE 2013/59/EURATOM
controlo de qualidade		conjunto das operações (programação, coordenação e execução) destinadas a manter ou a melhorar a qualidade, como parte da garantia da qualidade, abrangendo a monitorização, avaliação e manutenção, aos níveis exigidos, de todas as características de funcionamento do equipamento que possam ser definidas, medidas e controladas.	quality control	means the set of operations (programming, coordinating, implementing) intended to maintain or to improve quality. It includes monitoring, evaluation and maintenance at required levels of all characteristics of performance of equipment that can be defined, measured, and controlled.	COUNCIL DIRECTIVE 2013/59/EURATOM

TERM PT	Abbreviation	DEFINITION PT	TERM EN	DEFINITION EN	Source
controlo regulador		qualquer forma de controlo ou de regulação aplicados a atividades humanas para fazer cumprir os requisitos de proteção contra as radiações.	Regulatory control	any form of control or regulation applied to human activities for the enforcement of radiation protection requirements.	COUNCIL DIRECTIVE 2013/59/EURATOM
cuidadores		as pessoas que, com conhecimento de causa e de livre vontade, se sujeitam a exposição a radiações ionizantes para colaborar no apoio e bem-estar de pessoas que estejam ou tenham estado sujeitas a exposições radiológicas médicas, salvo se o fizerem no contexto da sua atividade profissional.	carers and comforters	individuals knowingly and willingly incurring an exposure to ionising radiation by helping, other than as part of their occupation, in the support and comfort of individuals undergoing or having undergone medical exposure.	COUNCIL DIRECTIVE 2013/59/EURATOM
comunicação prévia		declaração de intenção de exercer uma prática ou uma atividade abrangida pelo âmbito de aplicação do presente decreto-lei.	prior communication/information		
detentor		qualquer pessoa, singular ou coletiva, que esteja na posse de uma ou mais fontes radioativas, incluindo, nomeadamente fabricantes, fornecedores, importadores, exportadores, transportadores, titulares e entidades que efetuam manutenção ou armazenagem.	owner/holder		
dose absorvida	D	a energia absorvida por unidade de massa: em que D é a energia média depositada pelas radiações ionizantes na matéria num elemento de volume, dm é a massa da matéria contida nesse elemento de volume. A expressão «dose absorvida» designa a dose média num tecido ou num órgão. A unidade de dose absorvida é o gray (Gy).	absorbed dose	(D) is the energy absorbed per unit mass: D is the mean energy imparted by ionising radiation to the matter in a volume element dm is the mass of the matter in this volume element. In this Directive, absorbed dose denotes the dose averaged over a tissue or an organ. The unit for absorbed dose is the gray (Gy) where one gray is equal to one joule per kilogram: $1 \text{ Gy} = 1 \text{ J kg}^{-1}$	COUNCIL DIRECTIVE 2013/59/EURATOM
dose efetiva	E	a soma das doses equivalentes ponderadas em todos os tecidos e órgãos do corpo e resultantes de exposição interna e externa. É definida pela fórmula: em que D é a dose absorvida média no tecido ou órgão T, T, R em resultado da radiação R, w_T é o fator de ponderação R da radiação, e w_R é o fator de ponderação tecidual para o tecido ou órgão T. Os valores de w_T e w_R são definidos em portaria do membro do Governo responsável pela área governativa da autoridade competente, sob proposta da autoridade competente.	effective dose	(16) (E) is the sum of the weighted equivalent doses in all the tissues and organs of the body from internal and external exposure. It is defined by the expression: $E = \sum T w_T H_T = \sum R w_R D_T$; where D_T is the absorbed dose averaged over tissue or organ T, due to radiation R, w_R is the radiation weighting factor and w_T is the tissue weighting factor for tissue or organ T. The values for w_T and w_R are specified in Annex II. The unit for effective dose is the sievert (Sv).	COUNCIL DIRECTIVE 2013/59/EURATOM

TERM PT	Abbreviation	DEFINITION PT	TERM EN	DEFINITION EN	Source
dose efetiva comprometida	[E(τ)]	a soma das doses equivalentes comprometidas nos diversos tecidos ou órgãos H (τ) na sequência de uma incorporação, sendo cada uma delas multiplicada pelo fator de ponderação tecidual w _r adequado. É definido pela fórmula $E(\tau) = \sum H(\tau) \cdot w_r$. H (τ), τ é dado pelo número de anos ao longo dos quais se faz a integração. Para efeitos de cumprimento dos limites de dose estabelecidos no presente decreto - lei, corresponde a um período de 50 anos após a incorporação, para os adultos, e a um período que vai até à idade de 70 anos para os lactentes e as crianças. A unidade de dose equivalente comprometida é o sievert (Sv).	committed effective dose	(12) is the sum of the committed organ or tissue equivalent doses HT(τ) resulting from an intake, each multiplied by the appropriate tissue weighting factor w _T . It is defined by: $E(\tau) = \sum H(\tau) \cdot w_T$. In specifying E(τ), is given in the number of years over which the integration is made. For the purpose of complying with dose limits specified in this Directive, is a period of 50 years following intake for adults and up to the age of 70 for infants and children. The unit for committed effective dose is the sievert (Sv)	COUNCIL DIRECTIVE 2013/59/EURATOM
dose equivalente	H	a dose absorvida no tecido T ou órgão T, ponderada em função do tipo e qualidade da radiação R. É definida pela fórmula: $H = \sum D_{T,R} \cdot w_R$. Os valores w _R adequados são definidos em portaria do membro do Governo responsável pela área governativa da autoridade competente, sob proposta da autoridade competente. A unidade de dose equivalente é o sievert (Sv).	equivalent dose	(16) (HT) is the absorbed dose, in tissue or organ T weighted for the type and quality of radiation R. It is given by: $HT = \sum D_{T,R} \cdot w_R$, where D _{T,R} is the absorbed dose averaged over tissue or organ T, due to radiation R, w _R is the radiation weighting factor. When the radiation field is composed of types and energies with different values of w _R , the total equivalent dose, HT, is given by: $HT = \sum D_{T,R} \cdot w_R$. The values for w _R are specified in Annex II, Part A. The unit for equivalent dose is the sievert (Sv).	COUNCIL DIRECTIVE 2013/59/EURATOM
dose equivalente comprometida	[H (τ)],	a) [H (τ)], a integral, em função do tempo (t) do débito de dose equivalente (no tecido ou órgão T) que é recebida por um indivíduo, em resultado de uma incorporação. É definida pela fórmula: $H(\tau) = \int_0^{\tau} \dot{H}_T(t) \cdot dt$ para uma incorporação no momento t, em que HT(t)dt é o débito de dose equivalente relevante (no órgão ou tecido T) no instante t, τ é o período durante o qual se realiza a integração. HT(τ), τ é dado pelo número de anos ao longo dos quais se faz a integração. Para efeitos de cumprimento dos limites de dose estabelecidos no presente decreto-lei.	committed equivalent dose	(12) (HT(τ)) is the integral over time (t) of the equivalent dose rate in tissue or organ T that will be received by an individual as a result of an intake. It is given by $HT(\tau) = \int_0^{\tau} \dot{H}_T(t) \cdot dt$ for an intake at time t ₀ where $\dot{H}_T(t)$ is the relevant equivalent dose rate in organ or tissue T at time t, τ is the time over which the integration is performed. In specifying HT(τ), is given in number of years over which the integration is made. For the purpose of complying with dose limits specified in this Directive, τ is a period of 50 years for adults and up to the age of 70 for infants and children. The unit for committed equivalent dose is the sievert (Sv).	COUNCIL DIRECTIVE 2013/59/EURATOM
emergência		uma situação ou evento não habitual envolvendo uma fonte de radiação ou fonte radioativa que requer uma ação rápida a fim de atenuar as consequências adversas graves para a segurança e a	emergency	means a non-routine situation or event involving a radiation source that necessitates prompt action to mitigate serious adverse consequences for human health and safety, quality of life, property or the	COUNCIL DIRECTIVE 2013/59/EURATOM

TERM PT	Abbreviation	DEFINITION PT	TERM EN	DEFINITION EN	Source
		saúde humanas, para a qualidade de vida, os bens ou o ambiente, ou um perigo suscetível de provocar tais consequências adversas.		environment, or a hazard that could give rise to such serious adverse consequences.	
especialista em física médica		o indivíduo reconhecido pela autoridade competente, nos termos da lei, com conhecimentos, formação e experiência para atuar ou prestar consultoria sobre questões relacionadas com a física das radiações aplicada às exposições médicas.	medical physics expert	an individual or, if provided for in national legislation, a group of individuals, having the knowledge, training and experience to act or give advice on matters relating to radiation physics applied to medical exposure, whose competence in this respect is recognised by the competent authority.	COUNCIL DIRECTIVE 2013/59/EURATOM
especialista em proteção radiológica		o indivíduo reconhecido pela autoridade competente, nos termos da lei, com conhecimentos, formação e experiência para prestar consultoria sobre proteção contra radiações, com vista a garantir a proteção efetiva das pessoas.	radiation protection expert	an individual or, if provided for in the national legislation, a group of individuals having the knowledge, training and experience needed to give radiation protection advice in order to ensure the effective protection of individuals, and whose competence in this respect is recognised by the competent authority.	COUNCIL DIRECTIVE 2013/59/EURATOM
exposição		o ato de expor ou o facto de estar exposto a radiações ionizantes emitidas fora do corpo humano — exposição externa — ou dentro do corpo humano — exposição interna.	exposure	means the act of exposing or condition of being exposed to ionising radiation emitted outside the body (external exposure) or within the body (internal exposure).	COUNCIL DIRECTIVE 2013/59/EURATOM
exposição acidental		a exposição de indivíduos em consequência de um acidente, com exceção dos trabalhadores de emergência.	accidental exposure	an exposure of individuals, other than emergency workers, as a result of an accident.	COUNCIL DIRECTIVE 2013/59/EURATOM
exposição ao radão		a exposição ao radionuclídeo Rn-222 e à sua descendência.	exposure to radon	means exposure to radon progeny.	COUNCIL DIRECTIVE 2013/59/EURATOM
exposição do público		a exposição de pessoas, excluindo a exposição ocupacional ou médica.	public exposure	exposure of individuals, excluding any occupational or medical exposure.	COUNCIL DIRECTIVE 2013/59/EURATOM
exposição imagiológica não médica		qualquer exposição deliberada de pessoas para fins de obtenção de imagem, em que a intenção principal da exposição não é proporcionar um benefício para a saúde dos indivíduos expostos.	non-medical imaging exposure	any deliberate exposure of humans for imaging purposes where the primary intention of the exposure is not to bring a health benefit to the individual being exposed.	COUNCIL DIRECTIVE 2013/59/EURATOM
exposição médica		exposição a radiação ionizante de pacientes ou de indivíduos assintomáticos, no âmbito dos seus próprios diagnósticos ou tratamentos médicos, ou odontológicos, com o objetivo de	medical exposure	exposure incurred by patients or asymptomatic individuals as part of their own medical or dental diagnosis or treatment, and intended to benefit their health, as well as exposure incurred by carers and	COUNCIL DIRECTIVE 2013/59/EURATOM

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		proporcionar um benefício para a saúde, bem como a exposição a que estão sujeitos os seus cuidadores, e também os voluntários que participam em atividades de investigação médica ou biomédica.		comforters and by volunteers in medical or biomedical research.	
exposição normal		a exposição previsível em condições normais de funcionamento de uma instalação ou atividade, incluindo atividades de manutenção, inspeção e desmantelamento e os pequenos incidentes suscetíveis de serem mantidos sob controlo, ou seja, durante o funcionamento normal e em caso de ocorrências operacionais previsíveis.	normal exposure	exposure expected to occur under the normal operating conditions of a facility or activity (including maintenance, inspection, decommissioning), including minor incidents that can be kept under control, i.e. during normal operation and anticipated operational occurrences.	COUNCIL DIRECTIVE 2013/59/EURATOM
exposição ocupacional		a exposição a que os trabalhadores, incluindo trabalhadores externos, aprendizes e estudantes estão sujeitos no decurso da sua atividade profissional.	occupational exposure	exposure of workers, apprentices and students, incurred in the course of their work.	COUNCIL DIRECTIVE 2013/59/EURATOM
exposição potencial		a exposição de cuja ocorrência não há certeza, mas que pode resultar de um evento ou sequência de eventos de natureza probabilística, incluindo falhas do equipamento e incidentes de funcionamento.	potential exposure	exposure that is not expected with certainty but may result from an event or sequence of events of a probabilistic nature, including equipment failures and operating errors.	COUNCIL DIRECTIVE 2013/59/EURATOM
exposição profissional de emergência		a exposição a que ficam submetidos os trabalhadores de emergência, numa situação de exposição de emergência.	emergency occupational exposure	exposure received in an emergency exposure situation by an emergency worker.	COUNCIL DIRECTIVE 2013/59/EURATOM
extremidades		as mãos, os antebraços, os pés e os tornozelos.	extremities	the hands, forearms, feet and ankles.	COUNCIL DIRECTIVE 2013/59/EURATOM
fonte de radiação natural		uma fonte de radiação ionizante de origem natural, seja terrestre ou cósmica.	natural radiation source	means a source of ionising radiation of natural, terrestrial or cosmic origin.	COUNCIL DIRECTIVE 2013/59/EURATOM
fonte de radiação		uma estrutura ou equipamento suscetível de causar exposição, por exemplo, através da emissão de radiação ionizante ou da libertação de material radioativo.	radiation source	an entity that may cause exposure, such as by emitting ionising radiation or by releasing radioactive material.	COUNCIL DIRECTIVE 2013/59/EURATOM
fonte fora de uso		uma fonte radioativa selada que já não é, nem se destina a ser, utilizada para a prática para	disused source	a sealed source which is no longer used or intended to be used for the practice for which authorisation	COUNCIL DIRECTIVE 2013/59/EURATOM

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		a qual foi concedida licença ou registo mas que continua a exigir uma gestão segura.		was granted but continues to require safe management.	
fonte órfã		uma fonte radioativa que não beneficia de isenção e não se encontra sob controlo regulador, por exemplo, por nunca ter estado sujeita a esse controlo, quer por ter sido abandonada, perdida, colocada no local errado, roubada ou transferida de qualquer outro modo sem a devida licença ou registo.	orphan source	a radioactive source which is neither exempted nor under regulatory control, e.g. because it has never been under regulatory control or because it has been abandoned, lost, misplaced, stolen or otherwise transferred without proper authorisation.	COUNCIL DIRECTIVE 2013/59/EURATOM
fonte radioativa		uma fonte de radiação que contém material radioativo com intenção de utilização da sua radioatividade.	radioactive source	(16) a radiation source incorporating radioactive material for the purpose of utilising its radioactivity.	COUNCIL DIRECTIVE 2013/59/EURATOM
fonte radioativa selada de atividade elevada		uma fonte radioativa selada cuja atividade do radionuclídeo é igual ou superior ao valor estabelecido no anexo I ao presente decreto -lei, do qual faz parte integrante.	high activity sealed source	a radioactive source whose activity is equal to, or higher than, the value established in Annex I of this Decree-Law, of which it is an integral part thereof.	Proposed translation
fonte radioativa selada		uma fonte radioativa em que o material radioativo está permanentemente selado numa cápsula, ou está integrado numa estrutura sólida que impede, em circunstâncias normais de utilização, qualquer dispersão de substâncias radioativas.	sealed source	a radioactive source in which the radioactive material is permanently sealed in a capsule or incorporated in a solid form with the objective of preventing, under normal conditions of use, any dispersion of radioactive substances.	
garantia de qualidade		todas as ações planeadas e sistemáticas, necessárias para garantir uma confiança adequada quanto ao funcionamento satisfatório de uma instalação, um sistema, componente de equipamento ou procedimento, de acordo com normas aprovadas, incluindo, designadamente, o controlo da qualidade.	quality assurance	all those planned and systematic actions necessary to provide adequate assurance that a structure, system, component or procedure will perform satisfactorily in compliance with agreed standards. Quality control is a part of quality assurance.	
gerador de radiação		um dispositivo capaz de gerar radiações ionizantes, tais como raios -X, neutrões, eletrões ou outras partículas carregadas.	radiation generator	a device capable of generating ionising radiation, such as X-rays, neutrons, electrons or other charged particles.	
Gray	Gy	designação especial da unidade de dose absorvida, sendo que um Gray é igual a um Joule por quilograma, e é definida por: 1 Gy = 1 J kg ⁻¹ .	gray (Gy)	The SI unit of <i>kerma</i> and <i>absorbed dose</i> , equal to 1J/kg.	IAEA Safety Glossary. Terminology Used in Nuclear Safety and Radiation Protection, 2018 Ed.p. 104.
incidente		qualquer ocorrência não intencional cujas consequências ou potenciais consequências não	incident	Any unintended event, including operating errors, equipment failures, initiating events, accident	IAEA Safety Glossary. Terminology Used in

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		sejam negligenciáveis do ponto de vista da proteção contra radiações ou da segurança nuclear.		<i>precursors, near misses or other mishaps, or unauthorized act, malicious or non-malicious, the consequences or potential consequences of which are not negligible from the point of view of protection and safety.</i>	Nuclear Safety and Radiation Protection, 2018 Ed.p. 112.
incorporação		as atividades dos radionuclídeos que entram no organismo provenientes do meio exterior.	absorption		
inspeção		todas as inspeções, incluindo visitas a locais, controlo das emissões e verificação dos relatórios internos e dos documentos de acompanhamento, verificação do autocontrolo, verificação das técnicas utilizadas e da adequação da gestão das atividades e práticas sujeitas ao presente decreto -lei, efetuadas pela entidade referida no artigo 181.º ou em seu nome, para verificar e promover a conformidade das atividades e práticas com as condições de licenciamento e registo e com o presente decreto -lei.	inspection	an investigation by or on behalf of any competent authority to verify compliance with national legal requirements.	COUNCIL DIRECTIVE 2013/59/EURATOM
instalação radiológica para fins médicos		uma instalação onde são executados procedimentos radiológicos médicos.	medical radiological installation	a facility where medical radiological procedures are performed.	COUNCIL DIRECTIVE 2013/59/EURATOM
licença		decisão administrativa emitida pela autoridade competente para o exercício de uma prática ou de uma atividade, em conformidade com as condições específicas nela estabelecidas e o presente decreto -lei.	licence	(1) A legal document issued by the regulatory body granting authorization to perform specified activities relating to a facility or activity. Note 1: A licence is a product of the authorization process (although the term licensing process is sometimes used), and a practice with a current licence is an authorized practice. Note 2: Authorization may take other forms, such as registration or certification.	IAEA Safety Glossary. Terminology Used in Nuclear Safety and Radiation Protection, 2018 Ed.p. 126. Additional definitions are provided
limite de dose		o valor da dose efetiva ou, onde aplicável, da dose efetiva comprometida, ou da dose equivalente, num determinado período, que não pode ser excedido para cada indivíduo.	dose limit	the value of the effective dose (where applicable, committed effective dose) or the equivalent dose in a specified period which shall not be exceeded for an individual.	COUNCIL DIRECTIVE 2013/59/EURATOM
material de construção		qualquer produto de construção destinado a ser permanentemente incorporado num edifício ou partes de um edifício, cujas características podem	building material	any construction product for incorporation in a permanent manner in a building or parts thereof and the performance of which has no effect on the	COUNCIL DIRECTIVE 2013/59/EURATOM

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		influenciar a exposição às radiações ionizantes dos seus ocupantes.		performance of the building with regard to exposure of its occupants to ionising radiation.	
material radioativo		material que contém substâncias radioativas.	radioactive material	material incorporating radio active substances.	COUNCIL DIRECTIVE 2013/59/EURATOM
medidas de proteção		as medidas destinadas a evitar ou a reduzir as doses que poderiam de outro modo ser recebidas numa situação de exposição de emergência ou numa situação de exposição existente, com exceção das medidas de remediação.	protective measures	measures, other than remedial measures, for the purpose of avoiding or reducing doses that might otherwise be received in an emergency exposure situation or an existing exposure situation.	COUNCIL DIRECTIVE 2013/59/EURATOM
medidas de remediação		as medidas de remoção de uma fonte de radiação ou a redução da sua intensidade, em termos de atividade ou quantidade, a interrupção de vias de exposição, ou a redução do respetivo impacto com o objetivo de evitar ou reduzir as doses que, na sua ausência poderiam ser recebidas numa situação de exposição existente.	remedial measures	the removal of a radiation source or the reduction of its magnitude (in terms of activity or amount) or the interruption of exposure pathways or the reduction of their impact for the purposes of avoiding or reducing doses that might otherwise be received in an existing exposure situation.	COUNCIL DIRECTIVE 2013/59/EURATOM
membros do público		elementos da população, com exceção dos trabalhadores expostos, dos aprendizes e dos estudantes, durante as suas horas de trabalho, e de pessoas durante as exposições médicas, cuidadores, ou ainda de pessoas que voluntariamente participem em programas de investigação médica e biomédica.	members of the public	individuals who may be subject to public exposure.	COUNCIL DIRECTIVE 2013/59/EURATOM
monitorização do ambiente		a medição dos débitos de dose externos devidos à presença de substâncias radioativas no ambiente, ou das concentrações de radionuclídeos nos compartimentos ambientais.	environmental monitoring	the measurement of external dose rates due to radioactive substances in the environment or of concentrations of radionuclides in environmental media.	COUNCIL DIRECTIVE 2013/59/EURATOM
nível de isenção		o valor expresso em termos de concentração de atividade ou de atividade total, estabelecido pela autoridade competente ou pela legislação nacional, e para o qual, ou abaixo do qual, uma fonte de radiação não está sujeita a licença ou registo.	clearance levels	values established by the competent authority or in national legislation, and expressed in terms of activity concentrations, at or below which materials arising from any practice subject to notification or authorisation may be released from the requirements of this Directive.	COUNCIL DIRECTIVE 2013/59/EURATOM
nível de liberação		o valor expresso em termos de concentração de atividade, estabelecido pela autoridade competente ou pela legislação nacional, que os	clearance level	values established by the competent authority or in national legislation, and expressed in terms of activity concentrations, at or below which materials arising	COUNCIL DIRECTIVE 2013/59/EURATOM

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		materiais resultantes das práticas sujeitas a comunicação prévia, licença ou registo não podem exceder para poderem ser libertos de controlo regulador.		from any practice subject to notification or authorisation may be released from the requirements of this Directive.	
nível de referência		o nível da dose efetiva, ou da dose equivalente ou da concentração de atividade acima do qual, numa situação de exposição de emergência ou numa situação de exposição existente, se considera inadequado permitir a exposição dos membros do público como consequência dessa situação de exposição, ainda que não se trate de um limite que não possa ser ultrapassado.	reference level	means in an emergency exposure situation or in an existing exposure situation, the level of effective dose or equivalent dose or activity concentration above which it is judged inappropriate to allow exposures to occur as a result of that exposure situation, even though it is not a limit that may not be exceeded.	COUNCIL DIRECTIVE 2013/59/EURATOM
níveis de referência de diagnóstico		os níveis de dose nas práticas médicas de radiodiagnóstico ou de radiologia de intervenção, ou, no caso de radiofármacos, os níveis de atividade para exames típicos em grupos de pacientes de tamanho padrão, ou em fantômas padrão para tipos de equipamento de definição alargada.	diagnostic reference levels	means dose levels in medical radiodiagnostic or interventional radiology practices, or, in the case of radio-pharmaceuticals, levels of activity, for typical examinations for groups of standard-sized patients or standard phantoms for broadly defined types of equipment.	COUNCIL DIRECTIVE 2013/59/EURATOM
peessoa representativa		um indivíduo que recebe uma dose que é representativa dos indivíduos mais expostos dessa população, com exceção das pessoas que têm hábitos extremos ou raros.	representative person	means an individual receiving a dose that is representative of the more highly exposed individuals in the population, excluding those individuals having extreme or rare habits.	COUNCIL DIRECTIVE 2013/59/EURATOM
plano de emergência		o conjunto das medidas planeadas para dar resposta adequada, em caso de ocorrência de uma situação de exposição de emergência com base em eventos postulados e cenários conexos.	emergency response plan	arrangements to plan for adequate response in the event of an emergency exposure situation on the basis of postulated events and related scenarios.	COUNCIL DIRECTIVE 2013/59/EURATOM
prática		uma atividade humana suscetível de aumentar a exposição dos indivíduos a radiação proveniente de uma fonte de radiação, que pode ser integrada num tipo de prática dentro de uma classe e que é gerida como situação de exposição planeada.	practice	a human activity that can increase the exposure of individuals to radiation from a radiation source and is managed as a planned exposure situation.	COUNCIL DIRECTIVE 2013/59/EURATOM
prejuízo individual		efeitos deletérios clinicamente observáveis nos indivíduos, ou nos seus descendentes e cuja ocorrência é imediata ou diferida implicando, neste último caso, uma probabilidade e não uma certeza de ocorrência.	individual detriment	clinically observable deleterious effects in individuals or their descendants, the appearance of which is either immediate or delayed and, in the latter case, implies a probability rather than a certainty of appearance.	COUNCIL DIRECTIVE 2013/59/EURATOM

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prejuízo para a saúde		a redução da esperança e da qualidade de vida de uma população após uma exposição, incluindo as decorrentes de reações nos tecidos, cancro e alterações genéticas graves.	health detriment	reduction in length and quality of life occurring in a population following exposure, including those arising from tissue reactions, cancer and severe genetic disorder.	COUNCIL DIRECTIVE 2013/59/EURATOM
prescritor		médico e médico dentista, em conformidade com os requisitos legais.	practitioner	a medical doctor, dentist or other health professional who is entitled to take clinical responsibility for an individual medical exposure in accordance with national requirements.	COUNCIL DIRECTIVE 2013/59/EURATOM
procedimento radiológico médico		qualquer procedimento que resulte numa exposição médica.	medical radiological procedure	any procedure giving rise to medical exposure.	COUNCIL DIRECTIVE 2013/59/EURATOM
processamento		manipulação química ou física do material radioativo, incluindo a extração, conversão e enriquecimento de material nuclear cindível ou fértil e o reprocessamento do combustível irradiado.	processing	chemical or physical operations on radioactive material including the mining, conversion, enrichment of fissile or fertile nuclear material and the reprocessing of spent fuel.	COUNCIL DIRECTIVE 2013/59/EURATOM
radão		o radionuclídeo Rn -222 e sua descendência, conforme pertinente.	radon	means the radionuclide Rn-222 and its progeny, as appropriate.	COUNCIL DIRECTIVE 2013/59/EURATOM
radiação ionizante		a transferência de energia, sob a forma de partículas ou ondas eletromagnéticas, com um comprimento de onda igual ou inferior a 100 nanómetros (nm), com frequência igual ou superior a 3×10^{15} hertz (Hz), capaz de produzir iões direta ou indiretamente.	ionising radiation	energy transferred in the form of particles or electromagnetic waves of a wavelength of 100 nanometres or less (a frequency of 3×10^{15} hertz or more) capable of producing ions directly or indirectly.	COUNCIL DIRECTIVE 2013/59/EURATOM
radiodiagnóstico		utilização de técnicas que incluem a medicina nuclear de diagnóstico in vivo, radiologia de diagnóstico médica com recurso a radiações ionizantes, e radiologia dentária.	radiodiagnostic	pertaining to in-vivo diagnostic nuclear medicine, medical diagnostic radiology using ionising radiation, and dental radiology.	COUNCIL DIRECTIVE 2013/59/EURATOM
radiologia de intervenção		a utilização de técnicas de imagiologia de raios -X a fim de facilitar a introdução e a orientação de instrumentos no interior do organismo para fins de diagnóstico ou tratamento.	interventional radiology	the use of X-ray imaging techniques to facilitate the introduction and guidance of devices in the body for diagnostic or treatment purposes.	COUNCIL DIRECTIVE 2013/59/EURATOM
radiológico médico		procedimentos de radiodiagnóstico e radioterapêuticos, e radiologia de intervenção ou outras utilizações médicas de radiações ionizantes para efeitos de planeamento, orientação e verificação.	medical radiological	pertaining to radiodiagnostic and radiotherapeutic procedures, and interventional radiology or other medical uses of ionising radiation for planning, guiding and verification purposes.	COUNCIL DIRECTIVE 2013/59/EURATOM

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rastreio médico		procedimento de diagnóstico precoce em grupos populacionais de risco com utilização de instalações radiológicas médicas.	health screening	a procedure using medical radio logical installations for early diagnosis in population groups at risk.	COUNCIL DIRECTIVE 2013/59/EURATOM
radioterapêutico		relativo a radioterapia, incluindo a medicina nuclear para efeitos terapêuticos.	radiotherapeutic	pertaining to radiotherapy, including nuclear medicine for therapeutic purposes.	COUNCIL DIRECTIVE 2013/59/EURATOM
registo		decisão administrativa que, no âmbito de um procedimento simplificado, permite o exercício de uma prática ou de uma atividade, em conformidade com as condições específicas nela estabelecidas e o presente decreto -lei.	registration	permission granted in a document by the competent authority, or granted by national legislation, through a simplified procedure, to carry out a practice in accordance with conditions laid down in national legislation or specified by a competent authority for this type or class of practice.	COUNCIL DIRECTIVE 2013/59/EURATOM
resíduos radioativos		os materiais radioativos sob forma gasosa, líquida ou sólida, independentemente da sua origem, cuja utilização ulterior não seja prevista ou considerada pelo Estado nem por pessoa, singular ou coletiva, cuja decisão seja aceite pelo Estado e que sejam regulados como resíduos radioativos pela autoridade competente ao abrigo do quadro legislativo e regulamentar em vigor.	radioactive waste	radioactive material in gaseous, liquid or solid form for which no further use is foreseen or considered by the Member State or by a legal or natural person whose decision is accepted by the Member State, and which is regulated as radioactive waste by a competent regulatory authority under the legislative and regulatory framework of the Member State.	COUNCIL DIRECTIVE 2013/59/EURATOM
responsabilidade clínica		a responsabilidade de um profissional habilitado em matérias de exposições médicas individuais, nomeadamente justificação, otimização, avaliação clínica dos resultados, colaboração com outros especialistas e outros trabalhadores, quando necessário, relativamente aos aspetos práticos dos procedimentos radiológicos médicos, obtenção de informações, se necessário, sobre exames anteriores, fornecimento das informações radiológicas existentes ou de registos a outros médicos ou prescritores, se tal for pedido, prestação de informações, quando necessário, sobre os riscos das radiações ionizantes para os pacientes e outras pessoas implicadas.	clinical responsibility	responsibility of a practitioner for individual medical exposures, in particular, justification; optimisation; clinical evaluation of the outcome; cooperation with other specialists and staff, as appropriate, regarding practical aspects of medical radio logical procedures; obtaining information, if appropriate, on previous examinations; providing existing medical radiological information and/or records to other practitioners and/or the referrer, as required; and giving information on the risk of ionising radiation to patients and other individuals involved, as appropriate.	COUNCIL DIRECTIVE 2013/59/EURATOM
responsável pela proteção contra radiações		um indivíduo com competências técnicas no domínio da proteção contra radiações reconhecidas pela autoridade competente, que sejam pertinentes para supervisionar ou proceder à aplicação das	radiation protection officer	an individual who is technically competent in radiation protection matters relevant for a given type of practice to supervise or perform the	COUNCIL DIRECTIVE 2013/59/EURATOM

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		medidas de proteção contra radiações num determinado tipo de prática.		implementation of the radiation protection arrangements.	
responsável pela realização da exposição médica		um médico, médico dentista ou qualquer outro profissional de saúde habilitado a assumir a responsabilidade clínica por uma exposição médica individual.	practitioner	a medical doctor, dentist or other health professional who is entitled to take clinical responsibility for an individual medical exposure in accordance with national requirements.	COUNCIL DIRECTIVE 2013/59/EURATOM
restrição de dose		valor máximo prospetivo de doses individuais, efetivas ou equivalentes, ao longo de um período de tempo definido e adequado, utilizado no contexto do processo de otimização para uma determinada fonte numa situação de exposição planeada.	dose constraint	a constraint set as a prospective upper bound of individual doses, used to define the range of options considered in the process of optimisation for a given radiation source in a planned exposure situation.	COUNCIL DIRECTIVE 2013/59/EURATOM
serviço de dosimetria		o organismo ou indivíduo responsável pela calibração, leitura ou avaliação de dispositivos de monitorização individual, pela medição da radioatividade presente no organismo humano ou em amostras biológicas ou pela avaliação de doses, cuja qualificação para o exercício de tais funções é reconhecida pelas autoridades competentes.	dosimetry service	a body or an individual competent to calibrate, read or interpret individual monitoring devices, or to measure radioactivity in the human body or in biological samples, or to assess doses, whose capacity to act in this respect is recognised by the competent authority.	COUNCIL DIRECTIVE 2013/59/EURATOM
serviço de saúde do trabalho		serviço que assegura a vigilância e promoção da saúde dos trabalhadores, na modalidade de serviços internos, externos ou comuns, de acordo com as disposições aplicáveis ao domínio da saúde do trabalho no Regime Jurídico da Promoção da Segurança e da Saúde no Trabalho, aprovado pela Lei n.º 102/2009, de 10 de setembro, na sua redação atual.	occupational health service	a health professional or body competent to perform medical surveillance of exposed workers and whose capacity to act in that respect is recognised by the competent authority.	COUNCIL DIRECTIVE 2013/59/EURATOM
Sievert	Sv	designação especial da unidade de dose equivalente ou de dose efetiva. Um sievert equivale a um joule por quilograma: $1 \text{ Sv} = 1 \text{ J kg}^{-1}$.	Sievert	(Sv) is the special name of the unit of equivalent or effective dose. One sievert is equivalent to one joule per kilogram: $1 \text{ Sv} = 1 \text{ J kg}^{-1}$.	COUNCIL DIRECTIVE 2013/59/EURATOM
sistema de gestão de emergências		quadro jurídico ou administrativo que define as responsabilidades em termos de preparação e resposta a situações de emergência, bem como os mecanismos para tomada de decisão em caso de uma situação de exposição de emergência.	emergency management system	a legal or administrative framework establishing responsibilities for emergency preparedness and response, and arrangements for decision making in the event of an emergency exposure situation.	COUNCIL DIRECTIVE 2013/59/EURATOM
situação de exposição de emergência		uma situação de exposição decorrente de uma emergência.	emergency exposure situation	a situation of exposure due to an emergency.	COUNCIL DIRECTIVE 2013/59/EURATOM

TERM PT	Abbreviation	DEFINITION PT	TERM EN	DEFINITION EN	Source
situação de exposição existente		uma situação de exposição que já existe quando a decisão de a controlar tem que ser tomada e que não exige ou já não exige a adoção de medidas urgentes.	existing exposure situation	an exposure situation that already exists when a decision on its control has to be taken and which does not call or no longer calls for urgent measures to be taken.	COUNCIL DIRECTIVE 2013/59/EURATOM
situação de exposição planeada		uma situação de exposição originada pelo funcionamento planeado de uma fonte de radiação ou por uma atividade humana que altera as vias de exposição, de modo a provocar a exposição ou a exposição potencial de pessoas ou do ambiente, que podem incluir quer as exposições normais quer as exposições potenciais.	planned exposure situation	an exposure situation that arises from the planned operation of a radiation source or from a human activity which alters exposure pathways, so as to cause the exposure or potential exposure of people or the environment. Planned exposure situations may include both normal exposures and potential exposures.	COUNCIL DIRECTIVE 2013/59/EURATOM
substância radioativa		qualquer substância que contenha um ou mais radionuclídeos, cuja atividade ou concentração de atividade não possa ser ignorada em termos de proteção contra as radiações.	radioactive substance	any substance that contains one or more radionuclides the activity or activity concentration of which cannot be disregarded from a radiation protection point of view.	COUNCIL DIRECTIVE 2013/59/EURATOM
titular		peessoa singular ou coletiva, legalmente responsável por determinada prática, atividade ou por uma determinada fonte de radiação, incluindo os casos em que o detentor de uma fonte de radiação não desenvolve quaisquer atividades humanas relacionadas com a referida fonte.	undertaking	a natural or legal person who has legal responsibility under national law for carrying out a practice, or for a radiation source (including cases where the owner or holder of a radiation source does not conduct related human activities).	COUNCIL DIRECTIVE 2013/59/EURATOM
torão		o radionuclídeo Rn-220 e sua descendência, conforme pertinente.	thoron	the radionuclide Rn-220 and its progeny, as appropriate.	COUNCIL DIRECTIVE 2013/59/EURATOM
trabalhador de emergência		qualquer pessoa com funções definidas numa emergência que pode ser exposta a radiações ionizantes no decurso da resposta à emergência.	emergency worker	any person having a defined role in an emergency and who might be exposed to radiation while taking action in response to the emergency.	COUNCIL DIRECTIVE 2013/59/EURATOM
trabalhador exposto		peessoa submetida durante o trabalho, por conta própria ou de outrem, a uma exposição decorrente de práticas abrangidas pelo presente decreto-lei, suscetíveis de resultar numa dose superior a qualquer um dos limites de dose fixados para os membros do público.	exposed worker	a person, either self-employed or working under an employer, who is subject to exposure at work carried out within a practice regulated by this Directive and who is liable to receive doses exceeding one or other of the dose limits for public exposure.	COUNCIL DIRECTIVE 2013/59/EURATOM
trabalhador externo		qualquer trabalhador exposto que não tenha sido contratado pela entidade responsável pelas zonas vigiadas e controladas, mas que exerça a sua	outside worker	any exposed worker who is not employed by the undertaking responsible for the supervised and controlled areas, but performs activities in those areas, including, apprentices and students.	COUNCIL DIRECTIVE 2013/59/EURATOM

TERM PT	Abbreviation	DEFINITION PT	TERM EN	DEFINITION EN	Source
		atividade em tais zonas, incluindo aprendizes e estudantes.			
valores e relações normalizados		os valores e relações recomendados nos capítulos 4 e 5 da Publicação 116 da Comissão Internacional de Proteção Radiológica (CIPR) para a estimativa das doses resultantes de exposição externa, e no capítulo 1 da Publicação 119 da CIPR para a estimativa das doses resultantes de exposição interna, incluindo as atualizações aprovadas pelos Estados -Membros, a publicar em portaria do membro do Governo responsável pela área governativa da autoridade competente, sob proposta da autoridade competente.	standard values and relationships	values and relationships recommended in chapters 4 and 5 of ICRP Publication 116 for the estimation of doses from external exposure and chapter 1 of ICRP Publication 119 for the estimation of doses from internal exposure, including updates approved by Member States. Member State may approve the use of specific methods in specified cases relating to the physico-chemical properties of the radionuclide or other features of the exposure situation or of the exposed individual.	COUNCIL DIRECTIVE 2013/59/EURATOM
veículo espacial		um veículo tripulado concebido para funcionar a uma altitude de mais de 100 km acima do nível do mar.	spacecraft	a manned vehicle designed to operate at an altitude of more than 100 km above sea level.	COUNCIL DIRECTIVE 2013/59/EURATOM
zona controlada		uma área submetida a regulamentação especial para efeitos de proteção contra radiações ionizantes ou para evitar a disseminação da contaminação radioativa e cujo acesso é controlado.	controlled area	an area subject to special rules for the purpose of protection against ionising radiation or preventing the spread of radioactive contamination and to which access is controlled.	COUNCIL DIRECTIVE 2013/59/EURATOM
zona vigiada		área em que, por virtude das condições de trabalho existentes, seja provável que a exposição a que os trabalhadores estão sujeitos durante um ano possa ultrapassar uma décima dos limites de dose fixados no presente decreto -lei, mas que não ultrapasse as três décimas dos limites de dose fixados no presente decreto -lei.	supervised area	an area subject to supervision for the purpose of protection against ionising radiation.	COUNCIL DIRECTIVE 2013/59/EURATOM

Sources: Directive 2013/59/EURATOM - Portuguese and English versions
Decreto-Lei n.º 108/2018 de 3 de Dezembro
Directive 2008/99/EC of 19 November
IAEA (2018). IAEA Safety Glossary. Terminology Used in Nuclear Safety and Radiation Protection.

ANNEX 4 – Occurrences for "Translation"

AntConc 3.5.8 (Windows) 2019

File Global Settings Tool Preferences Help

Concordance Concordance Plot File View Clusters/N-Grams Collocates Word List Keyword List

Concordance Hits 26

Hit	KWIC	File
1	contexts is somewhat 'stronger' (more active) than that of its usual translations and other similar words in some other languages. For e	IAEA GSR PA
2	contexts is somewhat 'stronger' (more active) than that of its usual translations and other similar words in some other languages. For e	PR_1708_Pr
3	is received in a language other than English, and if English translations are not readily available from the notifying/reporting St	EPR_IEComn
4	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	enhancetrans
5	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	EPR_Harmor
6	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	EPR_IEComn
7	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	EPR_IEComn
8	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	EPR_Pocketb
9	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	EPR-CommF
10	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	EPR-Lessons
11	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	IAEA GSR PA
12	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	IAEA-REP-EP
13	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	IEM-9_web.t
14	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	PR_1708_Pr
15	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	Pub1265_Ar
16	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	Pub1467_Cr
17	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	Pub1629_Cc
18	yalty agreements. Proposals for non-commercial reproductions and translations are welcomed and considered on a case-by-case basis. f	Pub1704_w

Search Term Words Case Regex
 translations Search Window Size 80

Show Every Nth Row 1

Kwic Sort
 Level 1 1R Level 2 2R Level 3 3R

Total No. 25
 Files Processed

ANNEX 5 – Occurrences for "Interpretation"

AntConc 3.5.8 (Windows) 2019

File Global Settings Tool Preferences Help

Corpus Files

- Aarhus_1998.txt
- enhancetransparency1
- EPR_FirstResponder_w
- EPR_HarmonizedAssis
- EPR_IEComm-2012_We
- EPR_IEComm 2019 we
- EPR_Pocketbook_web.t
- EPR-CommPlan2015_w
- EPR-Lessons learned 2
- EPR-RANET2018web.t
- IAEA GSR PART 3 - BS
- IAEA-REP-EPR_web.txt
- IEM-9_web.txt
- Nuclear Communicato
- PR_1708_Preparednes:
- Pub1265_Arrangement
- Pub1467_Criteria_Prep
- Pub1629_Communicati
- Pub1704_web (1).txt
- PUB1789_Leadership.t
- PUB1796_Termination_
- PUB1843_Human_Factc
- P1784_Communication
- report-on-capacity-bu
- TECDOC 1113.txt

Concordance Concordance Plot File View Clusters/N-Grams Collocates Word List Keyword List

Concordance Hits 55

Hit	KWIC	File
1	to ensure the observance of safety standards." INTERPRETATION OF THE TEXT A list of definitions	IAEA GSR PA
2	1.13) 3 Scope (1.14–1.16) 4 Structure (1.17) 5 2. INTERPRETATION, RESOLUTION OF CONFLICTS AND ENTRY INTO F	PR_1708_Pr
3	t for each emergency preparedness category. 2. INTERPRETATION, RESOLUTION OF CONFLICTS AND ENTRY INTO F	PR_1708_Pr
4	, regarding: the status of the plant, the interpretation of plant data and parameters, the status	EPR-RANET2
5	nterpretation of the monitoring results including interpretation of spectrometric results, and recommendations on	EPR-RANET2
6	the regulations are very prescriptive. Also, the interpretation of regulations as applied to a specific	TECDOC 111
7	particular, the articles of this Convention whose interpretation or application is at issue. The secretariat	Aarhus_1998
8	used have the meanings given under Definitions. INTERPRETATION 2.2. Except as specifically authorized by the st	IAEA GSR PA
9	in the IAEA Safety Glossary, 2007 Edition [12]. INTERPRETATION 2.2. Except as specifically authorized by t	PR_1708_Pr
10	competence and experience in the following areas: interpretation of bioassay data, biokinetic modelling, dose asse	EPR-RANET2
11	governing body of a Sponsoring Organization, no interpretation of these Standards by any officer or	IAEA GSR PA
12	erning body of a Sponsoring Organization, no interpretation of this standard by any officer or	PR_1708_Pr
13	nterpretation of the monitoring results including interpretation of spectrometric results, contamination maps and	EPR-RANET2
14	ded nature of responses, making summarization and interpretation of results often difficult. However, for num	Pub1629_Cc
15	provide analyses of data, dose calculations and interpretation. Resources Capabilities for dose calculations us	EPR-RANET2
16	FOR PROTECTION AND SAFETY 18 Definitions (2.1) 18 Interpretation (2.2) 18 Resolution of conflicts (2.3–2.5) 18 Ent	IAEA GSR PA
17	FLICTS AND ENTRY INTO FORCE 5 Definitions (2.1) 5 Interpretation (2.2) 5 Resolution of conflicts (2.3–2.5) 6 Entry	PR_1708_Pr
18	use of many sources, depending upon the interpretation used. The term 'facilities and activities' is	IAEA GSR PA

Search Term Words Case Regex

Search Window Size 50

interpretation Advanced

Start Stop Sort Show Every Nth Row 1

Kwic Sort

Level 1 4R Level 2 2R Level 3 3R

Clone Results

Total No. 25

Files Processed