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RISK MANAGEMENT METHODOLOGY FOR RBMN PROJECT

Maria F. B. Borssatto[1], Clédola C. O. Tello[2] and George Uemura[3]
Centro de Desenvolvimento da Tecnologia Nuclear
Comissão Nacional de Energia Nuclear
Av. Antônio Carlos 6672
31270-901 - Belo Horizonte/MG
[1]fborssatto@gmail.com, [2] tellocc@cdtn.br, [3] george@cdtn.br

ABSTRACT

RBMN Project has been developed to design, construct and commission a national repository to dispose the low- and intermediate-level radioactive wastes from the operation of nuclear power plants and other industries that use radioactive sources and materials. Risk is a characteristic of all projects. The risks arise from uncertainties due to assumptions associated with the project and the environment in which it is executed. Risk management is the method by which these uncertainties are systematically monitored to ensure that the objectives of the project will be achieved. Considering the peculiarities of the Project, that is, comprehensive scope, multidisciplinary team, apparently polemic due to the unknowing of the subject by the stakeholders, especially the community, it is being developed a specific methodology for risk management of this Project. This methodology will be critical for future generations who will be responsible for the final stages of the repository. It will provide greater guarantee to the processes already implemented and will maintain a specific list of risks and solutions for this Project, ensuring safety and security of the repository throughout its life cycle that is the planned to last at least three hundred years. This paper presents the tools and processes already defined, management actions aimed at developing a culture of proactive risk in order to minimize threats to this Project and promote actions that bring opportunities to its success. The methodology is based on solid research on the subject, considering methodologies already established and globally recognized as best practices for project management.

1. INTRODUCTION

It is the responsibility of the National Commission of Nuclear Energy (CNEN) the regulation of the Management of Radioactive Waste (RW) and the safe custody of waste, both in intermediate and final storage. CNEN is also responsible for the Implementation of the National Radioactive Waste Repository for Low and Intermediate-Level Radiation (LILW).

Under this assignment, in November 2008, CNEN launched the "RBMN" project in order to put in operation a national repository for the storage of low and intermediate-level radioactive wastes.

Due to its complexity and features, a project with such goal requires methodological processes to be customized to its particularities, and brings out a special concern about the risks associated. The technical and operational risks related to the use of radioactive materials and to the treatment and disposal of waste and residues generated, will not be approached in this article, but the specific risks related to the RBMN Project.

Risks are inherent to all projects of any nature, for every project aims to obtain a product or service never before performed, a feature that already presupposes uncertainties. Lack of technical knowledge, evolution or incompatibility of technologies, internal and external

environmental factors, cultural differences, scope changes and staff turnover are just a few examples of uncertainties that may affect the project's progress.

The methodological and systematic actions to address uncertainties of the project in order to act proactively, considering the threats to success and the opportunities that facilitate the achievement of the project objectives, are called risk management.

Risk management has been gaining increasing importance in business and government environments because of the benefits arising from the adoption of this practice. But this is only possible by creating awareness of everyone involved in the project about the need of participation and by stimulating the culture in project and risk management, based on a methodology adjusted and adherent to the project.

Managing risks means not just to identify them and plan mitigating actions, because risks are dynamic - they change over time - and different situations need different actions.

This paper presents the Risk Management Methodology (RMM) developed specifically for the RBMN Project.

2. REPOSITORIES

There are currently 128 sites of final storage of radioactive waste in the world and another six which have been proposed, besides the Brazilian project [1].

In Brazil there is already one repository that was built to store the radioactive waste generated in a radiological accident with cesium-137, which occurred in Goiânia, in September 1987. The repository was built from March 1991 to July 1997 in the city of Abadia de Goiás, 23 km far from Goiânia. The repository stores 3,500 m3 of material, totaling about 6,000 tons [2].

The repositories El Cabril and L'Aube, located respectively in Spain and France, operating since 1994, serve as an example for the repositories now in operation and under development in the UK, Korea, Hungary and Brazil.

Social, ethical and economic considerations are now being recognized as legitimate aspects of the public politics process. Decisions regarding radioactive waste, considered until very recently the exclusive responsibility of governments and the nuclear community, are now clearly in the public domain, including those relating to the repositories.

Therefore, a project to set up a repository for radioactive waste requires management processes throughout its lifecycle, including aspects related to risks that provide proactive actions that go beyond the actuation range of technical and deployment team.

3. RBMN PROJECT

RBMN Project aims to plan, execute and track all tasks for deploying Brazilian repository, from conceptual design throughout its construction. The repository will be specially designed and licensed to store waste of low and medium levels of radiation.

The RBMN Project will result in an installation that will operate for 60 years, with closure and institutional control already planned for a period expected total of about 300 years.

The planning of a project of this duration requires non-routine focus and practice, since all the professionals involved in this phase will not be present to monitor the operation and certainly not for the closure and institutional control phases. However, these professionals have a responsibility to ensure their flawless operation, or with the least possible number of them, paving a solid road for the future generations, which will be responsible for the other stages of the plant operation.

Concern for the future generations is part of the philosophical underpinnings of the project, which is the concept of sustainable development of the World Commission on Environment and Development: "Sustainable development is development that meets the needs of the present without compromising the needs of future generations to meet their own needs "[3].

In the light of these concerns, there is the need to adopt not only the risk and security analysis routinely carried out in nuclear facilities such as power plants, but to develop a system of risk management itself, containing management tools that can facilitate and ensure the handling and preservation of documentation, records and historical occurrences, for at least three centuries, which means that the management of the repository will undergo several generations, always aiming to ensure safety without risk to humans and the environment.

In October 2011, after a period of two years of slow pace, the planning of the RBMN Project was given a new impulse. Under the influence of the events in Fukushima, the need for effective risk management gained a greater importance. New threats and opportunities have been identified since then, especially in relation to issues regarding the population and the community where the repository will be installed as new opinions were formed with the increasing information resulting from Fukushima.

Regarding the selection of the site for the repository, it is necessary to show the population living close to local candidates the benefits it may have from the project, for example, an increased number of jobs, the cultural development favored by the addition of new specializations to train skilled workers, and the heating of local commerce, as well as new opportunities for the interested region.

It should be remembered that, for the RBMN Project, its social acceptability is as important as its technical security.

4. RISK MANAGEMENT OF RBMN PROJECT

For the development of a specific Risk Management methodology tailored to the RBMN Project, a comparison was made between the processes of each methodology and the best practice guides, thus determining the level of importance and relevance of the processes to the RBMN project.

The methodology proposed for the risk management of the project corresponds to a part of the RBMN project management methodology, which is being developed in parallel to this work.

Following the steps shown in FIG. 1 performed the methodology development.

Figure 1: Stages of development of the methodology.

The scope of the planning methodology included the following activities:

- Preparation of RBMN's Governance Risk documentation;
- Definition of risk management processes applicable to the Project RBMN;
- Description of the procedures for the execution of these processes, and
- Determination of the means of custody, maintenance and retrieval of data relevant to the history of the repository.

4.1. Governance Risk RBMN

The governance model proposed for the RBMN Project involves the representation of all stakeholders in a committee and subcommittees for specific subjects, due to the large scope of the project and the involvement of the population. FIG. 2 shows the proposed governance structure.

All decisions regarding the risks are taken collectively and according to standards that will be created by the Risk Committee.

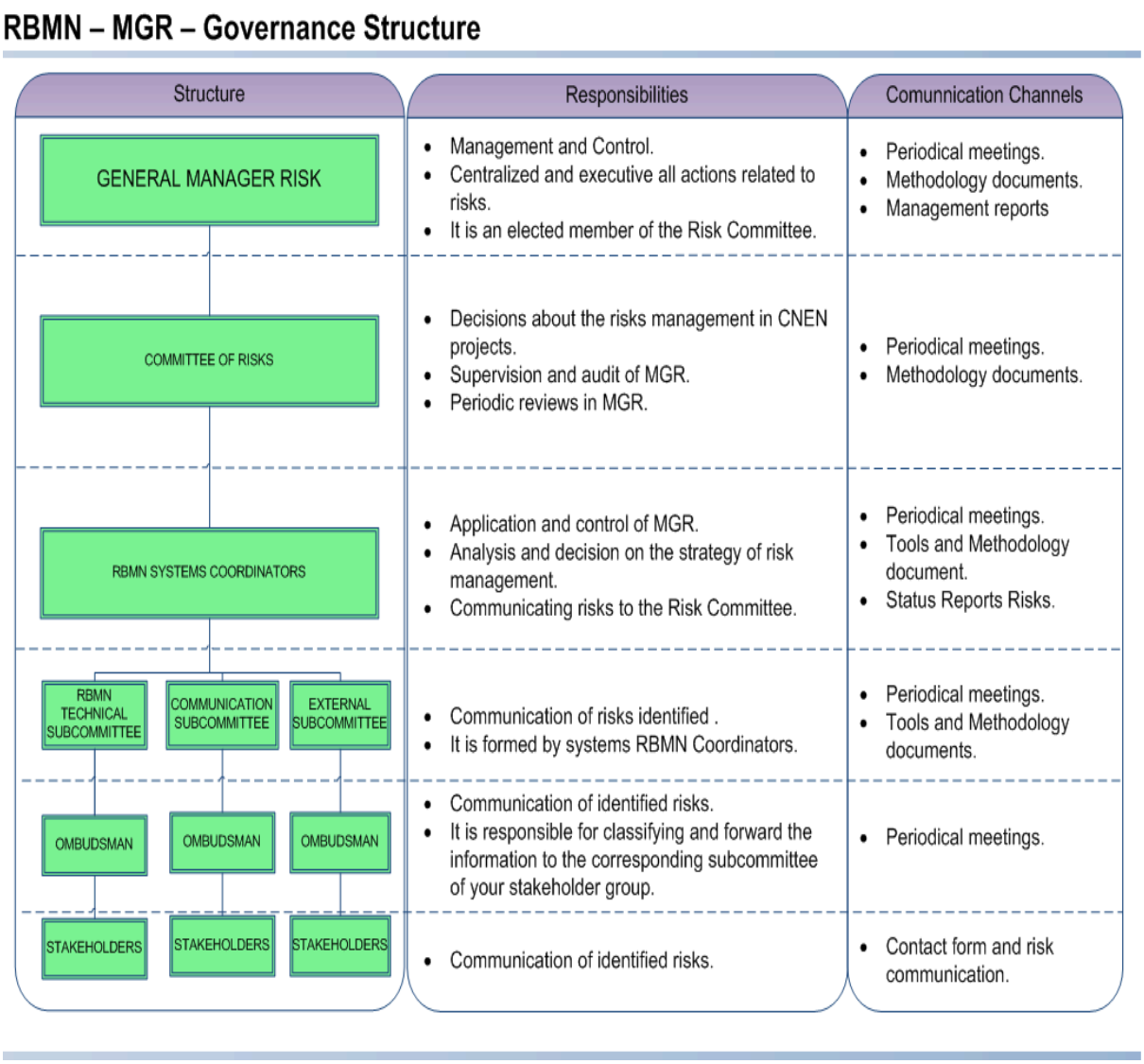

Figure 2: RBMN Risk Governance.

4.2. Risk Management Processes Applicable to RBMN Project

Based on this study and in the Project's environment, FIG.3 shows the flow of the proposed processes for risk management.

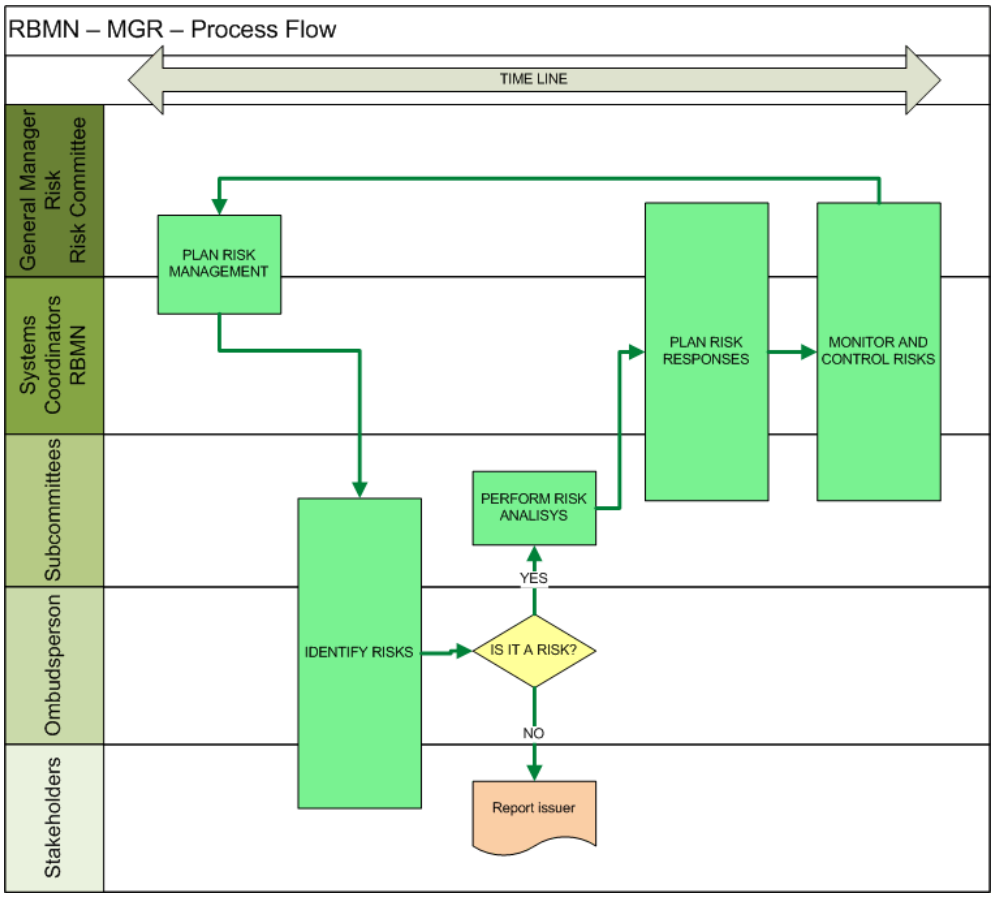

Figure 3: RBMN Process Flow.

4.2.1. Plan risk management

Plan risk management is the process to define the approach and how risk management will be structured and executed during the Project. It defines the criteria for classifying and assessing risks, the levels of risk tolerance considering an agreed basis of assessment, so as to level out the grades of risk perception and guide managers and other stakeholders on how to treat the risks and how to conduct the implementation of the successive steps.

4.2.2. Identify risks

This process identifies the risks of the project. All potential risks are raised, formalizing and documenting the data collected. This documentation is essential for the repository management and will also serve as the basis for managing the repository until its closure.

There were no historical risk management records that could be used for the RBMN Project initially, but the experience in other types of projects, reported by the coordinators, served as a basis for comparison and guidance for identifying risks.

Identify risks is an iterative process because during the life cycle of the project, new risks can be identified due to changes in the project environment. The process involves the entire project team and each risk has a person responsible for its control and the actions associated

risk response. Although external stakeholders do not participate in the project management, should provide information that is relevant to management.

4.2.3. Perform risk analysis

Process to determine the level of risk exposure, considering the qualitative and quantitative evaluations of each risk identified in the previous process, in order to define the level of management appropriate to each risk.

All risk has a probability to occur. The determination of the probability sensitivity will be made by consensus and based on the experience of those involved

Every risk has an impact on the project objectives (time, cost, scope and quality). For guidance on impact classification uses the correspondence shown in FIG. 4, according to the guide Project Management Body of Knowledge (PMBOK) from the Project Management Institute (PMI) [4].

Defined Conditions for Impact Scales of a Risk on Major Project Objectives
(Examples are shown for negative impacts only)

Project Objective	Relative or numerical scales are shown				
	Very low /.05	Low /.10	Moderate /.20	High /.40	Very high /.80
Cost	Insignificant cost increase	<10% cost increase	10-20% cost increase	20-40% cost increase	>40% cost increase
Time	Insignificant time increase	<5% time increase	5-10% time increase	10-20% time increase	>20% time increase
Scope	Scope decrease barely noticeable	Minor areas of scope affected	Major areas of scope affected	Scope reduction unacceptable to sponsor	Project end item is effectively useless
Quality	Quality degradation barely noticeable	Only very demanding applications are affected	Quality reduction requires sponsor approval	Quality reduction unacceptable to sponsor	Project end item is effectively useless

This table presents examples of risk impact definitions for four different project objectives. They should be tailored in the Risk Management Planning process to the individual project and to the organization's risk thresholds. Impact definitions can be developed for opportunities in a similar way.

Figure 4: Definition of scales impacts to four project objectives (PMI, 2008).

With the ratings of probability and impact will be possible to determine the level of risk exposure for the product (probability X impact) through the probability and impact matrix shown in FIG. 5. The interaction in red represents the area of attention, in which risks should have a response plan.

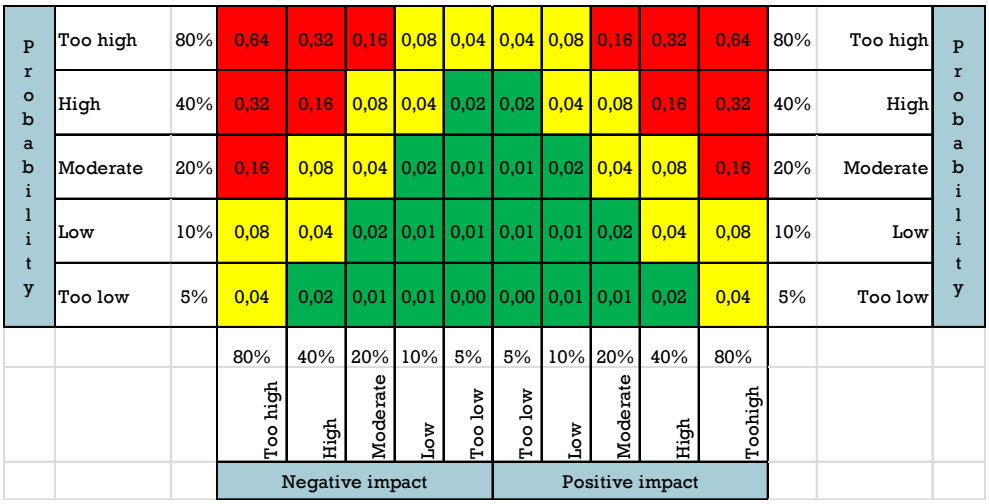

Figure 5: Probability and Impact Matrix.

Risks listed in the yellow zone may or may not have associated action plan and green zone form the "Watch List", can only be checked periodically to determine whether they are in the same classification or should have been changed response plan.

Risk analysis aims to create a ranking of importance for the risk by calculating the Expected Monetary Value (EMV) for the risk in order to direct the efforts of the management of the risks of greater importance.

The EMV is calculated considering the product of the value of the impact to the project, that risk can generate the event, and the percentage assigned to the probability of the risk occurring. The opportunities have EMV negative because the occurrence brings benefits to the project that will reduce the cost. The threats have EMV positive because they increase the project cost. The algebraic sum of all values of EMV results in the amount to be included in the Project Costs Plan to be added in the project budget baseline as "Contingency Reserve".

4.2.4. Plan risk responses

Process in order to develop action plans to manage the risks of greater importance in the classification obtained in the risk assessment. The goal is to enhance opportunities and reduce threats to the project's success.

In this case, for each risk is named an owner or manager who is in charge of responding for all actions in relation to risk management, which includes preparing the response plan and contingency plan to be implemented if the risk occurs.

The risk response plans can generate new work packages for the project, when actions require additional resources and activities. The Project Plan should be reviewed and updated by changing time and project costs.

4.2.4. Monitor and control risks

The process of monitor and control risks aims to scrutinize the implementation of risk response plans and make the assessment of effectiveness of the methodology, tools and templates selected, taking corrective and preventive actions for the effective implementation of the methodology. It made the control of contingency reserves and management. The risk list will be refined and updated, new risks can be identified and others cease to exist. Stakeholders should be informed about the risk situation of the Project, and should actively participate in the identification of new risks.

5. RESULTS

5.1. Project Status

The first Work Breakdown Structure (WBS), developed for the project, presented in FIG. 6, had not the full view of the scope of the project, but it was from her and Project Charter Project that were developed activities related to risk management.

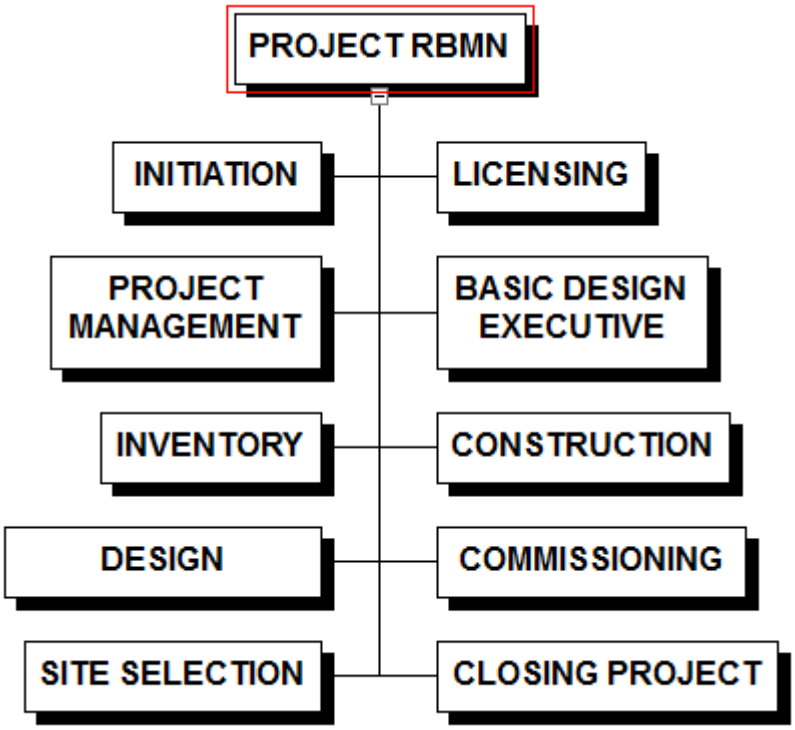

Figure 6: First WBS of RBMN Project – Level 1.

From the WBS Level 1 each system was decomposed into its work packages. It was difficult to identify the risks by the coordinators for both more and for less. Then, It was decided to draw an action plan for development of the culture of risk management for the Project.

5.2. Result of Preliminary Risk Analysis

FIG. 7 presents the topics (items) that were grouped risks whose classification (Weight X Importance) had greater relevance using a SWOT analysis (Strengths, Weaknesses, Opportunities and Threats).

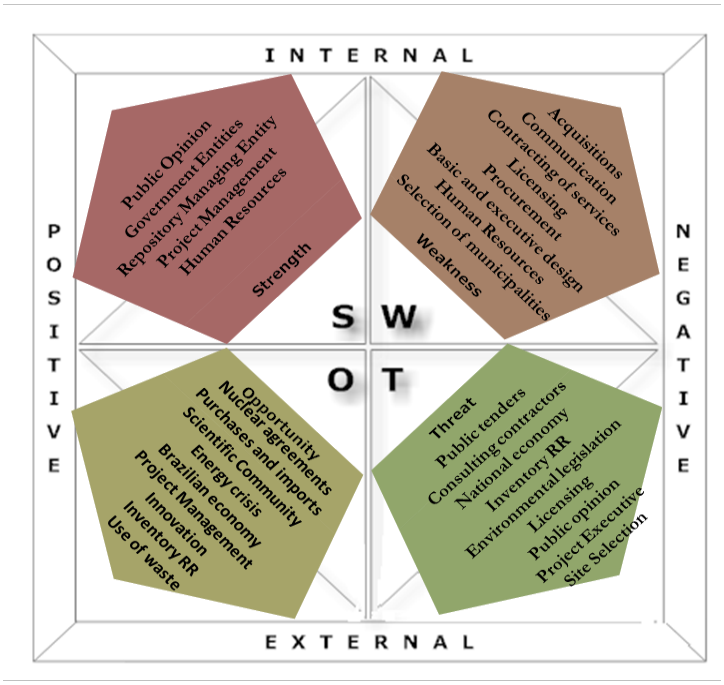

Figure 7: SWOT – Relevant subjects of the RBMN.

5.2. Identified Risks

There were 89 identified risks. A qualitative risk assessment was made at the time of identification, marking the Spreadsheet Analysis Risk Probability and Impact fields using the Probability and Impact Matrix shown in FIG. 5 to determine the level of risk exposure, by the product of probability and impact. In FIG. 8 is shown the graphic summary of qualitative assessment risk.

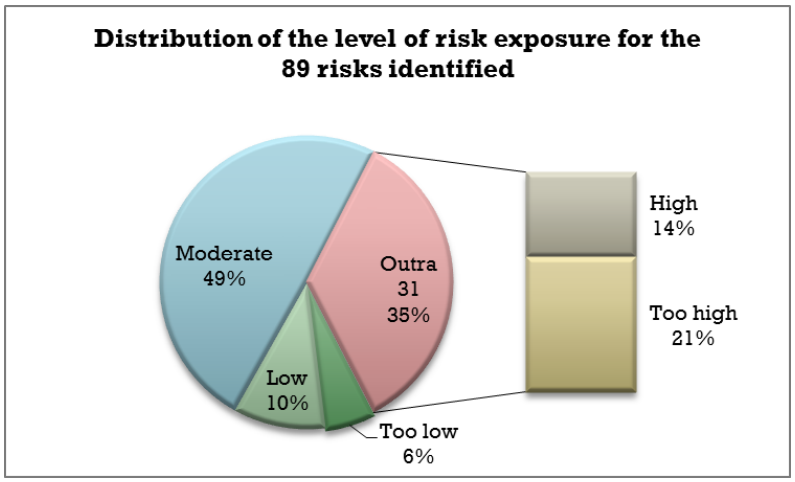

Figure 8: Distribution of the level of risk exposure to identified 89 risks.

The graph shows that 35%, or 31 risks, represent the sum of the risks classified as HIGH and VERY HIGH (12 + 19), which correspond to risks located in the "red zone" of FIG. 5. As a basic rule of risk management for these risks must be made quantitative analysis and risk response must be determined.

6. CONCLUSIONS

The methodology proposed in this work was obtained through experimental study, mainly considering environmental factors RBMN Project and stakeholders already identified, since Brazil does not yet exist a methodology for managing risk in projects repositories low and medium level radiation.

The basis for the elaboration of the methodology was the theoretical literature on the issues involved and the current situation in relation to them.

The application of the concepts and processes in scenario RBMN was performed only as a test for the effective establishment of the methodology.

Although nowadays, risk management is a practice in the personal lives of most people, the understanding of the concepts and the perception of the need and benefits from the practice of risk management are not always accepted spontaneously. There would be different with RBMN.

The stakeholders initially did not believe, and they thought is bureaucratic. There is a "reactive culture" which begins to be changed to a "proactive culture." When the systems' coordinators were invited to take part in the planning of the project, most of them thought it was not the time of participation and they should only be involved at the time the activities predecessors were already completed. But as they began to think of projects and risks, taking it to their personal lives too, they began to realize the importance of creating methods, standards and processes and that control must exist.

The recent sociopolitical events in Brazil and around the world demonstrate that the community, through social networks, has great influence in current decisions. It will not be different with RBMN, because the construction of a national repository for radioactive waste has the Brazilian people as the main stakeholder. This powerful tool should be used for the benefit of RBMN acting proactively in relation to the contrary manifestations, which inevitably will occur in order to minimize the possibility of crises or threats to the success of RBMN. It is therefore crucial to realization of the Risk Committee.

It is also worth emphasizing the importance of maintaining a team of high technical competence in GRR and to develop a culture of risk management, allowing evolution to higher levels in management maturity scale for the formation of a solid foundation for future generations to have a responsibility to maintain the operation of the Brazilian Center for Radioactive Waste Management.

The binomial Technical Competence X Culture of Risk Management is to ensure the maintenance of this proposed methodology and its evolution.

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