BX15 - Environmental Licensing Operational Plan for Mining Industries - A Case Study at Hydro Paragominas

Jonilton Paschoal[1], Ana Everdosa[2], Mayra Barral[3], Ana Karla Pontes[4], Deyvisson Santana[5] and Gizelia Matos[6]
1. Environment Manager
2. Environment Engineer
3. Environment Analyst
4. Environment Analyst
5. Environment Analyst
6. Senior Manager of Contracts and Services
Hydro Paragominas (Mineração Paragominas), Paragominas/PA, Brazil
Corresponding author: jonilton.paschoal@hydro.com

Abstract

Environmental licensing is a legal instrument applicable to potentially polluting activities in Brazil. Mining is a licensable activity and requires the implementation and operation of licensable auxiliary assets and processes, such as access roads, power transmission, emergency systems, production flow systems (e.g., pipeline, railways), tailings systems, and fuel stations. The complexity of mining activities requires appropriate planning for new licensing processes. This is to carry out reliable environmental studies, elaboration and revision of technical reports for licenses maintenance and to ensure adequate deadlines are set in place to obtain the licensing permits in time. In this way, the Operational Plan for Environmental Licensing (POL) was designed to guarantee the efficiency, compliance, and sustainability of the operations of Mineração Paragominas S.A (MPSA), a company of the Norsk Hydro Brasil group. The plan was written in accessible language, with compiled information from all environmental licensing processes, for consultation by various sectors of the company. It covers the entire licensing process, from the company startup to the current moment, and it contains the environmental licensing plan for the next 10 years. The plan was prepared considering the company's growth strategies, 4.0 Industry Guidelines, all of 10 International Council on Mining and Metals (ICMM) Mining Principles and Aluminium Stewardship Initiative (ASI) Performance Standards. Therefore, the POL provides a holistic view on how the management of legal licenses is carried out and whether this management takes place efficiently. In addition, it gathers important information for continuous improvement process and lessons learned over more than 15 years of the MPSA operation. Considering its structure and effectiveness, the POL might be applied in different industries as a complementary, but important tool for the maintenance of environmental licenses.

Keywords: Mining, Bauxite mining, Environmental Management, Environmental Licensing, Operational plan.

1. Introduction

The environmental licensing (EL) in Brazil is an instrument of the National Environment Politics (Federal Law n. 6.938/1981). It aims at providing sustainable development of industrial sector with a clear focus on preventive management for environmental protection. Through this instrument, environmental agencies can monitor the deployment, the installation, and the operation of activities that are considered potentially pollutant including companies that use natural resources, such as mining [1, 2].

Mining might be defined as the processes of mineral or ore extraction with economic feasibility [3, 4]. As a source of feedstock for several activities, from agriculture to technology industries, it is an essential primary industry for human development [5]. Not only it works as a multiplier of the use of minerals on the production chain, but also generates significant numbers of job directly and indirectly connected to the value chain, resulting in considerable gains on economics, social, politics and strategic aspects [3].

Once the mining process involves the extraction of non-renewable natural resources, it is considered as an activity that could have impact on environment. In Brazil, this type of activity is subject to the mining regulation of the Mining National Agency (ANM) and to previous approval from federal, state, or municipal agencies, such as the Environmental Licensing [3]. Therefore, the EL of mining activity represents an important legal instrument for the compatibility of mining with environmental protection, and consequently, is a critical process for any phase of a mining project [1,2].

Regardless of the activity, the environmental licensing process must be performed in a well-organized way to ensure that all stages of the process to obtain the permits are carried out in a timely manner. An environmental license is issue by the regulatory agencies with expiration date and scope defined as it states the rules, conditions, and environmental control measures to be complied with by the company. Additionally, in case of non-compliance with its pre-established conditions and scope, the license might be suspended or cancelled. Finally, once the license is issued to an operator, it is critical that company commitment must be given to the compliance with all its requisites to maintain it in place [2,3].

Considering the complexity that encompasses mining activities, new licensing processes demands appropriate planning, to overcome possible delay issues related to the project deadlines, to guarantee the elaboration of liable environmental studies, to properly address the requirements for each phase of the licensing process, and to the management of constraints and notifications fulfillment, which will all converge to the goal of keeping the current licenses valid.

In this context, amongst the high load of requirements related to the management of environmental licensing processes in the mining activity, the Environmental Licensing Operational Plan (POL) was prepared for Mineração Paragominas S.A (MPSA), a company of the Norsk Hydro Brazil group. The POL was arranged to guarantee the efficiency, conformity, and sustainability of operations. Hence, this work aims to present MPSA's POL as a study case, so it can be used as reference or source of guidance for the environmental licensing management of other companies.

2. Company Context

The MPSA mine is made of two bauxite deposits on contiguous plateaus referred as Miltonia 3 (M3) and Miltonia 5 (M5), situated on the municipality of Paragominas, northwest region of Pará State in the North of Brazil. The mine is located on the geographic coordinates 2° 59' 51" S; 47° 21' 13" O, as shown in Figure 1.

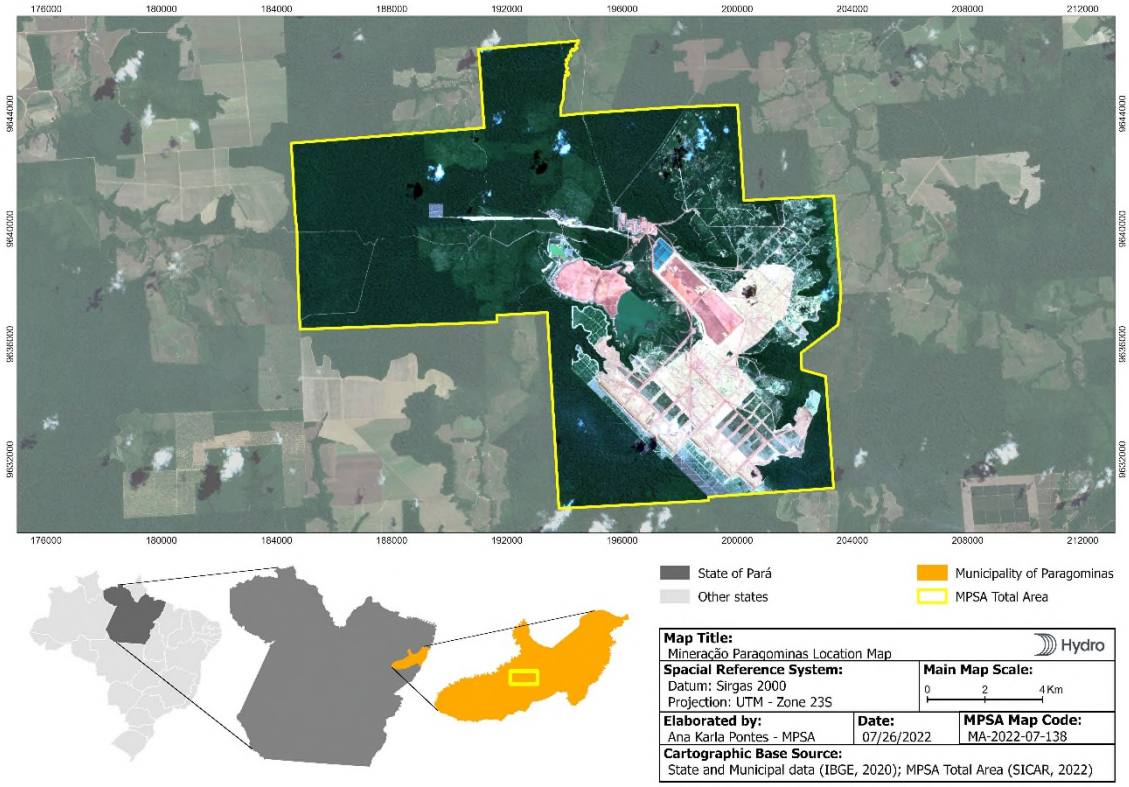

Figure 1. Mineração Paragominas Location Map.

The Project includes a production integrated system that includes mining, beneficiation, and transport of bauxite pulp through a 244 km pipeline that crosses seven municipalities of Pará State (PA), mostly underground. In proximity of this path there is a 236 km Power Transmission Line to supply the plant power demand with Pumping Station 2 (PS2) located in Tomé-açu/PA. For tailings management, there are two tailings disposal systems in operation, and the company implemented the tailings dry backfilling technology, that consists on disposing dried tailings back into the mine pits.

The environmental licensing process is regulated by the State Environmental Agency of Pará (SEMAS/PA), which is part of the Environmental National System (SISNAMA).

3. Preparing the Environmental Licensing Operational Plan (POL)

For the elaboration of the POL, a qualitative exploratory survey was carried out within members of MPSA's licensing management team. The survey covered lessons learned, empirical knowledge of the process, historical of MPSA's licensing process, responsibilities for each member, working premises based on internal norms and standard documents. The results provided enough information for the authors to perform an integrated analysis of the licensing process and to evaluate improvement opportunities based on the Plan, Do, Check and Act (PDCA) method and Hydro's quality management system (BABS) principles. Approach used for ISO 55001 and ISO 14001 was applied to document all the relevant information [6, 7].

While writing POL, the authors considered using accessible language so that POL could be consulted by professionals from diverse departments in the company. It was designed to be updated yearly, the updates should consider 4.0 Industry Guidelines, all of 10 International Council on Mining and Metals (ICMM) Mining Principles and Aluminium Stewardship Initiative (ASI) Performance Standards [8, 9, 10].

The case study was based on the evaluation of results obtained two years after POL's first version.

4. Results and Discussion

The main results from this study are divided on two topics: (a) the POL template relevant to diverse companies on the licensing management process, and (b) the effective results obtained from the application of this model on MPSA, based on a case study.

4.1 POL Template and Fulfillment Guidelines

The POL template framework includes 10 topics that can be applied or adapted according to the company specific needs. If the company has a licensing team, they should all participate on the document preparation coordinated by a leader. For a team, the construction and writing process should take about 2 to 3 dedicated working days in group meetings and approximately 3 hours for each member for revision and contribution. This is an estimate time as it will vary depending on the activity complexity, enterprise dimension, number of standardized documents/processes, amount of licensing processes, and team structure.

Considering the several stages of an EL process, it is essential to have a clear strategic planning process since the environmental studies to the conditions management for new licenses request. Based on that, the POL structure should consider the following content: Cover sheet and Presentation, Team Structure, Lessons Learned, Working Premises, Monitoring Actions, Visual Management Board, Licensing Team Targets, Licensing Process Consolidated Historical, Next 10 Years Licensing Plan, and Final Considerations. Below are guidelines to prepare each topic.

- Cover Sheet and Presentation

This topic is for the document traceability, and should contain:

a. The company general information (name, address, company ID/CNPJ, contact).
b. Technical Team or professional responsible for the POL's preparation.
c. Technical Team or professional responsible for the review and/or coordination.
d. Version and emission date.

After the cover sheet, we suggest adding an executive summary or a brief presentation of the document content.

- Team Structure

The objective of this topic is to present clear and consolidated information about the licensing team, so it should contain:

a. Brief overview of the licensing team responsibility.
b. Licensing team organizational chart.
c. Summary of historical resources demands and availability for the last 5 years (example: a chart crossing the number of team members versus the amount of main demands per year).
d. Roles and responsibilities for each team member (describe it by the position for each member).

This topic should provide a holistic view of the licensing management process, resources, and demands, and enough information for the manager and/or the team leader to structure the team to

promote more efficiency in the process by providing well balanced team in terms of abilities, competences, and seniority for each professional.

- Lessons Learned

List the team knowledge obtained over the years, example: *from experience "a", we learned this should be made this way / it would be better if we make that way / we needed to include/remove a step in the process*. So, whenever the team changes the experience is not lost, but recorded for others to consult. Those lessons should be identified, recorded, analyzed, and shared with the team so there is effective application of continuous improvement, it prevents the recurrence of negative cases, and promotes the application of the experiences in future cases.

The importance of this topic relies on the fact that eventual failure or lack of information in the environmental licensing process can result in project delays due to notifications and requests for clarification, or even major consequences, such as infractions and penalties.

- Working Assumptions

In this topic the licensing team working assumptions should be described, to guide the process and support decision making. It should also describe standardized documents and analysis guidance. The content should include guidance on the licensing management process, such as:

a. Guidelines for technical analysis and review of reports.
b. Guidelines for conditions and notifications compliance.
c. Standardized document for protocols in the Environmental Regulatory Agency.
d. Establish a system/process for change management requests regarding the environmental analysis.
e. Establish a system/process for the verification of new license request, received licenses and its handover to the owner (as an example: department who needs the license, such as operation and project departments).
f. Guidelines for meetings with the Environmental Agency, including inspections with official government representatives, for the company external public affairs.

- Follow-up Actions

This topic should include the list of activities needed to monitor the licensing processes in progress at the Environmental Agency and the deadlines to implement the actions. In general, it should list the licensing management routines, such as:

a. The conditions and notifications management.
b. Environmental analysis for internal processes.
c. Receipt of new permits and handover to operational areas.
d. Deadline compliance for annual reports.
e. Legal requirements management.
f. Geospatial analysis management (mainly for suppression authorization and new projects installation licenses).
g. Internal procedures aligned with the Company's Quality Management System standards.
h. Other extras activities identified.

- Visual Management Board

Using the list of activities from the previous topic, in this item the company's licensing team should consolidate in a calendar format the follow up routine, responsible person and deadlines. That information helps the team to identify the most critical periods and number of working hours

required for various demands. It is also important to have the board in a key location to be visible to people seen (by printing it, or in an electronic board) to visually monitor easily the progress of the activities and targets.

- Licensing Team Targets

In this topic the manager can list the targets for the team and for each member, by considering the plan described in the POL, the roles and responsibilities for each team member and the identification of critical processes and tasks.

- Licensing Process Consolidated Historical

This topic should be a summary of all the sources of consultancy for the entire licensing history of the company, divided by year and macro scope.

- The next 10 Years Plan

This topic includes the projects forecasts and environmental licenses renewals for the next 10 years. It is also important to indicate when the request is due in the Environmental Agency, and internal actions to prepare the environmental studies or to hire third-party companies for it.

- Final Considerations

Finally, this topic consists of additional information that was not included in the previous items and observations by the licensing team for the next version of POL.

4.2 Case Study: MPSA's Environmental Licensing Operational Plan - POL

The POL application in MPSA brought various positive results related to the effectiveness and efficiency of the company's licensing management process. The first version of MPSA's POL was prepared in 2019. Putting together the POL with all the topics was extremely important exercise to MPSA. It enabled the global assessment of the licensing team and the requirement to plan the current and future years.

The licensing team responsibilities is now based on pre-defined premises, which helps the coordination of actions related to the environmental licensing process at MPSA for various departments (operations, projects, mineral research, and new mines).

In this context, the licensing team responsibilities were listed in the POL:

- Control compliance of the environmental permits' conditions and notifications.
- Prepare official letters and technical documents, review, and elaborate documents (environmental monitoring reports, new licenses, and notifications responses).
- Evaluate the potential interference with protected areas, areas covered by the Degraded Areas Rehabilitation Program (PRAD), mining rights polygons (authorized by the National Mining Agency - ANM).
- Geospatial analysis before starting the licensing process, through Geographic Information System tools.
- Participate in internal and external technical consulting meetings and is responsible for consulting the progress of environmental licensing processes at the Environmental Agency.

Through the preparation of the Licensing Process consolidated historical, MPSA's team identified 220 permits issued by the Environmental State Agency to MPSA from 2003 to 2021. The licensing team separated the processes into eight major groups: (a)Mining and beneficiation; (b) Transmission line; (c) Pipeline; (d) Fuel station, (e) Water catchment; (f) Tailings System; (g) Pilot plant; (h) Pilot dike. From that exercise, it was also possible to note the increase in the number of Environmental Permits managed in the last 5 years, consequently resulting in an increase in the number of actions of conditions linked to them (Figure 2).

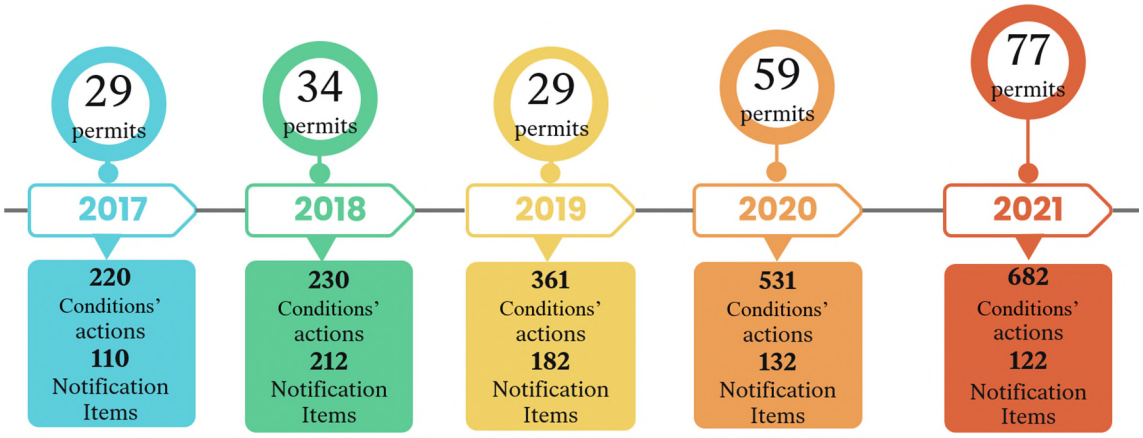

Figure 2. Historic of demands in the licensing management for the last 5 years.

Another important remark is that since the 2019 POL's first version, there has been a significant reduction in the number of notification items (Figure 2). That means the analysts from the Environment Agency needed less additional information from MPSA and infers that the documents presented in new licensing requests were more complete with information, resulting in less time to obtain the permits.

By having a global and documented view of the team members workload and responsibilities, the manager had easy access to information to assess the workload of team members to optimize the workload amongst the team. This would also provide an easy access to resource and guidelines for the team which can be used as a handover document for new personnel within the team. As a result, in 2020 and 2021, due to the high workload mapped in POL, MPSA licensing team received 5 new collaborators. The detailed description of the roles and responsibilities for the team members was already included in POL this made it easier for the new members to be included in the team and reduced the training time to be familiar with the process and the company's standards.

The implementation of documented information through the POL enabled MPSA to record the lessons learned by the licensing team and identify the performance criteria to be in line with the company's guidelines at all times. A good example for this relates to the need to carry out an environmental analysis for the management of all changes in MPSA areas. Activities such as routine maintenances, machinery acquisitions, opening of accesses, vegetation removal are common and essential to the mining activity. However, an environmental analysis is required for any change that would trigger a licensing review to protect the company from penalties.

In that context, from lessons learned mapped, the licensing team improved an existent form called "Environmental Analysis Request" (SAMA) which is used by all departments to request an environmental analysis of new projects and change management. After receiving a SAMA, the licensing team analyses the case and prepare a technical answering note indicating whether the project requires a new license request or not, it also indicates all environmental controls and legal

environmental requirements necessary for the project or activity. Furthermore, geospatial analysis is performed with GIS (Geographic Information System) data sent by the applicant, to ensure the preservation of protected areas.

In addition, if a new permit request is necessary, SAMA's technical report indicates the required documents to start the licensing process request (based on the Environmental Agency norms and notifications received with document requests), as well as the lead time to obtain the authorizations.

As showed in Figure 3, from 2012 to 2021, 1,252 SAMAs were analyzed by the environment team. If the SAMA's project does not imply in a new license process, change management or improvement reports are sent to the Environmental Agency through the annual reports to highlight the continuous improvement process in the operations and projects in progress at MPSA.

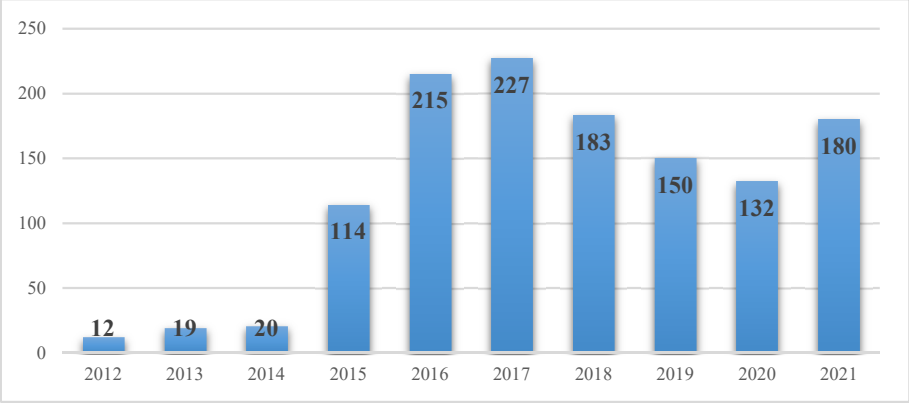

Figure 3. Environmental Analysis Request (SAMA) over the years.

The team also identified (from the backlog of document tasks) periods of high workload on legal requirements particularly during the period of Environmental Information Annual Reports (RIAAs), which caused a great overload in the team. The lesson learned is that the licensing team requires better planning for that period in the year to ensure legal matters are tackled with priority. As a result from the lesson learned, the licensing team determined new internal deadlines and criteria regarding condition's management during that critical period as follows:

- Internally request proof of compliance with license conditions two months ahead of its deadline.
- Hire a consulting company specialized in environmental studies to prepare the annual reports, including:
  - ✓ An audit on the compliance with license conditions.
  - ✓ The issuance of technical term of responsibility for each annual report prepared to the Environmental Agency.

In addition to the RIAAs, various types of documents are sent to the Environmental Agency. Considering the need for standardization and tracking of documentation, the licensing team established in the POL a review process of all documents before submissions, by developing a pre-determined protocol:

(a) Link the new documents to the main permit.
(b) Link the official letter subject with the information to be provided.
(c) In case of license conditions or notifications which had a request for deadline postponement, the final response letter must indicate the historical with the official letter number and protocol of the deadline extension request.

(d) Ensure that the response of license conditions and notifications includes all pending items in the official letter.
(e) Ensure that no inappropriate term/information is used, which that could compromise the company's reputation.
(f) In the case of new licensing processes, fill in the “New Licensing Process” form to keep the pattern in the database.

Once a permit is received in MPSA, the POL requires that the permits is handed over to its owner (the senior manager who requested a SAMA for the project). This is done by holding a formal meeting led by the licensing team in which an action plan is created to review all conditions listed in the new permit: the action plan including due dates and responsible person will be kept as a record in the register. During the meeting, the license scope is also discussed, to ensure that the project follows what was agreed with the Environmental Agency. Finally, the participants, with the licensing team support, provide commitment to adhering to the environmental legal conditions by signing a form called “Follow-up of new permits”.

Bauxite mining activities routinely require major maintenance and large capital projects, which needs careful planning to ensure the permits are provided in due time. The licensing team created a form with lead time estimates for the licensing process at MPSA which will help the operational area to improve their long-term planning. The lead time estimate list was made from the official lead time of the Environmental Agency and the experience of MPSA licensing team in lessons learned from past projects.

Additionally, the team also created a document list attached to the lead time list to guide the operational area about the "secondary Environmental Permits". These are some licenses linked to the main permit that are necessary for the operation of the main process. That list was compiled from all the lessons learned raised from notifications sent by the Environmental Agency requesting support information.

To keep all information documented in a controlled way, the MPSA’s POL summarizes all routine actions for the team, the frequency and deadline, the monitoring way, the storage traceability in the database and the people responsible for it. With all that information, the team built a visual management board. That tool shows the critical periods for each member of the team and for the team as a whole, mainly during the first quarter, when most of the RIAAs must be delivered to the Environmental Agency. It also highlighted the activities that are most impactful on the process and time demanding for the analyst. This kind of information is valuable for the manager to define smart strategies and to develop a resource plan to achieve the company’s goals and compliance with all license’s conditions.

5. Conclusions

The Environmental Licensing Operational Plan was prepared to systematize knowledge acquired over time and the working assumptions of the licensing team. The POL’s main functionality is being a macro document that encompasses the operating assumptions, roles and responsibilities of the licensing team members, lessons learned, time management, standardization and tracking of the information, planning annual goals and future vision of environmental permits. In that way, the plan must be updated every year to adjust to the realities and priorities of the company, record new lessons learned, update standardized documents, keep the company’s historical licensing process updated, and plan for the upcoming 10 years.

At MPSA, the plan helped to keep all information and knowledge to be used as a reference by other areas and support building competence of new members of the licensing team. The MPSA team also identified improvement in the process organization, which helped to deal with an

increased number of Environmental Permits required and increase number of conditions. The improvement also resulted in a reduction of notifications and response time within given deadlines while maintaining the number of team members unchanged.

The improvements described in this article were possible thanks to the details provided in the POL's Working Assumptions chapter. Also, the practice of keep lessons learned documented helped avoiding routine failures. This is an important indication of the quality of the environmental studies, the technical work of reviewing official documents and studies, and the inclusion of learned items into the checklist of key documents for new licensing requests.

6. References

1. Beatriz de Deus Grotto, Jéssica Tainá Concon Costa, Heitor Menezes Gomes, Licenciamento ambiental no Brasil: definições e desafios, *Guia Universitário de Informações Ambientais*, Vol. 2, No. 1, (2021), 53–55.

2. Maria Sarajane Farias da Costa, Helder Neves de Albuquerque. O Licenciamento Ambiental no Brasil e os seus desafios na proteção do meio ambiente. *Revista Saúde e Meio Ambiente – Edição Especial,* Vol. 12, No. 02, (2021), 101-115.

3. Juliane Sousa Régis, *Licenciamento ambiental e efetividade no controle das atividades minerárias*, Master Thesis, Universidade Federal da Paraíba, Paraíba, Brasil, 2020.

4. Adão Benvindo da Luz, João Alves Sampaio, Salvador Luiz Matos Almeida. *Tratamento de Minérios*, 5th Edition, Rio de Janeiro, 2010, 932 pages.

5. Simon M. Jowitt, Gavin M. Mudd, John F. H. Thompson, Future availability of non-renewable metal resources and the influence of environmental, social, and governance conflicts on metal production, *Communications Earth & Environment*, Vol. 1, No. 1 (2020), 1-8.

6. International Organization for Standardization, ISO 55001 Asset management – Management systems – Requirements, 2014.

7. International Organization for Standardization, ISO 14001 Environmental Management, 2015.

8. Singapore Manufacturing Federation, Standards for Industry 4.0, *Website*, http://standardsi40.sg/industry-40-smart-manufacturing-and-standards (accessed on 9 June 2022).

9. Aluminium Stewardship Initiative, ASI Performance Standard, *Website*, https://aluminium-stewardship.org/ (accessed on 9 June 2022).

10. ICMM Mining Principles, Our principles, *Website*, https://www.icmm.com/en-gb/our-principles (accessed on 28 July 2022).