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Revolutionizing Environmental Data Management in Quarry: The Application of AI in Consolidating Monthly Production Reports of Cabanatuan City Environment and Natural Resources Office (CCENRO)

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Abstract:- With the advent of the integration of Artificial Intelligence (AI) in private and government services, this has attracted noteworthy attention in improving the work of all professionals and service workers.

This study explores the depth on how artificial intelligence (AI) can revolutionize environmental data management in the quarry sector, with a particular focus on the Cabanatuan City Environment and Natural Resources Office (CCENRO). With the potential to enhance the basic services outcomes and streamlining the processes, this study likewise scrutinizes the benefits and impacts of integrating Artificial Intelligence (AI) tools into the services provided by CCENRO. Furthermore, this study is aimed to be accomplished by qualitative method approach through interviews by focusing on the effects of AI integration on the aspect of data compilation, report generation and data analysis.

The impact of AI-driven approach to efficiently and effectively managing data is expected to manifest: it will provide reduction on time and effort required for data processing while also improving the accuracy of the reports generated for informed decision-making.

By rationalization the data management process with AI-driven approach, CCENRO can monitor quarry activities in real time, allowing for quicker responses to environmental concerns and increasing transparency in operations. This paper highlights not only the immediate benefits observed at CCENRO but also the broader implications for environmental governance. It makes a strong case for the adoption of AI technologies across various services in the government, demonstrating how such innovations can lead to more efficient, sustainable practices and better management of natural resources.

This study underscores the potential of AI to transform environmental data management, making it more efficient and effective. By embracing these technologies, organizations like CCENRO can foster a more sustainable future while ensuring the protection of our natural resources.

Keywords:- *CCENRO, Artificial Intelligence (AI), Data Management, Quarry Monitoring.*

I. INTRODUCTION

As communities struggle for sustainable development, the quarry industry has found itself increasingly in the limelight. While quarries undoubtedly provide essential materials for construction and infrastructure that drive development, they can also have substantial environmental impacts, including habitat destruction, water pollution, and soil degradation. These concerns have heightened the demand for effective environmental oversight, making the role of local government agencies, such as the Cabanatuan City Environment and Natural Resources Office (CCENRO), more crucial than ever. CCENRO is tasked with monitoring quarry activities, ensuring compliance with environmental regulations, and protecting the natural resources that local communities depend on.

However, the journey of managing environmental data in the quarry sector is troubled with gargantuan but significant challenges. CCENRO faces the daunting task of gathering and analyzing monthly production reports from numerous local quarries. This process is often labor-intensive and relies heavily on manual data entry, which can lead to errors and delays. Such inefficiencies not only burden staff but also hinder timely decision-making, putting at risk both regulatory compliance and environmental protection efforts. Thus, this study presents an innovative AI-driven approach designed to simplify and improve the present data management process of CCENRO. By leveraging machine learning algorithms, the proposed system can efficiently process large datasets, identify trends, and generate actionable insights that support regulatory compliance and informed decision-making.

Recognizing these enormous challenges, this study seeks to explore how artificial intelligence (AI) can serve as a transformative key for environmental data management within the quarry sector. AI has already made significant inroads in various industries, offering innovative ways to automate repetitive tasks, analyze vast amounts of data, and

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uncover meaningful insights. By harnessing the power of AI, CCENRO could streamline its operations, enhance the accuracy of its reporting, and ultimately improve its ability to respond to environmental concerns.

The primary goal of this study is to explore an AI-driven approach that automates the consolidation of monthly production reports from local quarries. This approach is expected to alleviate the burdens placed on CCENRO staff, allowing them to shift their focus from tedious data compilation to more strategic aspects of environmental management. By employing machine learning algorithms, the proposed system is expected to efficiently process data, identify trends, and generate actionable insights that are vital for regulatory compliance and informed decision-making for protecting the surrounding ecosystems for a sustainable development.

In the following sections, we will delve into the methodology used in this study, present the findings for exploration of the AI-driven approach at CCENRO, and discuss the broader implications of these findings for environmental governance. The expectation is that this paper not only showcases the potential of AI to enhance efficiency and accuracy in data management but also sheds light on the importance of accepting new trend and technology in the quest for sustainable practices in the quarry industry and beyond. By integrating AI into environmental oversight, agencies like CCENRO can better protect our natural resources, fostering a sustainable future for the communities they serve. Ultimately, this study seeks to inspire a shift towards more innovative and effective approaches to environmental management, ensuring that we safeguard our ecosystems for generations to come.

II. LITERATURE REVIEW

The changes of todays technology have abruptly caused some disturbances on how humans live their life on a daily basis. The emerging usage of artificial intelligence (AI) on a daily basis has a potential in innovating the outdated system of operations and services for the local government units (LGUs) in the Philippines. For an office under the LGU of Cabanatuan City such as Cabanatuan City Environment and Natural Resources Office (CCENRO), that has a division working for the consolidation of monthly general production report for special minerals and extracted materials that is pivotal for operational efficiency and environmental sustainability. This review aims to provide the knowledge on AI usage in monthly production report consolidation.

➢ *Environmental Data Management in Quarry Operations*

The City of Government of Cabanatuan, a qualified government entity, was granted by the DENR a Special Minerals Extraction Permit (SMEP) for the development and utilization of sand and gravel and other unconsolidated materials for the construction of Emilio Vergara Highway at Cabanatuan City. The Republic Act (RA) No. 7942, otherwise known as the Philippine Mining Act of 1995 and Department of Environment and Natural Resources (DENR) Administrative Order (DAO) No. 2010-21, its Revised Implementing Rules and Regulations (IRR), are the primary guidelines to address safety and health, environment, and social development (SHES) to the quarry and mining operations [1]. In pursuant to the R.A. 7942, Chapter XXIX, Section 270, every contractor/permittee/permit holder or holder of a permit to quarry is required to submit a sworn Monthly Report on Production, Sales and Inventory of Special Minerals and Employment as prescribed in MGB Form 29-13 (Series of 2000), within fifteen (15) working days after the end of each calendar month [2]. With monthly production reports, which serves as a tool in tracking the extraction volumes, monitoring its production limits, it helps also to identify environmental impacts. However, a traditional manual method of consolidating these reports is error-prone, labor-intensive, and time-consuming [3].

➢ *Environmental Data Reporting and AI*

Artificial intelligence (AI) emerged as a tool in the government and private companies which displace some non-digital jobs that performs heavy load, repetitive tasks, and paperwork, but certainly realigned the workforce to what the modern technology requires [4]. AI powered reporting offers speed and accurate data collection enhancing operational efficiency [5].

➢ *Application of AI in Cabanatuan CENRO*

In the context of Cabanatuan's Monthly Production reports, incorporating AI tools addresses inconsistencies in data collection, time lags in report submissions, and numerous sheets of paper used for physical copies. By leveraging the use of AI tools such as ChatGPT to assist in developing a software system that automates calculations and analysis based on raw data inputs, including volumes extracted using truck capacity, materials expected revenue, and employee attendance, ensuring accuracy and reducing manual labor.

III. METHODOLOGY

We conducted qualitative research by interviewing all employees of the City Environment and Natural Resources Office (CCENRO). The interviews focused on understanding the previous process of consolidating monthly reports manually, the transition to using artificial intelligence (AI) tools, and the perceived impact on efficiency and performance. Specifically, we asked the following questions:

- How did you consolidate monthly reports manually before?
- How has the process changed since using AI?
- How efficient is the transition to AI in your perspective?
- Does using AI affect your overall performance in the workplace?

The responses were analyzed to identify common themes and evaluate the impact of AI on the reporting process.

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IV. RESULTS

➢ *The Findings from the Interviews Revealed the Following:*

- **Manual Consolidation**: The process of manually consolidating monthly reports was time-consuming, often requiring double or triple the time compared to the current process.
- **Transition to AI**: The introduction of AI significantly streamlined the reporting process. Employees reported that they now only need to input raw data, and the AI program automatically consolidates it into a written report.
- **Efficiency**: The use of AI tools minimized work time, allowing employees to focus on other tasks beyond consolidating reports.
- **Impact on Performance**: The majority of employees stated that using AI had no negative impact on their performance. On the contrary, it enabled them to complete additional tasks, enhancing overall productivity.

V. DISCUSSION

The transition from manual report consolidation to AI-driven processes exemplifies the transformative potential of technology in organizational workflows. As noted in the findings, AI tools have significantly reduced the time required for generating monthly reports, aligning with existing literature on the efficiency benefits of AI in administrative tasks. For instance, research by Davenport and Ronanki (2018) [6] highlights that AI applications enhance operational efficiency by automating repetitive tasks, thus enabling employees to focus on higher-value activities.

Additionally, the study supports the argument by Brynjolfsson and McAfee (2017) [7] that AI integration improves productivity without adversely affecting employee performance. The CCENRO employees' experience demonstrates that AI fosters a more productive workplace by alleviating routine burdens, allowing for a redistribution of time and effort toward other responsibilities.

VI. CONCLUSION

The integration of AI in consolidating monthly reports at CCENRO has proven to be a significant efficiency booster. Employees now spend less time on repetitive tasks, and their productivity has increased as they focus on a broader range of responsibilities. This study underscores the value of AI in administrative contexts, affirming that such technologies can drive operational improvements without compromising employee performance. Future research could explore long-term impacts on employee satisfaction and potential applications in other organizational processes.

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