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Analysis of Occupational Safety and Health Implementation in National Strategic Projects Case Study of Kulon Progo Airport Infrastructure Development Project

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Keywords

Airport, National Strategic Project, Construction Safety Management System (CSMS), Lesson Learned

ABSTRACT

One of the provinces that has received the government's attention and is recorded as having a national strategic project as stated in Presidential Decree No. 3 of 2016 concerning the acceleration of the implementation of national strategic projects is the Province of the Special Region of Yogyakarta (DIY), namely Kulon Progo Airport Infrastructure Development. The project which is carried out by a joint operation between PT PP (Persero) Tbk and PT Geotekindo (PP KSO) stands on 587 Ha of land with the target that the airport must operate partially in just nine months from the start of construction. This project has challenges in the form of work complexity, the use of a large number of various types of heavy equipment, thousands of workers with various skills, and a very short time to complete the work. The purpose of this study is to analyze the factors that influence the Construction Safety Management System (CSMS), analyze the risk level of project implementation, and evaluate the effectiveness of CSMS performance implementation in the Kulon Progo Airport Infrastructure Development Project which is expected to be able to provide lessons learned from other similar projects. The research method used is a qualitative method using HSE activity reports during the construction period and interviews with seven informants who were involved during the construction period. The results of the study show that there are ten top ranking keys to the success of CSMS in the Kulon Progo Airport Infrastructure Development Project, including Hazard Identification, Risk Assessment, Control and Opportunity, Job Safety Analysis (JSA), Communication, Concern with training programs, Occupational Health Management, Work Environment Safety Management, Equipment, Construction Safety Unit Duties and Responsibilities, Standards and Legislation as well as Inspections and Audits. Whereas the implementation of the risk level can be mitigated properly because it is planned in great detail and communicated very intensively from the top management level to the level of workers in the field and for the implementation of CSMS performance in the case study this research has proven to be effective.

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INTRODUCTION

The Indonesian government is currently intensively building infrastructure for transportation systems both land, sea and air spread from Sabang to Merauke. One of the provinces that received government attention and was recorded to have national strategic projects as stated in Presidential Decree Number 3 of 2016 concerning the acceleration of the implementation of national strategic projects is the Yogyakarta Special Region Province (DIY). DIY Province has a tourism sector that is a destination for domestic and international tourists only has one airport, namely Adisutjipto Airport which is one of the third busiest airports in Java Island today. Adisutjipto Airport can also be said to be the entrance of other countries to Indonesia. Over the past few years, Adisutjipto Airport has experienced a decline in service quality because it has exceeded its carrying capacity and capacity (lack of capacity) so it is very important to develop or build a new airport in this province. (Van Deni &; Abdullah, 2018) (Hamurwani & Denny, 2021)

Through the Presidential Regulation of the Republic of Indonesia Number 98 of 2017 concerning the Acceleration of the Construction and Operation of New Airports in Kulonprogo Regency, Yogyakarta Special Region Province, the Government instructed PT Angkasa Pura 1 (Persero) to carry out new airport operations in stages in April 2019. In short, the duration of work from the stages of land preparation, planning and construction makes all stakeholders involved in the construction of this airport accelerate work or crash programs which will generally have an impact on cost, quality, time and occupational safety and health. According to research conducted the acceleration of projects with the crash program method has an impact on occupational health and safety, namely by increasing the number of workers to accelerate work will reduce the freedom of workspace of each worker so as to reduce worker productivity. In addition, the addition of overtime hours will also reduce the concentration of workers, thereby increasing the risk of work accidents. In addition, his research stated that direct costs will increase if the project implementation time is accelerated, but these direct costs will also increase if the project implementation time is slowed down. Indirect costs do not depend on the quantity of work, but rather depend on the timeframe of project implementation. If these indirect costs are considered fixed over the life of the project, then the cumulative costs will rise linearly according to the life of the project. (Arikhman, 2020; Yusdinata et al. 2018; Saraswati et al.,2020; Putri & Rahayu, 2018a)

Feasibility Study Report on the Construction of Kulon Progo New Airport in Yogyakarta stated that the capacity of Adisutjipto Airport is inadequate due to: (1) The terminal capacity of Adisutjipto Airport is designed to accommodate 1.2 million passengers per year while at the end of 2014. The number of passengers has reached 6.2 million passengers per year. (2) Passenger growth in the last 3 (three) years also increased by 8.62%, namely 5.7 million in 2013 to 6.2 million in 2014 and 6.3 million in 2015. (3) The capacity of the aircraft parking area (apron) at Adisutjipto Airport is also only able to accommodate 8 aircraft, which results in queues and delays for aircraft to land and air. (4) The runway capacity is also unable to accommodate wide-body aircraft for long-haul international flights (including Hajj flights). (5) Adisutjipto Airport can no longer be developed due to limited land and natural obstacles in the form of mountains and rivers and (6) Passenger forecast in 2041 is 20 million passengers per year. (Putra et al., 2021)

Due to these limitations and given the importance of airport development to accommodate existing traffic, the construction of an airport in a new location is a necessity. From the results of the feasibility study for the determination of the location of the new Yogyakarta airport that has been carried out, the most feasible location is located in Temon District (Jangkaran, Palihan, Sindutan, Glagah, and Kebonrejo Villages), Kulon Progo Regency, DIY Province. (Bangun & Hariyono, 2019; Nugraha & Yulia, 2019; Putri & Rahayu, 2018b)

This airport is the first airport in Indonesia to successfully obtain a gold green building certificate with planning that has taken into account the burden of tsunami, disaster

mitigation and liquefaction in the airport area and uses building information modeling in its implementation. Another uniqueness in the implementation that has an impact on CSMS in this project is that all work areas both air side and ground side are carried out simultaneously until they can be operated. There are thousands of workers, hundreds of heavy equipment working simultaneously and the overtime work system and two shifts are challenges for PP KSO to succeed this government program. The rise of construction accidents and national strategic projects today is a challenge for the project team to ensure that SMKK projects run and support production and completion in the field (Maretnowati et al., 2020). This research is a lesson learned from SMKK on the implementation of national strategic projects with the purpose of research to analyze the effectiveness of construction safety implementation in national strategic projects.

METHODS

In this study, a qualitative research approach was used, where research data was taken from secondary data and primary data. The research process started from the first stage was to identify the Kulon Progo Airport Infrastructure Development Project. The second stage is to determine the objectives of the study. The third stage is data collection, where the data used is primary data in the form of interviews with related stakeholders and secondary data in the form of project data. After all the data is collected and validated, proceed with the stage of analyzing the data. The first data analysis technique is to analyze the factors that affect the Construction Safety Management System (SMKK) by grouping these data into 5 elements of SMKK and its derivatives contained in the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 21 / PRT / M / 2019 concerning Construction Safety Management System Guidelines. The process of grouping primary data and secondary data is so much that the help of ATLAS.ti software is needed. to avoid data grouping errors. The second data analysis technique is to analyze the level of risk of project implementation using secondary data in the form of weekly project reports to inventory events related to construction safety. The report is checked against HSE Plan, Job Safety Analysis (JSA), Work Permit ¸and Risk Analysis. The third data analysis technique is SMK3 audit documentation to evaluate the effectiveness of SMKK performance implementation. After all the data has been analyzed, check whether it has answered the purpose of the research yet. The next stage is the interpretation of the results in the form of lessons learned from the case study of the Kulon Progo Airport Infrastructure Development Project. The final stage is to draw conclusions from this study and provide suggestions for future research. The stages of this research can be seen in the research analysis framework diagram in Figure 1 as follows:

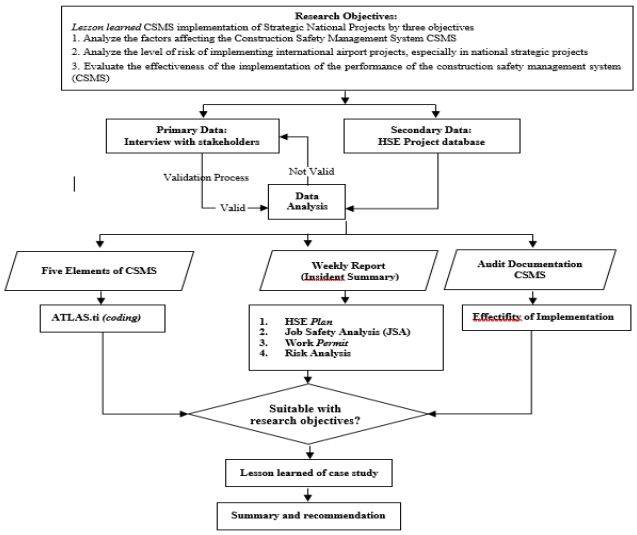


Figure 1 Research Analysis Framework Diagram

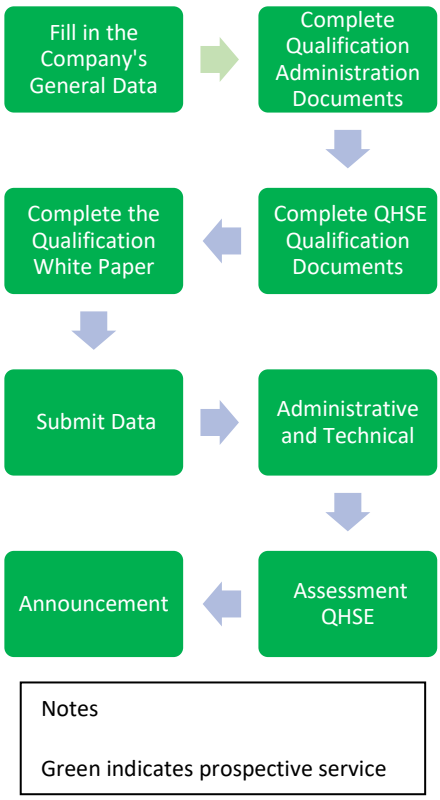
RESULTS

CSMS Strategy

Procurement *Strategy*

In selecting and negotiating the selection of service providers, PP KSO makes the SMKK aspect one of the requirements in choosing prospective service providers. Figure 2 below is the registration flow for prospective service providers used to select service subproviders in the Kulon Progo Airport Infrastructure Development Project. The registration flow for prospective service providers considers the CSMS aspect as one of the requirements. This is one of the strategies to ensure that prospective service providers have understood and fulfilled the aspects of CSMS before working on this project.

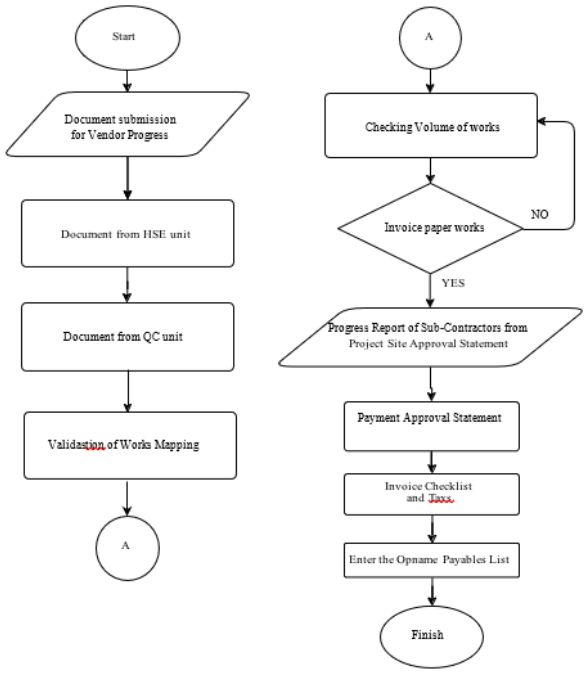
The registration flow process for prospective service providers above is divided into two processes, where the green is the process inputted by the prospective service provider and the blue is the checking process carried out by PPKSO. In the "QHSE Assessment" stage, there are QHSE documents that have been submitted by prospective service providers and will be verified by PP KSO. The verification carried out includes the ownership status of the quality management system and K3L, the person in charge related to QHSE, quality assurance organizations and K3L, questions about CSMS and other QHSE supporting documents.



Picture 1 Registration Flow for Prospective Service Providers

Another procurement *strategy* carried out in this project is the process at the time of billing and handover of work from service providers to PP KSO. If in other regular projects, bills and handovers usually do not involve the HSE Unit and Quality Control Unit*, in the Kulon Progo Airport Infrastructure Development Project there are stages that must go through the HSE Unit and* Quality Control Unit before going to the billing process as Figure 3. The flow of the process of billing the *work progress* of the Service Subprovider starts from submitting documents for vendor progress in the form of documents from the HSE Unit and QC Unit. Furthermore, validation of job mapping and checking of work volume is carried out. After that, the billing file will be issued, if it is not appropriate, it will return to

the stage of checking the volume of work and if it is appropriate, it will proceed to the stage of providing a Subcontract Performance Report (LPS) from the Field Minutes which is then included in the Payment Minutes. *Checklist of invoices* and taxation is then included in the list of hospitalization debts.

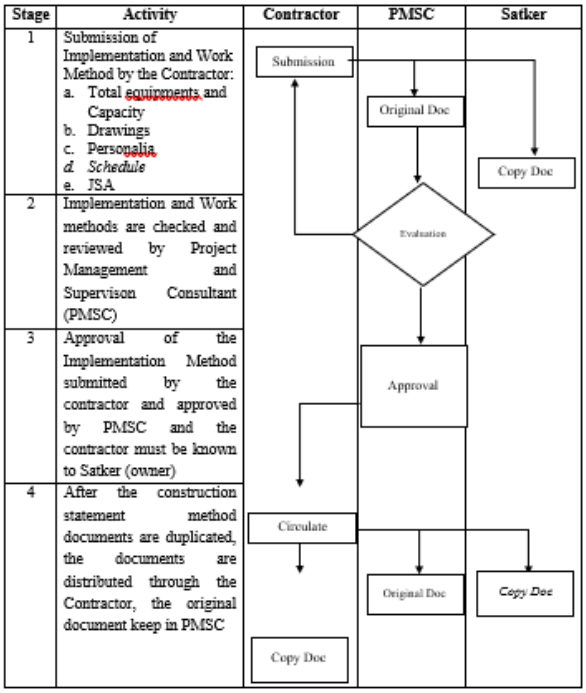


Picture 2 Billing Process Flow Subprovider Work Progress

This process is solely to ensure that the CSMS run by subproviders runs well and ensure that the CSMS is not just a mere document but also needed in the implementation process and requires *improvement*.

Strategy of Work Implementation Methods

A good implementation method is an implementation method that provides convenience for the implementation of work in the field and includes aspects of CSMS and quality. Implementation Method per each work made in the Kulon Progo Airport Infrastructure Development Project consists of *Engineering Documents*, implementation methods related to the sequence, way and process of implementing work to be carried out in the field, estimated implementation time, related to the length of work process time and HSE *Plan* planning which explains the CSMS plan in which there is *a Job Safety Analysis* (JSA). This is to provide an overview to units and workers working in the field related to all aspects from methods to CSMS for the work to be done. The process of approving the implementation method to PMSC and the Project Owner follows the procedure agreed upon at the beginning of the project. Figure 4 is the flow of approval of implementation methods between contractors, PMSC and Project Owners in the Airport Infrastructure Development Project in Kulon Progo.



Picture 3 Flow of approval of implementation methods between the Contractor, PMSC and Project Owner (SOP for Airport Infrastructure Development Project in Kulon Progo, 2018)

After the implementation method document has received approval, the final stage carried out is socialization and *training*. This is done to provide an overview both in theory and field practice to field personnel in carrying out the work and to convey risks and things that need attention.

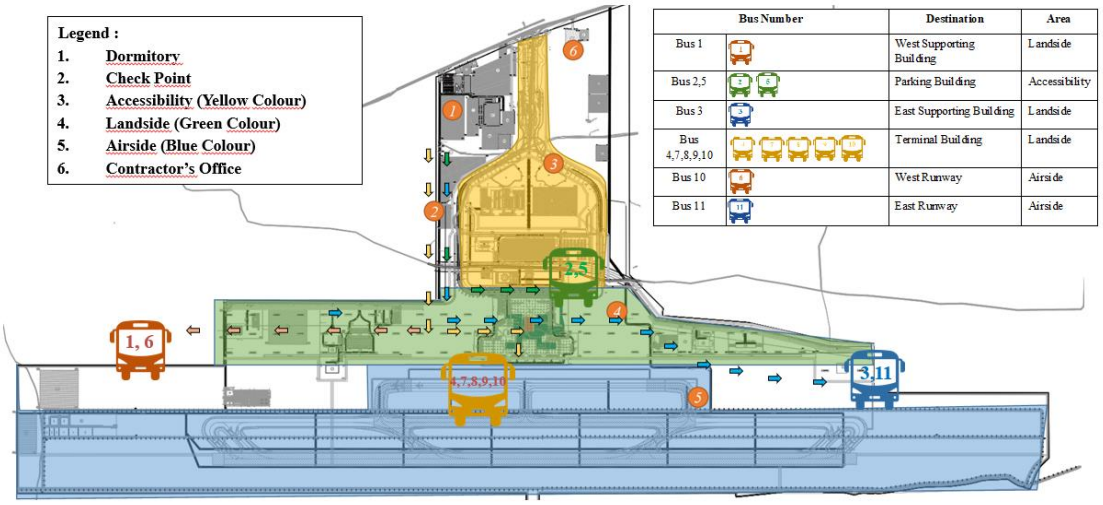
Dormitory *Strategy* for Workers

In the implementation of construction projects, a plan of residence or worker barracks or *dormitories* is needed for labor during the construction period. A decent and representative place to live will make workers feel at home so that it will indirectly help the productivity of work in the field. One aspect of planning and making a dormitory *is the number of workers who will work, security aspects, accessibility aspects and of course the comfort of the workers when they will live in the* dormitory. *The dormitory* should also be built close to the main access road of the project to facilitate access and control of people in and out of the project with a one-door design which can be seen in Figure 5 below.

Picture 4 Location of Worker Dormitory

Another strategy carried out by PP KSO to keep the workforce at home, healthy and productive is to provide worker buses that serve between workers from the *dormitory* to

the work area. The large work area with a considerable distance from the *dormitory* to the work location makes PP KSO have to think of strategies to maintain discipline when workers come, and leave. Another problem is that because the distance is quite far, not a few workers are lazy to go back to the *dormitory*, so activities during the break are spent in the project environment. During the rest period, activities such as eating and even sleeping are automatically carried out in the project environment and result in a lot of food waste that pollutes the project area. Therefore, an idea was sparked to provide public transportation for workers who live in *dormitories*, the transportation is a bus. The route and destination division from next to the bus can be seen in Figure 6 below.



Picture 5 Worker Bus Traffic Management at Airport Infrastructure Development Project in Kulon Progo

Factors Affecting CSMS

Factors affecting the construction safety management system (CSMS) in the Kulon Progo Airport Infrastructure Development Project are carried out by analyzing all primary data and secondary data and ranking them into 5 (five) elements of CSMS as contained in the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia No. 21/PRT/M/2019 concerning Construction Safety Management System Guidelines article 7, to see what factors are dominant. The 5 (five) elements of CSMS and their derivatives can be seen in table 1 below.

Occupational Health and Safety Program Strategy

The strategy carried out by PP KSO in running the CSMS program in the Airport Infrastructure Development Project in Kulon Progo is to place the person in charge in their respective areas led by the HSE Manager. Collaboration with service providers who provide HSE *Officers* in the field is also one of the keys to success. Daily, weekly and monthly monitoring and evaluation are also carried out to measure and evaluate what achievements and obstacles will be faced. The HSE work programs implemented are (1) *Induction*, (2) HSE *Training, (3*) Toolbox *Meeting, (4) HSE Inspection, (5) HSE Patrol* and Management Review, (6) HSE Meeting, (7) HSE *Talk*, (8) Reward and Punishment, (9) *Corporate Social Responsibility,* and (10) Medical *Program.*

Then from the existing CSMS data and documents of the Kulon Progo Airport Infrastructure Development Project and the results of interviews, analysis was carried out using ATLAS.ti software. The stages of analysis carried out are by formulating CSMS elements into a *coding* then grouping from primary data and secondary data to CSMS elements that have been coded with the help of ATLAS.ti software. *Coding* that is input into

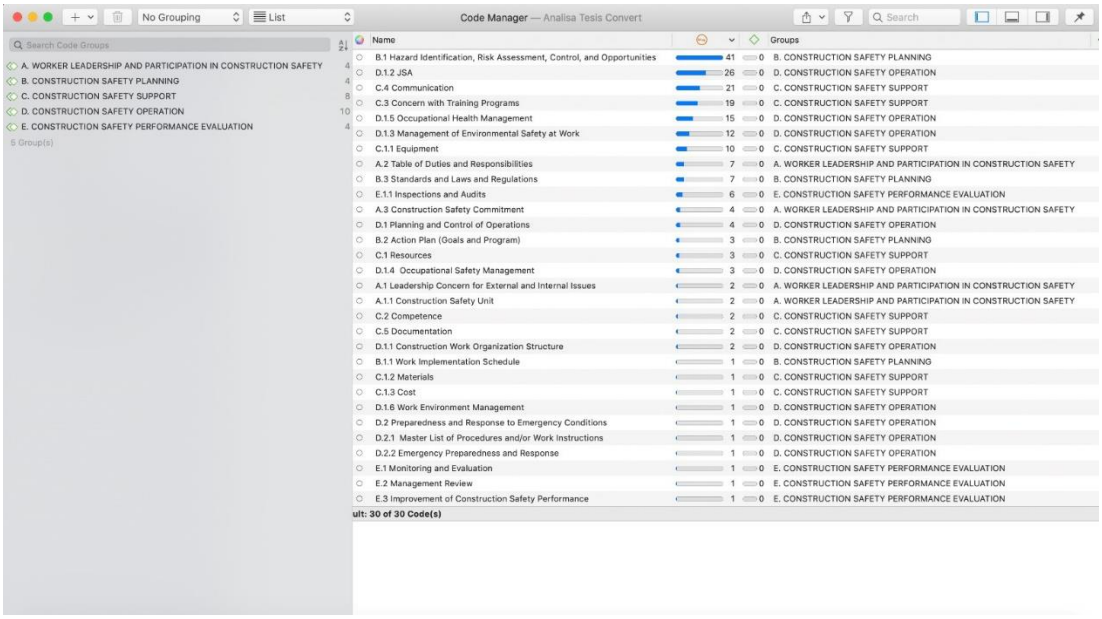
the *software* consists of two levels. The first level is called "*Code Groups*" which contains five elements of CSMS, while the second level is *coding* which consists of derivatives of five elements of CSMS.

Table 1 Five (5) elements of SMKK and its Derivatives

No.	Five Elements of SMKK	Derivatives of the Five Elements of SMKK
1	Worker Leadership and Participation in Construction Safety	Leadership Concern for External and Internal Issues
		Construction Safety Unit / UKK (SMKK Management Organization)
		Table of Duties and Responsibilities of UKK
		Construction Safety Commitment
2	Construction Safety Planning	Hazard Identification, Risk Assessment, Control and Opportunity (IBPRP)
		Work Implementation Schedule
		Action Plan (Goals and Program)
		Standards and Laws and Regulations
3	Construction Safety Support	Resources
		Equipment
		Materials
		Cost
		Competence
		Concern

The documents used to analyze the factors affecting the Construction Safety Management System in the Kulon Progo Airport Infrastructure Development project are HSE *Plan* PP KSO documents, Interview Resource Person Resume, Transcription of interview results*, Job Safety Analysis* (JSA), S-Curve, *Project Planning* Kulon Progo Airport Infrastructure Development Project, and Kulon Progo Airport Infrastructure Development Project Cost Budget Plan.

After conducting an analysis with ATLAS.ti in the top ten rankings of factors that affect the construction safety management system include Hazard Identification, Risk Assessment, Control and Opportunities (IBPRP), *Job Safety Analysis* (JSA), Communication, Concern with training programs, Occupational Health Management, Work Environment Safety Management, Equipment, Construction Safety Unit (UKK) Duties and Responsibilities, Standards and Legislation and finally Inspection and finally Inspection and Audit as shown in Figure 7.

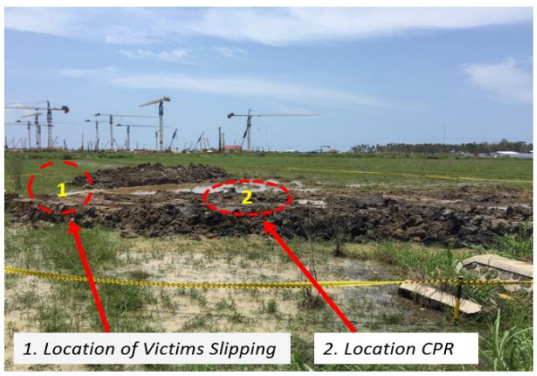


Picture 6 Output ATLAS.ti

Risk Level of International Airport Project Implementation

Throughout the implementation of the Kulon Progo Airport Infrastructure Development Project, there were five (5) *accidents* and *incidents* related to construction safety taken from HSE's weekly report data archive. The *accidents* and *incidents* that occur during the construction process are used as a basis for mitigating similar events from occurring in other projects and providing recommendations and *lessons learned.* Data retrieved from HSE Weekly Reports. It can be seen in Figure 8 to Figure 12 related to *accidents* and *incidents* that occurred during the project.

Picture 7 Truck Mixer rolls over



Picture 8 Location Fatality Zone Accessibility

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Picture 9 Overturned Dump Truck in Accessibility Zone

Picture 10 Damaged Mainframe Scaffolding Material

Picture 11 Location of Mired Workers

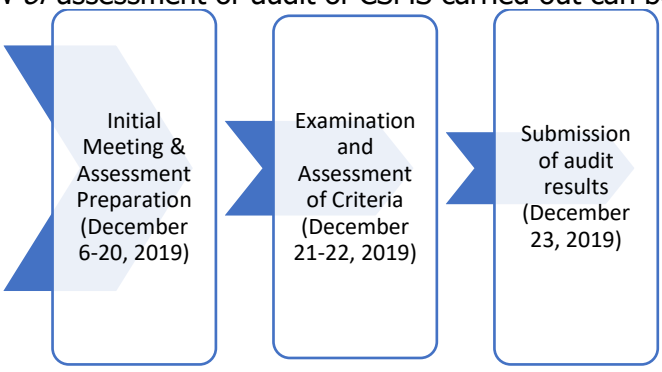
The level of risk that occurs during five (5) weeks of CSMS events can be seen in Table 2 below:

Table 2 Risk Level of Events During Construction

No.	Week To-	Date	Job Description	Hazard Identification	Types of Hazards	Risk Level Assessment			
						Severity (F)	Probability likelihood (A)	Risk Value (F x A)	Risk Level (TR)
1	17	November 11, 2018	Foundry Work	The machine was mired in the area around the beheading.	Crushed by heavy equipment, injured	4	2	8	Medium
2	18	November 14, 2018	Excavation measurement work	Falling into a dug pit filled with water	Died of drowning	3	4	12	Medium
3	25	January 6, 2019	Landfill Work	Truck rollover Truck mired	Crushed by heavy equipment, injured	4	2	8	Medium
4	71	November 22, 2019	Working at Heights	Scaffolding collapsed	Stricken by tools	4	2	8	Medium
5	79	January 16, 2020	Stainless Steel Railling *Works*	Falling from a Height	Injured	4	2	8	Medium

Evaluation of the Efficiency of CSMS Performance Implementation

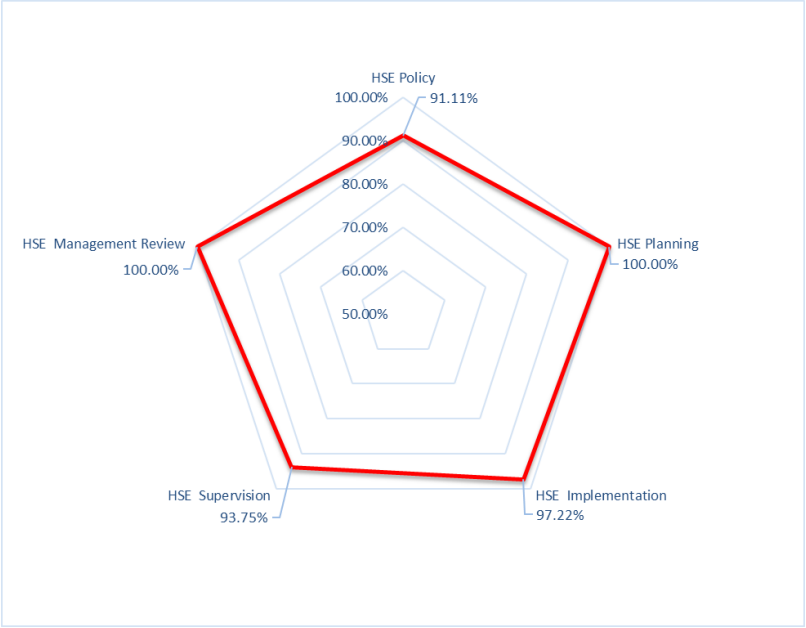
The effectiveness of the implementation of the Construction Safety Management System (CSMS) performance in the International Airport Project is measured using data from the results of HSE assessments that have been carried out. The purpose of the audit is to see the level of achievement of implementation and development of K3 performance. The scope of the audit carried out covers all work units with auditors consisting of 4 people from Management Consultants and Project Owners. The flow *of* assessment or audit of CSMS carried out can be seen in Figure 13.



Picture 12 CSMS Assessment Flow for Airport Infrastructure Development Project in Kulon Progo

After all series of audits were carried out, the results of the *assessment were* submitted to PP KSO where the results obtained were that the level of conformity of achievement of application to the SMK3 criteria was 95.31%. In the Government Regulation of the Republic of Indonesia Number 50 of 2012 concerning the Implementation of the Occupational Safety and Health Management

System, it is stated that if the assessment of the level of implementation of SMK3 between 85% - 100% can be categorized as satisfactory, thus the application of CSMS in the Airport Infrastructure Development Project in Kulon Progo is categorized as **satisfactory**. The assessment results of the audit criteria and their fulfillment are made a radar diagram as Figure 14 below:



Picture 13 Net Analysis Diagram HSE Program

In the radar diagram above, the highest value in the HSE planning element and HSE management review is 100%, then in the HSE implementation element of 97.22%, in the HSE supervision element of 93.75%, and in the HSE policy of 91.11%.

CONCLUSION

Based on data analysis and discussion that has been carried out in this study, several conclusions were obtained as follows:

1. The key to the success of the Construction Safety Management System in the Airport Infrastructure Development Project in Kulon Progo in accordance with the Regulations Public Works and Public Housing Meter of the Republic of Indonesia No. 21/PRT/M/2019 article 7 is influenced by Hazard Identification, Risk Assessment, Control and Opportunities (IBPRP), Job Safety Analysis (JSA), Communication, Concern with training programs, Occupational Health Management, Work Environment Safety Management, Equipment, Construction Safety Unit Duties and Responsibilities, Standards and Legislation and finally Inspection and Audit
2. The level of risk of implementing work on national strategic projects, especially the Airport Infrastructure Development Project in Kulon Progo, can be in Mitigation is good because it is planned in great detail and communicated very intensively from the top management level to the level of workers in the field.
3. The implementation of the performance of the Construction Safety Management System in this research case study has proven to be effective. This is due to the implementation process since Procurement to implementation in the field that is strictly controlled, related to construction safety, both from human factors, work tools and management's commitment to its implementation.

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