

Risk Management Maturity Safety and Health Management System (SMK3) Contractor-Case Study: Toll Road Project Bogor-Ciawi-Sukabumi

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Abstract: *Strategic plans to improve the application of occupational safety and health (SMK3) in general in Indonesia are still often overlooked. This is indicated by the still high number of work accidents on the implementation of toll roads by contractors in Indonesia. Risk Management Maturity is a method used to measure the maturity level of the application of risk management in one organization by identifying steps, types of work that need to be completed, and the sequence of activities that need to be implemented and have meaningful and measurable results. The purpose of this study is to determine the extent of the risk management of maturity / maturity, occupational safety and health in the Bogor-Ciawi-Sukabumi toll road project. This study uses a comparative analysis of Analytical Hierarchy Process (AHP) to get the results of the high risk category in the risk of applying an occupational health and safety management system, while the criteria assessment uses the Enterprise Risk Maturity. The results of this study indicate that the level of maturity at level 3 means that this study recommends that this level be improved so that it can encourage the implementation of occupational health and safety to be carried out thoroughly and applied to the current and future Bogor-Ciawi-Sukabumi toll road projects.*

Keywords: Risk Management Maturity SMK3, Contractors

1. Preliminary

Along with the development of construction services in Indonesia, the problem of workplace accidents that cause loss of material and energy are expected to continue to rise. In developed countries, the study of the risk of workplace accidents is mostly done and published. Based on data from the Employment BPJS number of cases of occupational accidents continues to decline in 2015 occurred as many as 110 285 cases of occupational accidents, whereas in 2016 some 105 182 cases, thus decreased by 4.6% while until August of 2017 there were as many as 80.392 cases.

Toll road or highway is a road reserved for vehicles wheelbase is more than two (cars, buses, trucks) and aims to shorten the distance and time from one place to another and reduce congestion. The toll road is a public road where the wearer subject to liability to pay the levy. The toll road is an alternative way of cross public roads that already exist and are built with the intention of accelerating the embodiment of an integrated road network. In this study, the authors analyzed the Toll Road Bogor- Ciawi-Sukabumi (Bocimi) in Sta 1 + 450. Toll Road is located in West Java province, linking the city of Bogor, Sukabumi. Toll Road was built in 2016 by PT. Trans Jabar Tol, a subsidiary of PT. Toll MNC investments with a length 54 km. Toll Road Bogor - Ciawi - Sukabumi.

In an effort to implement an effective and efficient SMK3 takes the concept of risk management as a basis to identify and analyze the risks and the SMK3 performance. Risk is ubiquitous, which can appear in many forms. If an

organization fails to manage risk organization can experience adverse consequences. In the field of occupational safety, risk is concerned only that negatively affects (downside risk). Therefore, the safety risk management becomes the main focus is the prevention or at least reduce (mitigation) safety threat. The goal is to reduce the losses with little chance for Zero Accident or not been accidents [Hinsa siahaan, Risk Management, PT. Jakarta Gramedia 2007]

Formulation of the Problem

- 1) The Government has made clear rules governing the implementation of SMK3 should be obeyed by implementing construction services but less ignored by the executing agencies / contractors.
- 2) The role of human error in the implementation of the cause of significant construction.

Research Purposes

- 1) Knowing the level of maturity SMK3
- 2) Get information about applying SMK3 on construction projects in development Toll Ciawi - Bogor-Sukabumi.

2. Theoretical Basis

Safety and Health Management Sytem SMK3

Occupational safety and health is the supervision of the person and the method includes the work environment so that workers are not injured. Basic and implementation of occupational safety and health based on the 1945 Constitution (Article 27: 2), which states that every citizen has the right to work and a decent income for humanity.

Decent livelihood is a job that is human, which allows workers to be healthy, happy, free from accidents and occupational diseases. A decent living is to live like human beings so as to meet the needs of a decent daily life so that the level of welfare can be met within their dignity as human beings. [The 1945 Constitution (Article 27, Paragraph 2)]

According to Abidin (2008), safety, occupational health and sustainability (SMK3) is an attempt to create a working atmosphere that is safe, comfortable, and the ultimate goal is to achieve the highest productivity. Thus the absolute SMK3 to be carried out on any kind of field work, without exception. [Abidin, et al. 2008. Relationship Behavioral Health and Safety With Radiation Dose In Full Reactor. Yogyakarta]

According Okky (2011) safety, occupational health and sustainability (SMK3) is a program created by the government that must be complied with and implemented employers and employees in an effort to prevent accidents caused by work and occupational diseases by identifying the potential to cause accidents and diseases occupational and anticipatory action in case of accidents and occupational diseases. The goal is to create a comfortable workplace, and healthy so as to suppress the lowest possible risk of accidents and diseases. [Okky Suli. 2011. Influence of Health and Safety at Work Against Employee Productivity Production Department PT. Indmira Nusantara Citra Tani. Veteran Development University]

Work safety shows in a safe or good condition of suffering, destruction, or loss in the workplace (Mangkunagara, 2000: 161). Safety is the protection of employees from injuries caused by accidents related to work, while the occupational health is employee freedom from physical or emotional illness (Mondy R. W, 2008: 82)

Work safety is a means to prevent accidents in the workplace and to prevent injury / disability, death or other material losses if the accident had to happen (Joseph, 2004: 1).

Mathis and Jackson (2002: 245) understanding of occupational health is a condition that refers to the physical, mental and emotional stability in general. Health within the scope of occupational safety and health is not only defined as a state of being free from the disease and its application seeking to implement workforce healthy, productive in their work, are in equilibrium steady between work capacity, workload and environmental conditions of work, as well as shielded from of diseases caused by work and the working environment (Suma'mur, 2009, p. 2).

Based on the Regulation of the Minister of Public Works No. 02 / PRT / M / 2018 Management Systemsafety, occupational health and sustainability (SMK3) Construction Sector Public Works that SMK3 are all activities to ensure and protect the safety and health of workers through prevention of occupational accidents and occupational diseases in the construction work. [CHEWING No. 02 / PRT / M / 2018 About, Management System Occupational Health, Safety and Sustainability]

SMK3 Risk Management is an attempt to manage risk

SMK3 prevented or unwanted accidents in a comprehensive, well-planned and structured in a systemic good.

Safety Maturity Model originally developed by the Software Engineering Institute (SEI) as a mechanism to improve how a software / systems are easily built and maintained (Paulk, MC, Curtis, B., Chrissis, MB & Weber, CV), This model gives organizations / companies 5 (five) levels which will lead them to develop software engineering practices / systems they are.

In practice SMK3 management system applied by the companies did not conduct a sustained increase (Continual improvement) that the system held by employees that merely meet the level of fulfillment of consumers or regulators (government). So that SMK3 Management System should be culture and will increase the maturity or maturity SMK3 Management System in the company.

UK Coal Journey SMK3 Model describes the maturity level is divided into five (5) stages of the vulnerable (vulnerable), reactive (reactive), Comply (compliant), proactive (proactive) and elastic (resilient) [Patrick Foster and Stuart Hoult, The Journey Safety, Using a Safety Maturity Model for Safety Planning and Assurance in the UK Coal Mining Industry. 2013, ISSN 2027-163X]

2.1 Risk Management Maturity

Risk management is a structured approach / methodology in managing uncertainty related to a threat; a range of human activities including risk assessment, developing strategies to manage and mitigate risk by using empowerment / resource management. Strategies that can be taken include the transfer of risk to another party, avoiding the risk, reducing the negative effects of risks, and holds some or all of the consequences of a particular risk. [Soehatman Ramli, Risk Management in Perspective K3 OHS Risk Management]

The definition of risk management in the risk management standards such as ISO 31000: 2009 which briefly defines risk management as "coordinated activities to direct and control an organization with regard to risk" (p.2) while the Institute of Risk Management (IRM, 2002) defines risk management as "the process whereby organizations methodically address the risks are identified, their activities aimed at achieving sustainable gains in each activity and across the portfolio of all activities" (p.2). In this study, risk management is recognized as a process that is supported by the resources to deal with a risk monitor and control the probability and / or impact of the threat, or to seek the realization of opportunities. [ISO 3100: Risk Management / Practical Guide For SMEs 13]

In a project that has a series of processes that work many risks involved in the project. The larger the size and complexity of the project risks inherent in the project are also getting bigger. If not anticipated then the risk would be a problem for the project.

Project risk management is the process of preparing a series of risk management planning, identification, analysis, response, monitoring, and control of a project. The aim is to

increase the probability and impact of positive events (opportunities) and minimize the likelihood and impact of negative events in a project.

SMK3 Risk Management is an attempt to manage risk SMK3 to prevent unwanted accidents in a comprehensive, well-planned and structured in a systemic good. SMK3 risk management relating to the hazards and risks in the workplace that may result in losses for the company. If not controlled sisiko SMK3 can threaten business continuity.

Enterprise Risk Management (ERM)

Definition of Enterprise Risk Management (ERM) is “A process that is influenced by the senior leaders and other personnel within an organization, applied in setting the strategy and include the overall organization, designed to identify potential events that affect an organization, to provide sufficient guarantees proper related to the achievement of organizational goals” (COSO ERP, 2004).

ERM is a process that involves all parts sustainability risk managers in a company within the framework of functional and technological aspects. ERM is a systematic way that is structured to align the organization's approach to managing uncertainty risk more effectively. In the early development of risk management with ERM called a paradigm breakthrough in the management of risk traditionally known. Segmented risk management performed by the company in one unit and division. Approach to risk management has traditionally received a lot of criticism because they ignore the relationship between the various risks, inefficient coordination and duplication of financing. Instead ERM treat each risk as the risk of the overall portfolio. Therefore,

ERM also commonly referred to in terms such as

- a) Strategic risk management,
- b) Integrated risk management
- c) Holistic risk management

All these terms refer to the same concept, namely that everything is looked at risk and risk management in a comprehensive manner, rather than with silo-based approach where the risk dikelolal separately and vary in the organization / company (CAS, 2003). [RIMS Org. (2006). RIMS Risk Maturity Model (RMM) for Enterprise Risk Management. Risk and Insurance Management Society Inc.]

Safety Culture Maturity Model (SCMM)

Maturity model concept was originally developed by the Software Engineering Institute (SEI) as a mechanism to improve the way software is built and maintained. This model provides organizations with a five-level process to assist them in developing the engineering practices of their software. Five initial levels, Repeatable, Defined, Managed and Optimizing. Framework capability maturity model has been adapted for use in other domains and to address the problem, such as project management, human resources, usability and quality. The concept of capability maturity model is useful because it enables organizations to establish their current level of maturity and the actions needed to reach the next level.

The elements that make up the safety culture maturity model

has been adapted from a culture of safety components listed by the HSE HSG48. It is unlikely that these elements will be mapped exactly to the factors that the company had previously been measured in a survey of safety culture or climate, because there are variations in the elements of the organization's safety culture. Some researchers argue that the safety culture consists of the attitude of employee safety organizations and others suggest that it is far more extensive system combines, attitudes, values, beliefs and symbols of the organization. security climate tends tool for measuring elements are slightly different from the culture of safety. The elements used in the safety culture maturity model contains the most common components of both theoretical models and measurements.

Maturity safety culture of an organization composed of ten elements, which are described below. Installation level of maturity of the organization or determined on the basis of their maturity on these elements. It is entirely possible that the organization will be at different levels in the ten components of the SCMM. Decide the most appropriate level will be based on the average level achieved by the organization or installation being evaluated

3. Research methodology

Place and time of research

This research will take a sample of the jobs data on development projects Toll-Ciawi Bogor-Sukabumi 2017-2018 budget years with the object of risk management is handled by contractors.

Data types

According Indriantoro (2002), data sources can be divided into two categories, namely:

- 1) Primary data, questionnaires and respondents to experts in the field.
- 2) Secondary data, ie data derived from the company in the form of documents weekly and monthly reports, articles and share publications and related institutions that are relevant to the issues raised.

As described this research using interviews, the investigation conducted to obtain the facts of the existing symptoms and seek factual descriptions of secondary data.

Method of collecting data

The method of data analysis is done by preparing, discussing and evaluating data and interviews / observations about SMK3 at the project site. Furthermore, analysis of data using AHP (Analytical Hierarchy Process) and the study of literature that Enterprise Risk Management (AHP) is used as a measure of maturity level ratings SMK3.

4. Implementation and Results Discussion

4.1 Implementation

The research was conducted on Highway Development Project-Ciawi Bogor-Sukabumi, at the time of the research conducted, Highway Development Project-Bogor-Ciawi-Sukabumi been going on since 2015

Discussion

Based on the references used to support the research can be explained in the following table

Data collection

Data Collection Phase I (Validation Specialist)

The criteria are those that experienced experts, projected construction and also has experience as a contractor or owner of the project on construction work Tol Ciawi-Bogor-Sukabumi

No	Name	Gender	Age (Years)	agencies / Company	Work Experience (Years)
1	Dr. Ir. Suprayoga Hadi, MSP	lk	53	Kementerian Planning / Bappenas	> 15 years
2	Dr. Irika Widiyanti, MT	pr		State University of Jakarta	> 15 years
3	Ir. Joko Susilo, MT	lk		Project Leader Trans Jabar Tol	> 15 years
4	DB Lawrence Aji, ST, M.Sc	lk	36	Cau Kiel (Research Assistant)	11 years old
5	INRA Jalangkaraya, ST.MT	lk		The Ministry of Defense of the Republic of Indonesia	12 years old

The data collection phase II (Questionnaire Respondents Against Risks)

Filling this questionnaire involving several respondents can be seen in the following table:

Table 4.2: Respondents Phase II Data

Kuesioner Manajemen Risiko Kontraktor Pelaksana terhadap kinerja mutu kesehatan,keselamatan kerja dan keberlanjutan

No.	Keterangan	Persentase
1	Posisi/Jabatan	
	- Personil Kontraktor (Direksi)	17 orang 85,00%
	- Deputy Kontraktor	3 orang 15,00%
	- Site Engineering Kontraktor	0,00%
	- Pelaksana Teknik	0,00%
	- Administrasi Teknik	0,00%
2	Pengalaman Kerja	
	- 0 s.d. 5 th	4 orang 20,00%
	- 5 s.d. 15 th	4 orang 20,00%
	- > 15 th	12 orang 60,00%
3	Pendidikan	
	- D3	6 orang 30,00%
	- S1	14 orang 70,00%
	- S2	0,00%
	- S3	0,00%
4	Proyek	
	- Proyek Pembangunan Jalan Tol Bogor-Ciawi-Sukabumi	100,00%

Data Collection Phase III (Questionnaire Respondents Against Implementation (ERM))

This questionnaire filling stage is the stage to seek the maturity level of the supervising consultants. Assessment conducted on contractors element that is Team Leader Site Engineering, implementing technical and administrative techniques.

Table 4.2: Respondents Phase III Data

Pengelompokan Responden Tahap 2A
 Kuesioner Implementasi Enterprise Risk Management kepada Kontraktor Pelaksana

No.	Keterangan	Persentase
1	Posisi/Jabatan	
	- Personil Kontraktor (Direksi)	6 orang 33,33%
	- Deputy Kontraktor	6 orang 33,33%
	- Site Engineering Kontraktor	4 orang 22,22%
	- Pelaksana Teknik Kontraktor	2 orang 11,11%
	- Administrasi Teknik Kontraktor	18 orang
2	Pengalaman Kerja	
	- 0 s.d. 5 th	3 orang 16,67%
	- 5 s.d. 15 th	3 orang 16,67%
	- > 15 th	12 orang 66,67%
3	Pendidikan	
	- D3	4 orang 20,00%
	- S1	16 orang 80,00%
	- S2	0 orang 0,00%
	- S3	20 orang -
4	Proyek	
	- Proyek Pembangunan Jalan Tol Bogor - Ciawi - Sukabumi	100,00%

Data analysis

Analysis of the data in this research effort or how to process data into information so that the characteristics of the data can be understood and useful for solutions to problems, terutama issues related to research and activities undertaken to change the data results of the research into information that can later be used to draw conclusions

Risk Rating Analysis by Using AHP (Analytical Hierarchy Process)

The data will be analyzed by analysis of AHP method begins with the pairwise comparisons yan and finally get the average value of the degree of influence and frequency

Pairwise comparison

Making the pairwise comparison matrix aims to compare the five variable assessment.

Table 4.3: Matrix Couples For Effect Level

	Very high	High	moderate	Low	Very low
Very high	1:00	3:00	5:00	7:00	9:00
High	0:33	1:00	3:00	5:00	7:00
moderate	0:20	0:33	1:00	3:00	5:00
Low	0:14	0:20	0:33	1:00	3:00
Very low	0:11	0:14	0:20	0:33	1:00
total	1.79	4.68	9:53	16:33	25.00

Source: Processed Alone, 2018

Table 4.3: Matrix Couples To Frequency

	Very high	High	moderate	Low	Very low
Very high	1:00	3:00	5:00	7:00	9:00
High	0:33	1:00	3:00	5:00	7:00
moderate	0:20	0:33	1:00	3:00	5:00
Low	0:14	0:20	0:33	1:00	3:00
Very low	0:11	0:14	0:20	0:33	1:00
total	1.79	4.68	9:53	16:33	25.00

Source: Processed Alone, 2018

Validation Specialist Final Results of Analysis

Based on the analysis of questionnaires that have been submitted to the experts hence the need for clarification of the interviews for the application and the steps to the project both in terms of quality performance management system health, and safety (SMK3) as well as Risk Management Maturity against construction contractor motorway bogor-Ciawi-sukabumi.

Discussion

Based on the assessment of the results of the questionnaire ERM (Enterprise Risk Management) Highway Development Project-Ciawi Bogor-Sukabumi entrance to level 3 (ERM), then visible attribute relationships developed by CRMS – Risk – Appetite Management. Is the level of understanding on trade-offs. Among the risks to be aware, Accountability in leadership and policies to guide decision-making and the gap between the perceived risk to the actual risk. Risk appetite defines acceptable risk limits and risk tolerance defines risk appetite variations in measurements that are deemed acceptable by management.

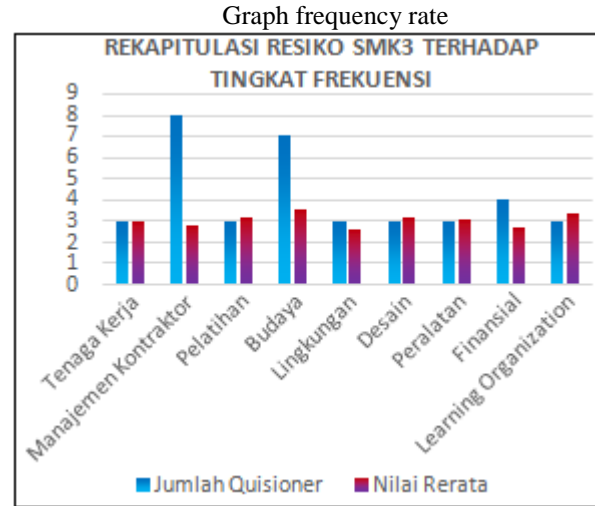
Dominant Factor Quality Risk SMK3

a. SMK3 cultural role in job

Safety culture on Highway Development Project-Ciawi Bogor-Sukabumi which became the subject of research in this thesis, has not done well in its application, although the administrative procedures have been run very well. Cultural workers were accustomed to working with makeshift equipment become the norm to do. It became one of the obstacles in the implementation of SMK3. Application of rules and procedures, communication management system, as well as workers' behavior to make SMK3 be the right of workers not be an obligation to be a factor that must be improved in order to make a quality company in the future development.

b. Cultural influence on workplace accidents

Occupational accidents are unexpected events and expected result of the work (Soekidjo Notoatmodjo, 1997: 192). An accident is an unexpected events that cause injury or damage (John Ridley, 2004, 113). An accident can cause damage, organizational chaos, complaints and grief, disorder and disability as well as death.



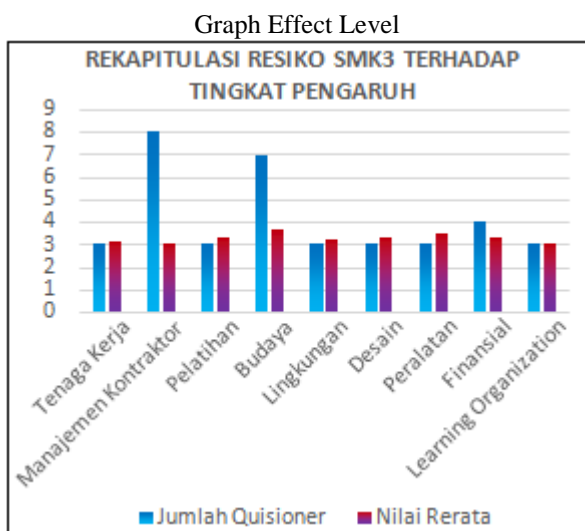
Source: Processed itself in 2018

Level 3 Risk Management Maturity Model

Based on the analysis of the level ERM Risk Management Maturity Model Implementation Contractor Highway Development Bogor Ciawi Sukabumi with 3:40 Mean values are level 3 (Intermediate), this means that the level of risk management was standardized, there are principles of writing and basic training.

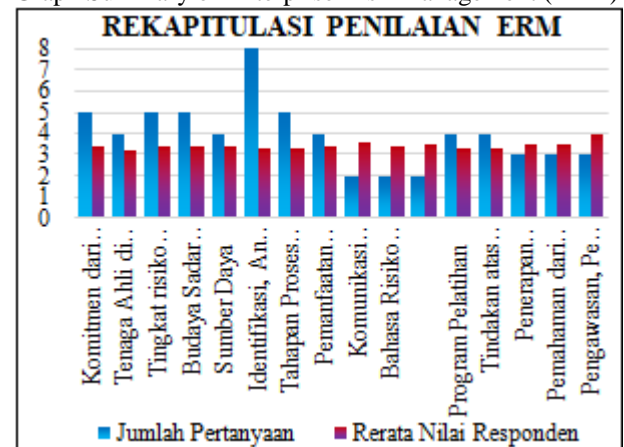
Tabel 3 Klaisifikasi Nilai Rata-rata Maturitas ERM

Interval Nilai	Tingkat Maturitas	Keterangan
4,21 – 5,00	Level 5 – Optimal	Manajemen risiko dijalankan secara optimal, dengan prinsip dan proses yang telah terintegrasi dalam proses bisnis
3,41 – 4,20	Level 4 – Baik	Terdapat sistem pengawasan terhadap implementasi manajemen risiko, prinsip-prinsip sudah dijalankan, disertai perbaikan secara priodik.
2,61 – 3,40	Level 3 – Menengah	Manajemen risiko telah distandardisasi, terdapat prinsip-prinsip tertulis disertai pelatihan dasar.
1,81 – 2,60	Level 2 – Lemah	Manajemen risiko telah diatur secara informal, tetapi belum terdapat pelatihan maupun komunikasi.
1,00 – 1,81	Level 1 – Sangat Lemah	Manajemen risiko dilakukan secara intuitif dan belum terdapat upaya formalisasi manajemen risiko.



Source: Processed itself in 2018

Graph Summary of Enterprise Risk Management (ERM)



Source: Processed Alone, 2018

The process of risk management in highway construction projects to be supported by the integrity, ethical values, organizational governance, competence and responsibility of the stakeholders of the organization. This process should

also be supported by the establishment of organizational goals that take into account the dimensions of risk, communication and the flow of information that is dynamic and continuous monitoring of all components of the risk management framework. Organizations should implement an effective ERM as it allows organizations to optimize the management of risk by providing a thorough and systematic evaluation, as well as risk control.

Based on the results of interviews, there are several inputs to overcome the risk management of the implementation of SMK3, seeing the impact of the development of science and technology in various sectors has the effect of creating multi potential hazards.

Implementing ERM based on ISO 31000: 2009 Risk Management - Principles and Guidelines in organizations needs to be accompanied by supervision and improvement to be able to achieve organizational goals. Therefore, the calculation of the maturity level of implementing ERM needs to be done. Organizations need to have sufficient knowledge of this so that they know the level of maturity of the application of organizational risk management and are able to continuously improve ERM in the organization.

5. Results and Discussion

Based on the analysis that has been done, can be concluded in several ways, as follows:

- 1) Literature review shows the variables for quality performance SMK4 and Enterprise Risk Management (ERM), namely:
 - a) Quality Risk SMK4 there are 32 variables
 - b) Enterprise
 - c) Risk Management (ERM) as many as 62 criteria
- 2) Next verification, classification and validation together five experts obtained variables given to the two respondents:
 - a) Owner of the work and the contractor to determine the risk
 - b) contractor
- 3) The dominant risk factor based data management using AHP (Analytical Hierarchy Process) in Bogor Ciawi toll road development sukabumi
 - a) Quality risk SMK3
 - K3 culture plays a role in job
 - Cultural influence on workplace accidents
- 4) Based on the analysis above, the level of the Risk Management Maturity Model Contractor in Highway Development Bogor-Ciawi-Sukabumi with 3:40 Mean values are level 3 (Intermediate), this means that the level of risk management was standardized, there are principles of writing and basic training.

6. Suggestion

Advice given researchers in this conclusion are:

- 1) Intensive improvement of workers in the project environment to spur safe practices, for example by giving rewards to workers in terms of the use of PPE and adherence to compliance with K3 regulations and the imposition of sanctions for all kinds of rules violations.

- 2) Improving the implementation of SMK3 that has been running at the project location
- 3) Government intervention is needed as control and gives sanctions for companies that ignore the SMK3 problem, giving rise to the attention and awareness of the company to implement SMK3 for the common interest

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