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OCCUPATIONAL SAFETY RISK MANAGEMENT OF RAGUNAN ZOO STAFF BASED ON ISO 31000

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Abstract

Ragunan Wildlife Park (TMR) is one of the largest zoos in Indonesia which is a public body managed by the DKI Jakarta local government facing challenges in managing staff occupational safety risks, especially those who interact directly with dangerous animals. Some of the accidents that occurred showed that the existing safety procedures were not fully effective. This study aims to evaluate the implementation of ISO 31000-based occupational safety risk management in TMR and provide recommendations for improvement of existing systems. This study uses a qualitative approach with a case study design, involving interviews with staff, direct observation, and document analysis related to risk management implemented in TMR. The data obtained were analyzed using the ISO 31000 framework to assess the effectiveness of risk management and identify areas that need to be improved in occupational safety procedures. The results show that TMR has identified a wide range of safety risks, such as wild animal attacks, work equipment accidents, and fire risks. The implementation of ISO 31000 in risk management helps improve safety procedures by improving staff training, the use of appropriate personal protective equipment (PPE), and regular risk evaluation. However, there are still challenges in terms of communication between staff, supervision, and readiness to face emergency situations. The implications of this study show that the application of ISO 31000 can be a more systematic basis in managing safety risks in TMR. This research makes an important contribution to improving staff occupational safety and provides recommendations for more effective risk management, which in turn supports the smooth operation and sustainability of conservation programs at TMR.

Keywords: ***Risk Management, Occupational Safety, ISO 31000, Ragunan Zoo, Staff, Safety Procedures.***

INTRODUCTION

Risk management constitutes a fundamental systematic process encompassing the identification, assessment, and control of potential hazards that may result in organizational losses or endanger personnel safety. Contemporary organizational environments, particularly those involving high-risk operations such as zoological institutions, necessitate comprehensive risk management frameworks to ensure operational continuity and personnel protection (Lizarzaburu et al., 2025). The ISO 31000:2018 standard provides a structured and internationally recognized approach to risk management, emphasizing the integration of both internal and external organizational contexts while considering human and cultural factors that influence management effectiveness (Jatmiko et al., 2022). This framework has demonstrated significant applicability across diverse sectors, including public institutions, healthcare systems, and specialized environments requiring enhanced safety protocols. The importance of systematic risk management in public institutions has been increasingly recognized as organizations face escalating operational complexities and regulatory requirements. (Hassan et al., 2023) emphasize that modern institutional environments require sophisticated approaches to risk identification and mitigation, particularly in sectors involving direct human-animal interactions. The implementation of ISO 31000 provides organizations with a comprehensive methodology for managing uncertainties while capitalizing on opportunities for operational improvement and growth protection against intolerable risk levels. Furthermore, the standard's emphasis on continuous monitoring and adaptive management aligns with contemporary organizational needs for dynamic risk response capabilities. Occupational safety in zoological environments presents unique challenges that differentiate these institutions from conventional workplace settings. Personnel working in zoological facilities face multifaceted risks including direct animal interactions, exposure to zoonotic diseases, accidents involving specialized equipment, and emergency situations requiring immediate response protocols. (Murakami et al., 2021) highlight the complexity of managing occupational

risks in specialized institutional environments where traditional safety protocols may prove insufficient. The inherent unpredictability of animal behavior, combined with the necessity for close human-animal contact in care and maintenance activities, creates risk scenarios that require sophisticated management approaches beyond standard occupational safety measures. The integration of artificial intelligence and advanced analytical approaches in risk management has emerged as a critical component of modern safety systems. (Wong et al., 2024) demonstrate that AI-driven risk management enables organizations to dynamically respond to volatile environments and facilitate complex decision-making processes in resource-constrained settings. This technological advancement provides particular relevance for zoological institutions where rapid risk assessment and response are essential for preventing incidents that could endanger both personnel and animals. The application of predictive analytics and machine learning algorithms can enhance traditional risk assessment methodologies by identifying patterns and potential hazards that may not be immediately apparent through conventional observation methods.

Recent research has established strong correlations between effective risk management implementation and organizational performance across various sectors. (Pangeran, 2022) demonstrates through case study analysis that comprehensive risk mitigation strategies integrated with balanced scorecard approaches significantly improve organizational performance metrics. The study reveals that systematic risk identification and mitigation processes enhance operational efficiency while reducing incident rates and associated costs. This finding particularly applies to zoological institutions where operational disruptions due to safety incidents can significantly impact conservation programs, educational activities, and public trust. The relationship between leadership effectiveness and risk management implementation has been identified as a critical factor in organizational safety performance. (Ardilo, 2022) establishes that emotional intelligence and risk leadership capabilities directly influence the effectiveness of ISO 31000 implementation within organizations. The research demonstrates that without adequate emotional intelligence levels, organizational leaders struggle to cultivate effective risk cultures, thereby compromising the overall success of risk management initiatives. This finding highlights the importance of leadership development in conjunction with technical risk management system implementation, particularly in high-stakes environments such as zoological institutions.

Contemporary occupational safety management approaches emphasize proactive rather than reactive risk management strategies. (Bochkovskyi & Sapozhnikova, 2023) propose proactive occupational safety management concepts that extend beyond traditional ISO 45001:2018 recommendations by implementing continuous monitoring and prompt adjustment mechanisms for identified hazardous factors. This approach represents a significant advancement from conventional periodic risk assessments toward real-time risk management capabilities that can prevent incidents through immediate parameter adjustments. The proactive methodology demonstrates particular applicability in zoological environments where continuous risk exposure requires constant vigilance and adaptive response mechanisms. The analysis of occupational risk management models according to international standards reveals significant variations in terminology interpretation and implementation approaches. (Tsopa et al., 2022) conduct comprehensive morphological analysis of professional risk management models, identifying critical differences between various international standards including ISO 45001:2018, EU-OSHA guidelines, and ILO-BHP 2001 requirements. The research establishes that successful risk management implementation requires careful consideration of these terminological differences and their implications for documentation and assessment procedures. This finding emphasizes the importance of standardized approaches to risk management documentation and evaluation processes.

Educational service environments have demonstrated successful ISO 31000 implementation through systematic risk identification and mitigation strategies. (Febiyanti et al., 2024) illustrate how educational institutions can effectively implement risk management frameworks to improve service performance and operational continuity. The research demonstrates that comprehensive risk assessment and mitigation activities, integrated with internal control systems, successfully anticipate and address various risk threats. This evidence supports the broader applicability of ISO 31000 frameworks across diverse organizational contexts, including specialized institutions such as zoological facilities. The banking and financial services sector provides valuable insights into advanced risk management implementation strategies that may inform practices in other high-risk environments. (Alsahlawi, 2021) examines the role of hedging techniques and financial technology adoption in enhancing risk management effectiveness, demonstrating positive correlations between systematic risk management approaches and organizational performance. (Hac et al., 2021) further establish the importance of risk management culture development for sustainable organizational growth, particularly under varying macroeconomic conditions. These findings suggest that comprehensive risk management implementation extends beyond technical procedures to encompass cultural and strategic organizational dimensions.

Climate risk management research provides additional perspectives on systematic approaches to managing complex, multifaceted risks. (Reiter et al., 2022) examine barriers and implementation strategies for climate risk management against indirect effects of natural disasters, emphasizing the importance of proactive management strategies that address cascading effects and system interdependencies. This research demonstrates the necessity for comprehensive stakeholder engagement and integrated approaches to risk management that consider both direct and indirect risk factors. Transportation safety research offers relevant insights into risk perception and management in public environments. (Ceccato & Loukaitou-Sideris, 2022) examine safety perceptions in transit environments across multiple international contexts, revealing significant correlations between risk perception, behavioral adaptation, and actual safety outcomes. This research demonstrates the importance of considering human factors and perception management as integral components of comprehensive risk management strategies (Care & Suppl, 2025).

Despite the extensive research on risk management implementation across various sectors, significant gaps remain in understanding the specific challenges and requirements for occupational safety risk management in zoological environments. Existing literature predominantly focuses on conventional workplace settings, financial institutions, educational environments, or industrial applications, with limited attention to the unique characteristics of human-animal interaction environments. The specialized nature of zoological operations, involving direct contact with potentially dangerous animals, exposure to zoonotic diseases, and the need for emergency response capabilities, creates risk scenarios that require tailored management approaches (Control & Industry, 2022). Furthermore, while previous studies have established the effectiveness of ISO 31000 implementation in various organizational contexts, there is insufficient research examining the specific adaptation and application of this framework to zoological institutions. The integration of risk management principles with conservation objectives, educational programs, and public safety requirements presents unique challenges that have not been adequately addressed in existing literature (Christensen et al., 2021).

Additionally, the long-term sustainability implications of risk management implementation in conservation-focused institutions require further investigation to understand the broader impacts on organizational mission achievement. The present study addresses these research gaps by providing a comprehensive examination of occupational safety risk management implementation at Ragunan Wildlife Park using ISO 31000 framework principles (Febiyanti et al., 2024). This research contributes to the existing body of knowledge by offering specific insights into risk management adaptation for zoological environments, identifying unique challenges and opportunities associated with human-animal interaction safety, and providing practical recommendations for improving occupational safety outcomes in similar institutional contexts (Jatmiko et al., 2022). The study's findings will inform risk management practices in zoological institutions while contributing to the broader understanding of specialized risk management implementation strategies (Elsayed et al., 2023).

METHOD

This research employs a qualitative approach with a case study design applied at Ragunan Wildlife Park (TMR). Data collection was conducted through interviews with staff, direct field observations, and analysis of documents related to risk management implemented at the zoo. Interviews were carried out with staff who work directly with dangerous animals to gather information about existing safety procedures, challenges faced, potential risks, and experiences related to incidents or near accidents. Additionally, observations were conducted to assess the implementation of safety procedures during staff interactions with dangerous animals. The risk identification process involved classifying the potential safety risks faced by staff, including wild animal attacks, injuries from working equipment, and the potential for fire or explosion. Data on these risks were collected through interviews with field staff and analysis of incident reports recorded at TMR (Lopez et al., 2021). The application of ISO 31000 involved analyzing the risk control measures already implemented at TMR and evaluating their effectiveness in reducing workplace accidents (Bazaluk et al., 2023). In the data analysis process, the researcher utilized thematic analysis techniques to identify key themes emerging from the interviews and observations. Subsequently, the data were analyzed using an ISO 31000-based risk approach, which includes identification, assessment, and control of risks existing in the TMR work environment. This technique refers to the guidelines given by ISO 31000, which recommend the use of systematic and structured procedures in risk management for public organizations (Hardjomidjojo et al., 2022). Furthermore, an evaluation was conducted to assess whether the risk management implemented at TMR aligns with the international standards set by ISO 31000. The application of ISO 31000 in risk analysis involved evaluating existing risk control measures and providing recommendations for improvement.

RESULTS AND DISCUSSION

Risk Identification

The results showed that TMR faces 14 occupational safety risks which include attacks of wild animals, bites or scratches, transmission of zoonotic diseases, and accidents that occur due to work equipment. The results showed that TMR faces 14 occupational safety risks which include attacks of wild animals, bites or scratches, transmission of zoonotic diseases, and accidents that occur due to work equipment. Comprehensive risk identification frameworks, as established by contemporary research, emphasize the importance of systematic approaches to categorizing diverse risk factors in organizational environments (Björnsdóttir et al., 2022; Settembre-Blundo et al., 2021). The existing risk management processes at TMR are not fully optimal, especially in terms of the implementation of structured safety procedures. Research demonstrates that inadequate safety culture and climate significantly contribute to suboptimal risk management implementation (Kalteh et al., 2021). The use of inappropriate personal protective equipment (PPE) and infrequent training are the main factors that increase the risk of accidents, as shown in Table 1.

Table 1. Risk Identification

Risk Code	Risk	Brief Impact
R1	Wild Animal Attacks	Severe injuries, major trauma, death
R2	Bites/Scratches from Small/Medium Animals	Physical wounds, infection, disease transmission
R3	Transmission of Zoonotic Diseases	Infectious diseases to humans, respiratory issues
R4	Slipping/Falling in Work Area	Physical injuries (sprains, fractures)
R5	Injuries from Work Equipment	Wounds from sharp objects or medical tools
R6	Exposure to Harmful Chemicals	Irritation, burns, respiratory problems, poisoning
R7	Physical and Mental Fatigue	Reduced concentration, injury risk, muscle stress
R8	Fire or Explosion	Serious injuries, property damage, operational disruption
R9	Poor Communication	Misunderstandings, reduced efficiency, accident risk
R10	Violation of SOPs	Accidents, disease spread, legal issues
R11	Negative Interactions with Visitors	Complaints, reputational damage, safety incidents
R12	Animal Escape Crisis	Safety threats, property damage
R13	Security System Failure	Unauthorized access, theft, vandalism
R14	Natural Disasters	Major damage, injuries, operational disruptions

Analysis

Risk Analysis is the process of explaining the sources of risks that arise, both from positive and negative aspects. The table below presents the Risk Identification from Ragunan Wildlife Park.

Table 2. likelihood

Rate	Likehood	Description	Estimated Time of Arrival (ETA)
1	Rare	Almost never occurs	Extremely unlikely to happen
2	Unlikely	Rarely occurs	Very rare or unlikely
3	Possible	May occur occasionally	Could happen but not frequently
4	Likely	Occurs regularly	Happens often under normal working conditions
5	Almost Certain	Expected to occur very frequently	Happens almost certainly or very often

Table 2 outlines five key points in conducting risk analysis. One of these is Likelihood, which refers to the probability of a risk occurring within a specified time frame. Likelihood is classified into several categories: Rare, Unlikely, Possible, Likely, and Almost Certain. The criteria in the table have been adjusted to reflect the estimated probability of the risk occurring within the given period. This probabilistic approach aligns with established methodologies for operational risk assessment in organizational settings (Tirayoh & Pangeran, 2023).

Table 3. Risk Scale Impact

Scale	Description	Guideline	Impact
1	Very Small	Incident results in a negligible impact and can be ignored	1/100 x
2	Small	Incident results in a minor impact that can be easily managed	1/10 x
3	Moderate	Incident results in a reasonably serious impact	1 x
4	Large	Incident results in a very large impact that should be avoided	10 x
5	Very Large	Incident results in an extremely large impact to be avoided	100 x

Note: The impact/loss is measured in currency units such as rupiah. If the standard moderate scale (scale 3) represents IDR 1, then IDR 10 million means a 'large' scale value is 10 times, and other scales adjust accordingly.

The risk impact scale helps to measure how severe the consequences of a risk event could be. It ranges from 1 (very small impact) to 5 (very large impact). A level 1 impact means the effect is minimal and can be ignored, while a level 5 impact indicates a very serious consequence that must be avoided. This scale is often related to financial loss or other measurable damage, helping organizations prioritize which risks need more attention and control. Contemporary management approaches emphasize the importance of quantitative impact assessment for effective resource allocation in risk mitigation strategies (Parsamehr et al., 2023).

Table 4. Risk Analysis

Risk Code	Risk Description	Likelihood (1–5)	Impact (1–5)	Risk Score (L x I)
R1	Wild animal attacks	3 (Possible)	5 (Very High)	15
R2	Bites or scratches from small/medium animals	4 (Likely)	3 (Moderate)	12
R3	Transmission of zoonotic diseases	3 (Possible)	4 (High)	12
R4	Slipping or falling in work area or cage	4 (Likely)	3 (Moderate)	12
R5	Injuries from work equipment	3 (Possible)	3 (Moderate)	9
R6	Exposure to harmful chemicals	3 (Possible)	4 (High)	12
R7	Physical and mental fatigue (burnout)	4 (Likely)	3 (Moderate)	12
R8	Fire or explosion in work area	2 (Unlikely)	5 (Very High)	10
R9	Poor communication between staff/management	3 (Possible)	3 (Moderate)	9
R10	Violation of SOPs	3 (Possible)	4 (High)	12

	by staff			
R11	Negative interactions with visitors	3 (Possible)	2 (Low)	6
R12	Crisis due to animal escape	2 (Unlikely)	5 (Very High)	10
R13	Security system failure	2 (Unlikely)	4 (High)	8
R14	Natural disasters	1 (Rare)	5 (Very High)	5

Table 4 illustrates the risk values derived from Likelihood and Impact obtained from the management unit of Ragunan Wildlife Park (UP TMR).

Risk Evaluation

Risk Evaluation is a process conducted to compare different levels of risk based on the analysis results. This process aims to assist in decision-making. Risk Evaluation is a process conducted to compare different levels of risk based on the analysis results. This process aims to assist in decision-making through systematic multilayered assessment frameworks (Ullah et al., 2021). The table below presents the outcomes of the analysis performed, indicating the results determined from the risk assessment with criteria including Likelihood (L), Impact (I), and Risk Level: L (Low), M (Medium), and H (High Risk).

Table 5. Risk Level

No.	Risk Level	Code	Description
1	Low	L	Risks that can be avoided and managed
2	Medium	M	Risks that need handling
3	High	H	Risks that urgently need to be handled as soon as possible

Table 6. Risk Evaluation Matrics

Likelihood	Insignificant	Minor	Moderate	High	Major
Almost Certain	5	10	15	20	25
Likely	4	8	12	16	20
Possible	3	6	9	12	15
Unlikely	2	4	6	8	10
Rare	1	2	3	4	5
	Impact				

Table 6 displays the results of the multiplication between Likelihood and Impact. The criteria for Likelihood and Impact consist of specific values ranging from 1 to 5. By multiplying Likelihood and Impact, the risk level associated with Ragunan Wildlife Park is determined. This matrix-based evaluation approach represents a standardized methodology consistent with ISO risk management principles (Smirnova et al., 2023).

Table 7. Risk Evaluation

Risk Code	Risk Description	Likelihood (1–5)	Impact (1–5)	Risk Score (L x I)
R1	Wild animal attacks	3 (Possible)	5 (Very High)	High
R2	Bites or scratches from small/medium animals	4 (Likely)	3 (Moderate)	High
R3	Transmission of zoonotic diseases	3 (Possible)	4 (High)	High
R4	Slipping or falling in work area or cage	4 (Likely)	3 (Moderate)	High
R5	Injuries from work equipment	3 (Possible)	3 (Moderate)	Medium
R6	Exposure to harmful chemicals	3 (Possible)	4 (High)	High
R7	Physical and mental fatigue (burnout)	4 (Likely)	3 (Moderate)	High
R8	Fire or explosion in work area	2 (Unlikely)	5 (Very High)	Medium
R9	Poor communication between staff/management	3 (Possible)	3 (Moderate)	Medium
R10	Violation of SOPs by staff	3 (Possible)	4 (High)	Medium
R11	Negative interactions with visitors	3 (Possible)	2 (Low)	Medium
R12	Crisis due to animal escape	2 (Unlikely)	5 (Very High)	Medium
R13	Security system failure	2 (Unlikely)	4 (High)	Medium
R14	Natural disasters	1 (Rare)	5 (Very High)	Medium

Risk Treatment

Risk Treatment is a process aimed at eliminating or minimizing risks faced by the company. Risk Treatment is a process aimed at eliminating or minimizing risks faced by the company. Effective risk treatment strategies require comprehensive understanding of organizational vulnerabilities and adaptive management approaches (Rahman et al., 2021). At this stage, there are 14 treatment recommendations tailored to the 12 risk identifications outlined in Table 8. The development of targeted mitigation strategies reflects contemporary sustainability-oriented risk management practices (Nobanee et al., 2021). Management of physical and mental fatigue requires comprehensive employee retention strategies that address workplace conditions and organizational culture (Alijoyo, 2023). The comprehensive risk management framework implemented at TMR demonstrates systematic alignment with contemporary ISO 31000 principles through structured identification, analysis, evaluation, and treatment processes. The comprehensive risk management framework implemented demonstrates alignment with contemporary ISO standards, though gaps remain in specific guidance for complex organizational environments (Björnsdottir et al., 2022). This finding emphasizes the need for continuous improvement and adaptation of risk management practices in specialized institutional settings such as zoological facilities.

Table 8. Risk Treatment

Risk Code	Risk Description	Level	Mitigation Recommendations
R1	Wild animal attacks	High	Use full PPE, special animal handling training, select experienced staff
R2	Bites or scratches from small/medium animals	High	Use thick gloves, animal handling technique training
R3	Transmission of zoonotic diseases	High	Regular hand washing, vaccination, periodic staff health checks
R4	Slipping or falling in work area or cage	High	Wear anti-slip shoes, keep floors dry, put warning signs in risky areas
R5	Injuries from work equipment	Medium	Work equipment training, regular inspection, avoid carelessness
R6	Exposure to harmful chemicals	High	Store chemicals properly, use mask & gloves, label hazardous substances
R7	Physical and mental fatigue (burnout)	High	Manage work/rest schedule, provide counseling or psychological support
R8	Fire or explosion in work area	Medium	Provide fire extinguishers, evacuation drills, check electrical & flammable materials regularly
R9	Poor communication between staff/management	Medium	Regular meetings, use group chat or radio for communication
R10	Violation of SOPs by staff	Medium	Routine SOP refresh, regular audits, enforce discipline
R11	Negative interactions with visitors	Medium	Staff training for hospitality & conflict, SOP for problematic visitors
R12	Crisis due to animal escape	Medium	Regularly check & strengthen cages, simulate capture procedures, add safety barriers

Risk Code	Risk Description	Level	Mitigation Recommendations
R13	Security system failure	Medium	Regularly check CCTV/alarm, have backup systems, prepare emergency SOP
R14	Natural disasters	Medium	Clear evacuation routes, emergency drills, store important documents safely

CONCLUSION

Based on the research conducted at Ragunan Wildlife Park using the ISO 31000: 2018 method, it was concluded that the analysis of workplace accident risks can be categorized into four types. The first category is Identification, followed by Risk Analysis, Risk Evaluation, and Risk Treatment. The method applied resulted in two risk levels, namely medium and high. Additionally, appropriate treatment recommendations were provided for 14 risks associated with high and medium risk levels.

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