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# Identification of Risk Management Implementation on Environmental Issues Related to Airport Operations (Case Study of Rahadi Oesman Airport)

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## Abstract

This study aimed to evaluate environmental risks based on risk assessment analysis and implement effective risk management to support Rahadi Oesman Airport operations. The research design and methodology used an evaluative case study approach with qualitative methods. Data were collected through a literature review, interviews with two airport employees, including the airport chief, and direct observation in the field. Analysis was conducted by identifying issues, categorizing data, and evaluating findings to develop recommendations and risk reduction strategies. The main findings of this study show that environmental risks such as bad weather, non-standard aircraft spacing, foreign objects, security issues, and wildlife around the airport can cause flight delays, cancellations, or accidents. Risk management includes reducing the use of vehicles with engines, saving water and lights, and using human labour for ground handling activities. The implications of this study emphasise the importance of environmental risk control strategies, strict implementation of SOPs, and training for airport staff. This research contributes to environmental risk management practices in the aviation industry and provides valuable insights for other airports facing similar challenges. Nonetheless, this study has limitations on the number of respondents and the use of questionnaires that need to be further developed.

**Keywords:** Risk Management, Environmental Risk, Airport Operations, Aviation, Extreme Weather.

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## Introduction

The era of globalization has brought humanity to various changes, developments and, at the same time challenges that must be anticipated early on. The development of insights about science in all aspects of human life has colored the globalization process, one of which is in the aviation industry sector. Technological developments in the aviation industry sector have increased rapidly yearly, bringing many

benefits to all aspects of human life. However, in addition to the myriad benefits that are present thanks to the rapid development of this industry, there is also the potential for harm.

The rapid development of air travel produces greenhouse gases (GHGs) that are believed to cause global warming, although it only accounts for about 3% of total global GHGs, but with the increasing number of commercial aircraft in operation, and the percentage of emissions is expected to continue to increase. The onset of global GHG emissions is believed to be the driving force behind the greenhouse effect that causes global warming and climate change. (Indriatmoko & Purwanta, 2017). Aircraft engine combustion can produce exhaust emissions that include carbon dioxide (CO2), water vapour (H2O), nitrogen oxides (NOx), carbon (HC), carbon monoxide (CO), sulphur oxides (SOx), and other particles. These emissions will impact airport air quality locally and the global climate, both of which will impact public health.

Damage to air quality at the airport will undoubtedly be a boomerang for the airport's operations itself, where the core process of airport operations, namely aircraft flight operations, can be disrupted by damage to air quality that is polluted due to the emission gases produced. The transportation industry faces more complicated risks in the era of globalization. One that has a high level of task complexity and involves many stakeholders is the air transportation sector. Due to its reputation as a high-risk sector, the aviation industry often uses risk management techniques. Airport operations are not limited to the movement of passengers and goods, environmental quality management systems such as waste management and environmentally friendly activities must be introduced. The impact of airport construction on public institutions and the environment has received less attention. Environmental complaints are rare, but only recently have people become concerned about the impact of airport operations on the environment. This may be due to worsening environmental problems and increasing air traffic.

The scientific method of risk management involves estimating potential losses and implementing measures that can reduce those losses or associated financial losses. The definition of risk management is a rational and systematic strategy to find, assess, decide on solutions, and monitor and report on the risks that occur in any activity or process. Similar to other industrial sectors, air transportation faces several challenges. Airport operational risk is one of the issues that the aviation sector must face. Airport operational risk is a hypothetical set of events that, if realized, may have a favourable or unfavourable impact on various areas, including the economy, health, public safety, and the environment. In other words, risk is a potential scenario or situation that may cause harm to the airport. (Anugrah Ramadhani & Rachmawati, 2021).

As a service provider and airport manager, under these conditions. Airport Operator Unit (UPBU) class 2 Ketapang not only needs to provide comfortable service to passengers but also needs to improve other airport operational support facilities, such as aircraft take-off and landing facilities, visual aids, operation buildings and be able to support smooth flight operations by Standard Operating Procedures (SOP), so that passengers are also satisfied with the services provided by the Airport Operator Unit (UPBU) class 2 Ketapang. To support and improve the quality of flight services, airports generate revenue from aeronautical and non-aeronautical revenues to meet operational needs. As one of the primary sources of airport revenue, Aircraft Passenger Services (PJP2U) comes from fees charged by airport managers to aeroplane passengers who use the airport concerned for their participation in services and use of airport facilities.

The aviation industry is not optimally operating because it is faced with the issue of climate change, in several countries in the world including Indonesia. (Septian, 2022). Increased global temperatures caused by climate change contribute to hydrometeorological disasters such as rising sea levels. Climate conditions significantly impact the aviation (air transportation) industry. For take-off and landing during flight the weather in flight is significant for pilots. Pilots will assess the weather conditions collected from the local meteorological agency, the departure airport along the route, or the

flight's destination airport whenever starting a flight regardless of how long or short the route is. The weather information collected at the departure airport, during flight, and after landing consists of weather-related factors such as wind, temperature, pressure, clouds, and visibility.

Climate change also affects the transportation industry, particularly air travel (aviation). The debate on how climate change will affect the aviation industry explains how it will affect aviation facilities, infrastructure and operations. Climate change has a direct impact on airport operations, especially in the form of extreme weather that has increased in both quality and quantity. High air temperatures, very low air temperatures, strong winds, heavy rain, and high humidity are examples of extreme weather that can directly affect aviation. Airports are located in coastal areas in several countries and Indonesia. These factors coastal erosion, flooding, and seawater intrusion make airport infrastructure particularly vulnerable to the impacts of sea level rise. (Purwanta, 2014). The environment hurts airport operations, one of which is the heat wave that often hits Ketapang (West Kalimantan) during the summer, affecting aircraft and disrupting flights. Several flights were cancelled due to the heat wave, which set temperature records and created catastrophic forest fires on 21 September 2019. Flooding due to rising sea levels occurred at Rahadi Oesman Airport in Ketapng in April 2011. When sea levels in coastal areas are pushed inland by storms, there is a rise in sea levels and high tides. Rahadi Oesman Airport was forced to stop operating because the runway was flooded due to the incident which had an impact on flight operations resulting in a decrease in the number of aircraft passengers and also had an impact on Aircraft Passenger Services (PJP2U) revenue which decreased. (Septian, 2022).

This research aims to evaluate environmental risks based on risk assessment analysis and implement effective risk management in supporting Rahadi Oesman airport operations. Thus, the main research question is how to effectively evaluate and manage environmental risks in the context of airport operations. This research has high relevance in the context of previous research as it makes a new contribution to the understanding and practice of environmental risk management in the aviation sector. By strengthening the integrated risk management approach, this research is expected to help improve airport operations' sustainability in the face of environmental challenges. The uniqueness of this research lies in its holistic and integrated risk management approach in managing environmental risks in the aviation sector. By combining risk assessment analysis and implementation of effective risk management practices, this research is expected to significantly contribute to addressing the environmental challenges faced by the aviation industry.

## Literature Review

### *Management*

Management is critical in running an organization effectively and efficiently towards achieving planned goals. Kotler & Keller (2018) explain that management involves planning, organizing, and controlling resources. The main functions in management include several key elements. First, planning is the first step in setting goals and the work path that will be followed. Second, organizing involves the division of tasks and responsibilities so that the process can be monitored appropriately. Third, Staffing involves the placement of human resources by the required tasks and qualifications. Fourth, directing involves guiding team members to carry out tasks according to the plan. Finally, Controlling is a thorough evaluation of the implementation of tasks to ensure that everything is going according to the plan that has been set. Organisations can achieve their goals effectively and efficiently by understanding and implementing these functions.

### *Risk*

Risk has a double meaning; it can be an opportunity with positive effects and a threat with adverse effects (Hillson, 2001). However, risk tends to be associated with negative impacts such as loss and harm (Frosdick, 1997). Risk is often thought of as the probability of an event that can cause a loss within a

certain period (Frosdick, 1997). Risk can also be measured quantitatively, with the formula Risk = Probability of Occurrence (Likelihood) x Impact (Risk Consequences), as defined by the Australian New Zealand Standard (AS/NZS) 4360:2004. The effect of a risk can be measured objectively through likelihood and consequence (risk impact) (Hidayat, Triatmodjo, & Utomo, 2022).

In airport operations, risks can be divided into several factors, including pilot/human factors, aircraft factors, environmental factors, and management factors (Abisay & Nurhadi, 2014). These risks can arise from the internal and external environment of the organization, with the potential for new hazards that have never occurred before (Hidayat, Triatmodjo, & Utomo, 2022). In dealing with these risks, management can take several approaches, such as reducing risks, transferring risks to other parties, mitigating risks, or embracing hazards (Dahlan, Leksono, & Fathoni, 2021). Risk management systematically increases company value and deals with organizational problems comprehensively (Hanafi, 2009). The risk management process includes the identification, measurement, and financial control of risks that threaten the company's assets and earnings (Smith, 1990). The definition of risk management according to ISO 31000 (2009) states that risk management is a coordinated activity to direct and control an organization in handling risk. Thus, risk management is essential in ensuring an organisation's operational continuity amid environmental uncertainty.

### *ISO 31000-based Risk Management*

ISO 31000-based Risk Management, outlined in an international standard codified by the International Organization for Standardization (ISO), offers generic principles and guidelines for effectively managing risk. The standard can be applied by organizations, including public, private, non-profit companies, groups, and individuals, without being tied to a specific industry or sector (ISO, 31000). Despite its generic nature, the application of this standard can be tailored to each organisation's unique needs, including different goals, contexts, structures, products, services, projects, and operational processes (ISO, 31000). In ISO 31000, "risk management" and "risk processing" are two main terms. "Risk management" refers to the general architecture that includes principles, frameworks, and processes for managing risk, while "risk processing" emphasizes how the architecture is applied to specific risks (ISO, 31000). The ISO 31000-based risk management process involves several critical stages.

First, establishing the general context involves defining the internal and external parameters that will affect the organization's risk management. The external context includes the political, economic, social, cultural, legal, financial, technological, and natural environments, as well as the perceptions and values of external stakeholders (Susilo & Kaho, 2010). The internal context includes organizational capabilities, information systems, policies, values, and culture (Susilo & Kaho, 2017). Second, establish risk criteria that include standards for measuring the impact and likelihood of risks. This is important for prioritizing the risks to be addressed and determining appropriate actions. This process also involves recognizing, analyzing, evaluating, and handling risks, including risk sharing, reducing likelihood or consequences, avoiding risks, or accepting risks (Susilo & Kaho, 2017). Third, conduct periodic monitoring and review of the risk management process that has been carried out. This monitoring and review help the organization evaluate the effectiveness of the actions that have been taken and ensure that risk management continues to be improved as needed (Susilo & Kaho, 2017). Finally, record the risk management process that has been carried out, including records regarding risk identification, analysis, evaluation, actions taken, and results. This allows the organization to learn from past experiences and make necessary improvements in future risk management (Susilo & Kaho, 2017). By applying this approach, organizations can manage risks more effectively and proactively, thereby better achieving their goals and facing environmental uncertainties with more confidence (ISO, 31000).

### *Environmental Risks*

Environmental Risk, particularly about commercial aviation, is an essential concern in the context

of environmental protection and sustainability of the aviation industry. As an integral part of the global economic infrastructure, commercial aviation contributes significantly to greenhouse gas emissions, which are one of the causes of global warming. Although technological advances have resulted in more efficient aircraft, such efficiency improvements have not been enough to stop the overall upward trend in CO2 emissions (Slotnick et al., 2014). A recent analysis estimated that commercial aviation will be responsible for approximately 1.5 billion tons of CO2 emissions per year by 2025, indicating a significant challenge in reducing the sector's environmental impact.

Adaptation to climate change is also a primary focus, especially in countries like Indonesia that are vulnerable to climate change impacts, such as sea level rise. The aviation industry is at risk of facing flight schedule disruptions, airport infrastructure damage, increased flight security, and navigation disruptions due to climate change affecting weather conditions and the operational environment (Purwanta, 2014). Environmental risks are not only limited to physical aspects, but also include financial aspects, such as a company's inability to effectively manage environmental resources, which can result in financial losses. Environmental uncertainty is seen as a significant risk factor in business operations. The focus on the industrial environment and sustainability is becoming increasingly important, with pressure from markets and governments to reduce negative environmental impacts. Understanding the macro and micro business environment is critical to effectively managing environmental risks. Environmental uncertainty can affect company performance, especially in terms of how fast and how dynamic the environment changes (Nuzula, Damayanti, & Sulasmiyati, 2019; Tjahjadi, 2011). In this context, environmental risk management becomes essential in ensuring the sustainability and resilience of the company to ongoing environmental changes.

## Research Method

This research employs an evaluation case study research strategy to address the challenge of disclosing environmental risks associated with airport operations. Through a qualitative approach, we utilized specialized data analysis techniques to dig deeper into the environmental concerns of airport operations. We assembled information to understand the airport's readiness to manage such risks using various data sources, such as literature review, in-person interviews with relevant parties, and on-the-ground observations. Two 52 airport employees, including the airport chief, were interviewed directly to gain deeper insights. Systematic observations were also made to understand the components of airport operational risk. After data collection, analysis was conducted by identifying issues, categorizing data, and evaluating findings to develop recommendations and risk reduction strategies. Throughout the research process, we are committed to ensuring the objectivity and credibility of our present results.

## Result and Discussion

### *Identification of Operational Risks Related to the Environment*

Risk is uncertainty with poor outcomes. Rahadi Oesman Airport defines risk as the possibility of an event occurring that will have an unfavorable impact on the objectives set in the objectives, strategies, targets, and planned activity results. (Abisay & Nurhadi, 2014) Uncertainty in business operations can arise from the organisation's internal and external environment. Risk and business are as inseparable as the two sides of a coin. Risk includes several features, including the tendency to reappear frequently, the possibility of unprecedented new hazards, and the interdependence of some risks with other risks. Identification with the help of RBS and fishbone tools can be done well if combined with appropriate and structured questions. ISO 31000 has standard questions that can be used in risk identification interviews: Identifying the source of airport risks, the impact of risks on airport operations, the controls that have been implemented, evaluating the risks that have occurred, and planning and controlling the implementation of airport operations.

***Identify the Source of Airport Risks***

In an interview conducted by Hamir, S.Mn. as Head of the Engineering, Operations, Security and Emergency Services Section, he stated that one of the indications of a safety management system to determine the likelihood of occurrence and the level of risk of an event is hazard identification and safety risk management. Risks in operational activities are: Weather that often turns bad; Distance between two aircraft that exceeds the minimum limit (Redu ced Separation Minimum); Foreign objects that have the potential to cause damage to aircraft (Foreign Object Damage); Security issues (security Issues); Wild life in the airport area (Wild life). By interviewing the airport chief and conducting focused conversations on the best way to identify risks in airport operations. 4 risk factors; pilot/human, aircraft, environmental, and management factors can be used to classify these sources of risk. (Hidayat et al., 2022). Dividing the risks that often occur in the environment that affect airport operations as follows (Purwanta, 2014): Wind, Temperature, Pressure, Visibility, Cloud Type. While based on height, there are 3 types of clouds: low, medium, and high. Low cloud types include Cumolonimbus (cb) and Towering Cumulus clouds (Tcu) but generally Cb clouds. This cloud information is required before landing and take-off.

***Risk Impact on Airport Operations***

In an interview conducted by Hamir, S.Mn. as Head of the Engineering, Operations, Security and Emergency Services Section, he stated that the existing risks can cause disruption to the Flight Schedule in the form of experiencing delays or cancellations or even worse can cause accidents / accidents if they continue to carry out flights.

***Controls That Have Been Performed Airport Activities***

In interviews conducted by Hamir, S.Mn. as Head of the Engineering, Operations, Security and Emergency Services Section, he stated that for our equipment, we carry out periodic maintenance and replace spare parts that are not suitable for use with new ones, then carry out certification and calibration of all equipment used. Controls can be carried out on humans / officers by providing training and education to personnel / officers and making a task schedule that is by the workload so that fatigue does not occur. As for natural factors, we always coordinate with related parties, namely the Meteorology and Geophysics Agency (BMG) regarding the current weather conditions and the next day's weather forecast. The controls that have been carried out are:

- Communication and consultation: Communication is used to share information regarding the current airside conditions and handling preparations that will be carried out in the event of a risk, event, or accident.
- Check for hazards, i.e. At this point, risk identification is carried out, in particular by inspecting the area near and on the runway surface for foreign object debris (FOD), piles of rubber or aircraft tires, rubber deposits, or other hazards that could damage aircraft, equipment, or even injure staff and passengers.
- Risk control is the pre-design stage of risk control that involves execution. Controls are used to foresee future hazards and minimize, reduce, or even eliminate current risks.
- Risk management efforts are carried out through risk management. This handling requires several related units to coordinate and work together to reduce risks, such as instructing the Aircraft Accident Management and Fire Fighting Unit (PKP-PK) to be alert or standby in the runway area if the Task Force issues a "Standby" status. Status, providing facilities for passengers who experience delays, compiling a chronology if there is an incident and requesting additional clarification, cleaning the area after the incident, and so on.

- Monitoring and review i.e. To ensure that the efforts made to produce the best results and by the objectives, as well as to improve the quality and effectiveness of the processes created, monitoring and reviewing risk processes are carried out.
- Records and reports communicate the overall results of the risk management process to stakeholders as additional information for decision-making, improve risk management activities, facilitate interaction with responsible parties, and assist risk management communication. They are assessed during the risk management stage, and suggestions are made to improve the quality of the risk management process itself.

***Evaluate Risks that Have Occurred***

In an interview conducted by Sapruddin, S.Sos. as Coconut Section of Airport Services and Cooperation stated that these risks can occur mainly in the air side area or the movement area of the Apron (Aircraft parking lot), taxiway (connecting runway between the runway and Aircraft Parking Lot), building and runway and aircraft. This hazard can present itself mainly in airside areas or movement areas of buildings, aprons, taxiways, runways and aircraft.

***Planning and Controlling the Implementation of Airport Operations***

In an interview conducted by Sapruddin, S.Sos. as the Coconut of the Airport Services and Cooperation Section, it was stated that ineffective control was due to some officers who lacked discipline and did not know the SOP of the activities they carried out, as well as a decrease in the cost of maintaining the facilities/vehicles used, often blamed for the lack of effective control. Less effective control is often caused by officers not knowing the SOP of the tasks they are carrying out, as well as reduced maintenance costs for the vehicles/facilities used. This must be followed up immediately by planning and controlling the operation of the airport, namely airport officers are expected to be disciplined and understand the SOPs that have been applied, in order to realize an environmentally friendly airport by continuing to strive to minimize the impact of environmental pollution due to airport operations.

***Implementation of Eco airport-based Airport Operations***

In interviews conducted by Sapruddin, S.Sos. as Kelapa Section of Airport Services and Cooperation argued that currently Rahadi Oesman Airport is included in the city area, the rapid development of the city of Ketapang causes around the airport to be filled by Perumaan and residential areas. With these conditions, Rahadi Oesman airport is impossible to develop again. This can be done only by optimizing the use of available land. Goegraphically Rahadi Oesman Airport is located near the coast, so the weather changes very quickly, deteriorating and sunny. The way to handle such weather conditions is to continue to coordinate with BMG to determine flight schedules.

In interviews conducted by Hamir, S.Mn. as Head of the Engineering, Operations, Security and Emergency Services Section stated that the Application of Eco Airport at Rahadi Oesman Airport, basically Rahadi Oesman Airport wants to implement a system oriented to the eco airport system maximally. However, currently there are only a few that can be applied. Supporting Facilities for implementing Eco Airport at Rahadi Oesman are: Installing lights equipped with motion sensors; Installing translucent glass; Installing water-saving toilet equipment; Using ground handling equipment that does not emit gas emissions.

Efforts to implement Eco Airport at Rahadi Oesman, namely there are several efforts to realize eco airport at Rahadi Oesman Airport, namely by reducing the use of air-side vehicles that use engines, saving water and lights. Reducing water use is applied in the toilet with a dry toilet system by installing several water-saving-based toilet utiliytas. As for lighting by making an open room that can absorb maximum light so that the use of lights during the day is not needed. For groung handling activities, considering the short distance of transportation, it is enough to use a wheelbarrow using human labor.

In interviews conducted by Budiman as Coconut Processing of Cooperation Materials and

Business Development of Airport Services, it was stated that the operational activities carried out by Rahadi Oesman Airport were by the SOPs that had been applied at the airport, namely: Pre flight service; In flight service, Post flight service. According to keke yulianti and primadi candra susanto (2019) regarding airport operational activities, namely:

- *Pre flight service*

  Handling activities for passengers and aircraft before departure (at the airport / origin station), namely After being confirmed to have a ticket, departing passengers proceed to the check-in counter room to register themselves, as evidenced by the issuance of a boarding pass. In addition, passengers who already have a boarding pass pass pass through the passenger checkpoint (also called the security check point) to enter the departure waiting room. waiting for the call to board the plane before boarding.
- *In flight service*

  Service activities for passengers while on the plane: The flight attendant instructs passengers to sit according to the seat number given by the boarding pass when they board the plane. The compartment above the passenger's head is where the passenger puts their luggage. Wearing a seat belt is required at all times during the flight, especially during takeoff and landing. Meals will be served to passengers in the full-service category, but no drinks or meals will be offered to passengers in the minimal frills category.
- *Post flight service*

  Handling activities for passengers, cargo, and aircraft after flight or arrival (at the destination airport) i.e. when passengers disembark from the aircraft at their final destination, officers direct them to the arrival lounge where they can collect their baggage. Travellers can leave the arrival hall and proceed to the lobby changing area for the next flight after verifying that the baggage number matches the identification belonging to the same passenger. Moreover, all cargo is sent to the cargo warehouse for inspection while waiting for the owner to pick up the cargo.

***Discussion***

Hazard identification and safety risk management. Risks in operational activities are: Weather that often turns bad; Distance of two aircraft that exceeds the minimum limit (Redu ced Separation Minimum); Foreign objects that have the potential to cause damage to aircraft (Foreign Object Damage); Security issues (security Issues); Wild life in the airport area (Wild life). the existing risks can disrupt the Flight Schedule by experiencing delays or cancellations or even worse can cause accidents / accidents if they continue to carry out flights.

Climate change also affects the transportation industry, particularly air travel (aviation). The debate on how climate change will affect the aviation industry explains how it will affect aviation facilities, infrastructure and operations. Climate change has a direct impact on airport operations, especially in the form of extreme weather that has increased in both quality and quantity. High temperatures, very low temperatures, strong winds, heavy rain and high humidity are extreme weather that can directly affect aviation. Airports are located in coastal areas in several countries and Indonesia. These factors coastal erosion, flooding, and seawater intrusion make airport infrastructure particularly vulnerable to the impacts of sea level rise. (Purwanta, 2014).

Controls can be carried out on humans / officers by providing training and education to personnel / officers and making a task schedule that is in accordance with the workload so that fatigue does not occur. As for natural factors, they always coordinate with related parties, namely the Meteorology and Geophysics Agency (BMG) regarding the current weather conditions and the next day's weather forecast. As for the controls that have been carried out, namely: Communication and consultation; Checking how dangerous; Risk control; Risk handling; Monitoring and review; Records and reports are assessed during the risk management stage, and suggestions are made to improve the quality of the risk management

process itself.

According to (Anugrah Ramadhani & Rachmawati, 2021) The scientific method of risk management involves estimating potential losses and implementing measures that can reduce those losses or associated financial losses. The definition of risk management is a rational and systematic strategy for finding, assessing, deciding on solutions, and monitoring and reporting risks that occur in any activity or process. Similar to other industrial sectors, air transportation faces several challenges. Airport operational risk is one of the issues that the aviation sector must face. Airport operational risk is a hypothetical set of events that, if realized, may have a favorable or unfavorable impact on various areas, including the economy, health, public safety, and the environment. In other words, risk is a potential scenario or situation that may cause harm.

## Conclusion

Research findings show that environmental risk in Rahadi Oesman airport operations is a significant challenge affecting flight schedules. Factors such as bad weather, non-standard aircraft spacing, foreign objects, security, and the presence of wildlife around the airport can cause flight delays, cancellations, and even accidents if not handled properly. Environmental risk management at the airport has been done by reducing vehicles with engines around the airstrip, saving water and lights, and using human labour for ground handling activities. Control strategies involve training and educating airport staff to avoid fatigue and coordinating with BMG regarding weather conditions. Suggestions include improving environmental risk control strategies, giving reprimands to employees who violate SOPs, and increasing the use of questionnaires as a data analysis tool for future research.

This research makes an essential contribution to both science and practice. The research findings reveal the importance of environmental risk management in airport operations to maintain smooth flights and passenger safety. In addition, the emphasis on risk control strategies and strict implementation of SOPs add value to risk management practices in the aviation industry. Focusing on Rahadi Oesman airport, this research provides valuable insights for other airports facing similar challenges. The originality of this research lies in the evaluative case study approach that provides an in-depth understanding of a specific situation in the context of environmental risks at the airport.

While providing valuable insights, this study has some limitations that need to be noted. These limitations include the limited number of respondents interviewed and observations made, so the results may not cover the full spectrum of responses from all parties involved. In addition, using questionnaires as a data analysis tool still needs to be further developed to gain a more comprehensive understanding of the issues at hand. Future research agendas may include follow-up studies involving more respondents and the development of more sophisticated analysis methods. Thus, future research can provide deeper insights and more effective solutions in managing airport environmental risks.

## Reference

Abisay, T. G., & Nurhadi. (2014). Manajemen Risiko Pada Bandara Soekarno Hatta Berbasis ISO 31000. *Jurnal Teknik Industri*, *14*(2), 116–130. https://doi.org/10.22219/jtiumm.vol14.no2.116-130

Anindita. (2019). Pengaturan Penerimaan Negara Bukan Pajak Sebagai Wadah Perlindungan Hukum Keuangan Negara. *Widya Pranata Hukum : Jurnal Kajian Dan Penelitian Hukum*, *1*(1), 19–35. https://doi.org/10.37631/widyapranata.v1i1.254

Anugrah Ramadhani, D., & Rachmawati, D. (2021). Analisis Implementasi Manajemen Risiko Operasional Runway Pt Angkasa Pura I Bandar Udara Internasional Juanda Surabaya Jawa Timur. *Jurnal Flight Attendant Kedirgantaraan*, *4*(1), 132–138. https://doi.org/10.56521/attendant-dirgantara.v4i1.544

Creswell, J. W., & Creswell, J. D. (2013). Research Design Qualitative, Quantitative, and Mixed Methods Approaches. In david c. Felts (Ed.), *Paper Knowledge . Toward a Media History of Documents* (Fisth Edit).

Dahlan, A., Leksono, E. B., & Fathoni, M. Z. (2021). Identifikasi Dan Analisis Risiko Operasional Pada Divisi Produksi Perusahaan Vulkanisir Ban Menggunakan Metode Risk Management Dengan Pendekatan Fmea Dan Fta. *JUSTI (Jurnal Sistem Dan Teknik Industri)*, *2*(1), 44. https://doi.org/10.30587/justicb.v2i1.3183

Hidayat, R. W., Triatmodjo, B., & Utomo, S. H. T. (2022). *Penilaian Risiko (Risk Assessment) Pengoperasian Pesawat Udara Apung (Seaplane) Di Bandara Udara Perairan*. *27*(2).

Indriatmoko, R. H., & Purwanta, W. (2017). Perubahan Lingkungan dan Strategi Adaptasi Dampak Perubahan iklim di Bandar Udara Hasanuddin , Makassar. *Jurnal Teknologi Lingkungan*, *18*(1), 80–87.

Jessica, S., & Ilfandi, A. (2018). Aktivitas Public Relations Angkasa Pura II dalam Menangani Pemberitaan Negatif Terminal 3 Bandara Soekarno-Hatta. *Jurnal Ilmiah Ilmu Hubungan Masyarakat (Profesi Humas)*, *2*(2), 119–135.

Kotler, Philip dan Keller, Kevin Lane. 2018. Manajemen Pemasaran. Edisi 12. Jilid 2. Jakarta: PT Indeks.

M.Si, D. S. S. E. (2022). No Title. In *Bandara Udara Enclave Civil Berbasis Pembangunan Berkelanjutan*. malang.

Mahardika, A. G. (2022). Implikasi Penghapusan Strict Liability Dalam Undang-Undang Cipta Kerja Terhadap Lingkungan Hidup Di Era Sustainable Development Goals. *Jurnal Hukum Dan Perundang-Undangan*, *2*(1). Retrieved from https://www.who.int/news-room/fact-sheets/detail/autism-spectrum-disorders

Muliasari, A. (2010). *Identifikasi Bahaya Dan Manajemen Resiko Sebagai Implementasi Safety Management System Di Bandar Udara Domine Eduard Osok*. *22*(10), 1003–1011.

Nahar, F. (2013). Analisa Perbandingan Penerapan Airport Sustainability di Bandar Udara Internasional Soekarno Hatta dan Bandar Udara Internasional Schiphol. *Perhubungan Udara*, *39*(4), 281–293.

Nuzula, N. F., Damayanti, C. R., & Sulasmiyati, S. (2019). Pengaruh Environmental Risk Terhadap Kinerja Keuangan Perusahaan ( Studi Pada Perusahaan- Perusahaan Di Indonesia, Singapura, Malaysia, Thailandm Filipina Dan Vietnam). *Jurnal Profit*, *13*(2), 12–22.

Purwanta, W. (2014). *Analisis Resiko Dan Peluang Dalam Penyusunan Rencana Adaptasi Perubahan Iklim Kasus: Sektor Transportasi Udara*. *15*(2).

Raffah, A. M. (2021). Analisis Penerapan Konsep Eco Green Airport Dalam Menangani Pencemaran Air Limbah Di Bandara Internasional Husein Sastranegara Bandung. *Manners*, *4*(1), 11–28.

Resky, M., & Simarmata, J. (2014). Fungsi Dan Kelemahan Unit Operasi Pelayanan Di Bandara. *Jurnal Manajemen Bisnis Transportasi Dan Logistik*, *1*(1), 224–232.

Septian, A. D. (2022). Analisis Pengaruh Pendapatan Pelayanan Jasa Penumpang Pesawat Udara ( Pjp2U ) Pada Masa Pandemi Covid-19 Terhadap Operasional Bandara Udara Kalimarau Berau. *Jurnal Ground Handling Dirgantara*, *4*(2), 253–260.

Slotnick, J. P., Khodadoust, A., Alonso, J. J., Darmofal, D. L., Gropp, W. D., Lurie, E. A., … Venkatakrishnan, V. (2014). Enabling the environmentally clean air transportation of the future: A vision of computational fluid dynamics in 2030. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *372*(2022). https://doi.org/10.1098/rsta.2013.0317

Sutikno, S., Kurniawan, Y., Hartono, D. D., & Purba, H. H. (2021). Identifikasi Risiko Keselamatan Pada Proyek Konstruksi: Kajian Literatur. *Jurnal Teknologi Dan Manajemen*, *19*(2), 13–22. https://doi.org/10.52330/jtm.v19i2.28

Susilo, L. J. & Kaho, V. R. (2017). *Manajemen Risiko Berbasis ISO 31000.* Jakarta pusat: PPM.

Susilo, L. J. & Kaho, V. R. (2019). *Manajemen Risiko Berbasis ISO 31000:2018.* Jakarta: PT Grasindo.

Tampubolon, Dr. Manahan P., 2004, *Manajemen Operasional* (*Operation Management*), Ghalia Indonesia, Jakarta.

Tjahjadi, B. (2011). *Hubungan Sistem Manajemen Risiko Dengan Ketidakpastian Lingkungan Dan Strategi Serta Dampaknya Terhadap Kinerja Organisasi*. *21*(2), 142–154.

Yulita, S., Sandhyavitri, A., & Malik, A. (2017). Evaluasi Risiko Keterlambatan Pekerjaan Pembangunan Apron Baru Bandara Sultan Syarif Kasim II, Pekanbaru. *Jom FTEKNIK Volume*, *4*(2).