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**PROJECT MANAGEMENT**

**MGMT-6062- (01)-24W – Project Risk and Quality**

**Assignment 2 – Module 7**

ADELAIDE STREET NORTH UNDERPASS

RISK & OPPORTUNITY MANAGEMENT PLAN

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# 1. Introduction

In London, Ontario, a significant infrastructure initiative known as the Adelaide Underpass project stands as a cornerstone in efforts to enhance the efficiency and safety of city transportation. With urbanization on the rise and vehicle traffic increasing, strategic infrastructure development has become imperative for sustaining urban mobility.

The Adelaide Underpass project targets the intersection of Adelaide Street and the main thoroughfare, envisioning the construction of an underpass to mitigate traffic congestion and optimize traffic flow. This initiative aligns closely with the city's enduring objectives of bolstering transportation infrastructure and fostering urban development. The goal of the city of Adelaide Underpass project is to alleviate the urgent problems caused by London, Ontario's increasing urbanization and traffic. The project aims to improve the overall efficiency of transportation networks by reducing congestion at the Adelaide Street intersection by building an underpass. Furthermore, the initiative aligns with the city's long-term goal of encouraging sustainable urban growth.

The primary aim of the Adelaide Underpass project is to alleviate traffic congestion and enhance the flow of vehicles and pedestrians at the critical junction of Adelaide Street. By implementing a comprehensive underpass infrastructure, the project endeavors to streamline transportation routes and improve accessibility to surrounding areas. This initiative underscores the city's commitment to enhancing the quality of urban life and facilitating seamless mobility for its residents.

An important strategic investment in London's infrastructure, the Adelaide Underpass project is a response to the growing demands of urbanization and transportation. The project's objective is to establish a more sustainable and effective urban environment by proactively addressing traffic congestion and improving traffic flow. Stakeholders in London, Ontario want to reap the long-term advantages of better urban development and transportation infrastructure through coordinated efforts and strategic planning.

***Background Information***

London, Ontario, is a vibrant city that is seeing tremendous population and economic growth. But with this expansion also comes the urgent problem of traffic congestion, which is especially noticeable at major thoroughfares and intersections. The Adelaide Street intersection has become a major bottleneck that hinders the smooth movement of pedestrians and vehicles.

To mitigate traffic congestion and improve connectivity, the Adelaide Underpass project was started by the municipal authorities as a strategic response to these issues. The primary goal of this project is to build a car underpass under Adelaide Street in order to improve accessibility to nearby areas and enable more efficient traffic flow.

London, Ontario's vibrant urban centre is experiencing rapid economic and population growth, but this development also presents some difficulties, most notably with regard to traffic congestion, especially at busy crossroads and thoroughfares. One significant bottleneck that is causing delays and disruptions for both cars and pedestrians is the Adelaide Street intersection.

City officials have presented the Adelaide Underpass project as a focused intervention to reduce traffic congestion and improve connectivity in order to address these problems head-on. One of the main features of this project is the building of a car underpass under Adelaide Street, which is intended to improve accessibility to nearby locations and improve traffic flow.

***Purpose of the Risk & Opportunity Management Plan***

London, Ontario's vibrant urban centre is experiencing rapid economic and population growth, but this development also presents some difficulties, most notably with regards to traffic congestion, especially at busy crossroads and thoroughfares. One significant bottleneck that is causing delays and disruptions for both cars and pedestrians is the Adelaide Street intersection.

City officials have presented the Adelaide Underpass project as a focused intervention to reduce traffic congestion and improve connectivity in order to address these problems head-on. One of the main features of this project is the building of a car underpass under Adelaide Street, which is intended to improve accessibility to nearby locations and improve traffic flow. The bustling urban core of London, Ontario, is undergoing significant economic and demographic growth, yet this progress brings forth notable challenges, notably in traffic congestion, particularly at critical intersections and thoroughfares. The Adelaide Street intersection, in particular, has been singled out as a major bottleneck, causing delays and disruptions for both motorists and pedestrians.

To tackle these issues head-on, city officials have introduced the Adelaide Underpass project as a targeted intervention to mitigate traffic congestion and enhance connectivity. A key component of this initiative involves the construction of a vehicle underpass beneath Adelaide Street, envisioned to streamline traffic flow and bolster accessibility to surrounding locales.

# 2. Methodology

## 2.1. Risk Identification Methodology

Risk identification serves as the initial step in the risk management process, aiming to systematically uncover potential threats and opportunities that may impact project objectives (Project Management Institute [PMI], 2017). Various techniques are employed to ensure a comprehensive assessment of risks.

***Brainstorming sessions*:** These sessions bring together stakeholders and project team members to generate ideas and insights regarding potential risks and opportunities.

***Checklists:*** Utilizing predefined lists of common risks and historical data helps ensure that no critical risks are overlooked.

***Interviews:*** Engaging with subject matter experts and key stakeholders allows for the identification of risks specific to their domains or perspectives.

***Expert judgment:*** Relying on the expertise and insights of experienced professionals can provide valuable input into identifying both common and unique risks.

## 2.2. Risk Analysis Methodology

Once risks are identified, the next step involves analyzing them to understand their potential impact on project objectives (Project Management Institute [PMI], 2017). This analysis helps prioritize risks and allocate resources effectively.

***Qualitative analysis:*** Qualitative techniques, such as probability-impact matrices and risk registers, provide a subjective assessment of risks based on their likelihood and potential consequences.

***Quantitative analysis:*** Quantitative techniques, including statistical modeling and simulation, assign numerical values to risks, allowing for a more precise assessment of their impact on project outcomes.

***Sensitivity analysis:*** This technique examines how changes in one variable (e.g., project cost, schedule) affect project risks and outcomes, helping identify critical areas of vulnerability.

***Data-driven approaches:*** Leveraging historical data and empirical evidence enables informed decision-making regarding risk assessment and prioritization.

## 2.3. Risk Response Planning Methodology

As a crucial step in the larger risk management process, risk response planning seeks to minimize possible risks and seize opportunities that could affect project goals. According to the Project Management Institute (PMI, 2017), this methodology entails the methodical creation of strategies that are suited to address opportunities and risks that have been identified while also being in line with the overall objectives of the project.

The nature and characteristics of the risks that were identified in the earlier stages of risk management must be thoroughly understood in order to plan a risk response. Through the application of risk probability, impact, and urgency classification, project teams are able to efficiently allocate their response resources.

Risk mitigation is a key tactic in risk response planning that entails taking proactive steps to lessen the possibility or impact of hazards that have been identified. To reduce the possible detrimental effects on project outcomes, this can mean putting in place safeguards, redundancies, or alternative strategies. For example, actions like putting advanced safety procedures into place or regularly inspecting building supplies could lessen the chance of delays or mishaps in the context of the Adelaide Underpass project.

Another important tactic is risk avoidance, which entails completely avoiding any potential risks by using different methods or avoiding dangerous situations. For instance, the project team may decide to look into alternate routes in order to reduce the risk of construction delays or unstable ground conditions along the proposed underpass route, as indicated by geological surveys.

Furthermore, risk transfer entails shifting accountability and liability for particular risks to outside parties via agreements, insurance plans, or outsourcing arrangements. With this approach, project teams can reduce the risks they face while making sure that sufficient safeguards are in place to deal with unforeseen difficulties.

The project team may choose to accept a risk when the expense of mitigating it outweighs the potential impact. In this scenario, the risk is acknowledged and resources are allocated to effectively manage any resulting effects. Lastly, risk enhancement tactics aim to maximize possible gains for the project and stakeholders by seizing opportunities found during risk analysis.

Essentially, the Adelaide Underpass project can effectively navigate uncertainties, improve resilience, and optimize outcomes in accordance with established project management principles by methodically implementing these risk response strategies. Project teams can successfully realize project objectives by minimizing potential threats and capturing opportunities through proactive planning and decisive action.



**Fig1: Risk planning flow chart**

## 2.4. Risk Monitoring and Control Methodology

Risk monitoring and control represent critical components of effective risk management, ensuring that identified risks are actively tracked and managed throughout the project lifecycle. As highlighted by the Project Management Institute (PMI, 2017), this methodology involves the establishment of robust mechanisms for overseeing risk exposure, implementing timely interventions, and maintaining alignment with project objectives.

At the core of risk monitoring and control is the establishment of clear thresholds for risk triggers, delineating the point at which a risk becomes actionable and requires intervention. These thresholds serve as early warning indicators, enabling project teams to proactively identify and address emerging risks before they escalate into significant issues. For instance, if the cost of materials exceeds a predetermined threshold, it may signal the need to reevaluate procurement strategies or adjust project budgets accordingly.

Regular reviews are instrumental in the risk monitoring and control process, providing opportunities to assess the status of identified risks, evaluate the effectiveness of existing mitigation measures, and identify new risks that may have emerged. These reviews may be conducted at predefined intervals or triggered by specific project milestones, allowing project teams to maintain a proactive stance in addressing evolving risk profiles.

In addition to proactive risk monitoring, effective risk control involves implementing corrective actions in response to identified risks or changes in risk exposure. This may entail reallocating resources, revising project timelines, or revisiting risk response strategies to ensure their continued relevance and effectiveness. By promptly addressing deviations from planned risk mitigation efforts, project teams can mitigate the potential impact of risks on project outcomes and minimize disruptions to project progress.

Furthermore, risk monitoring and control activities should be integrated seamlessly into the broader project management framework, facilitating ongoing communication and collaboration among stakeholders. This ensures that risk management remains a dynamic and responsive process, capable of adapting to evolving project dynamics and external influences.

In summary, risk monitoring and control methodology provide the necessary structure and discipline to effectively manage risks throughout the project lifecycle. By establishing clear thresholds, conducting regular reviews, and implementing timely corrective actions, project teams can mitigate potential threats, capitalize on opportunities, and safeguard the successful delivery of project objectives.

## 2.5. Documentation and Reporting

The fundamental components of risk management methodology are documentation and reporting, which offer an organized framework for gathering, evaluating, and disseminating risk-related data over the course of a project. The Project Management Institute (PMI, 2017) has highlighted that efficient documentation and reporting systems are essential for promoting accountability among project stakeholders, improving transparency, and enabling well-informed decision-making.

The creation of thorough risk registers, which act as repositories for cataloguing and classifying identified risks, their potential impacts, and related mitigation strategies, is essential to the documentation process. Project teams can systematically track and monitor risk exposure with the help of these registers, which give them a centralized source of information for proactive risk management interventions when needed. Keeping risk registers current gives project stakeholders’ important insights into how the risk environment is changing, enabling them to foresee and effectively address new threats and opportunities.

Additionally, documentation includes creating risk reports, which are essential communication tools that project sponsors, steering committees, and other important stakeholders use to learn about risk-related trends, insights, and mitigation initiatives. These reports usually contain recommendations for risk prioritization and resource allocation, as well as summaries of risk assessments and status updates on risk response plans. Risk reports enable collaborative efforts to address risk challenges and capitalize on opportunities by fostering constructive dialogue among project stakeholders and facilitating informed decision-making through the clear and concise presentation of risk information.

Documentation includes risk registers, reports, and the creation of risk response plans, which provide proactive approaches to managing risks that are found and in line with project goals. These plans ensure a coordinated and uniform approach to risk mitigation across project teams by outlining roles, responsibilities, and escalation procedures for managing risk events. The formalization of risk response strategies in documented plans can facilitate decision-making, improve accountability, and lessen the possible impact of unfavourable events on project outcomes for project stakeholders.

## 2.6. Continuous Improvement

Continuous improvement entails leveraging insights from past endeavors to refine and enhance risk management processes over time (Project Management Institute [PMI], 2017). By capturing lessons learned and establishing feedback loops, project teams can iteratively optimize their approach to risk management, adapting to evolving project dynamics (Kerzner, 2017).

To summarize, the Risk & Opportunity Management Methodology offers a systematic framework for identifying, analyzing, responding to, monitoring, and controlling risks and opportunities throughout the project lifecycle. This structured approach empowers project teams to proactively navigate uncertainties and leverage favorable conditions to achieve project objectives effectively.

# 3. Roles & Responsibilities

**Role**: Committed individuals or a group in charge of overseeing particular facets of the risk management procedure.

**Responsibilities:**

* Conducting detailed risk identification exercises using various techniques and tools.
* Analyzing identified risks to assess their potential impact on project objectives.
* Developing comprehensive risk response plans tailored to address specific risks and opportunities.
* Facilitating decision-making processes and providing stakeholders with information pertaining to risks.
* Communicating risk-related information to stakeholders and facilitating decision-making processes.

**Clarification of Responsibilities**

For any project to be successful, roles and responsibilities must be clearly defined within a risk management framework. By outlining roles and responsibilities clearly, you can maximize the effectiveness of risk management initiatives throughout the course of a project, ensure accountability, and foster teamwork.

* **Lead**: The Lead plays a crucial part in supervising the application of risk management techniques. They are in charge of making sure that the activities related to risk management are smoothly incorporated into the larger project management procedure. To address recognized risks, this entails defining procedures, establishing priorities, and allocating resources. In order to ensure alignment with project objectives and timelines, the Lead acts as the main point of contact for organizing risk management activities and communicating with stakeholders
* **Support:** Support team members are essential in helping the Lead carry out risk management responsibilities successfully. By utilizing their knowledge and experience, they provide insightful advice, direction, and support in managing intricate risk situations. The support staff works closely with the lead to pinpoint new risks, assess their possible consequences, and create effective countermeasures. The support team improves the overall robustness and resilience of the risk management process by utilizing collective knowledge and perspectives.
* **Risk Management Team Members:** These people or groups have specific responsibilities related to risk management, such as identification, analysis, response planning, monitoring, and control. Each team member contributes specific expertise and subject-matter knowledge to their areas of concentration, helping to fully evaluate and reduce project risks. Their close collaboration with stakeholders and other team members guarantees that risk management endeavours are congruent with project objectives and regulatory mandates.

In essence, effective collaboration, proactive problem-solving, and opportunistic thinking are essential for successfully completing a project. By clarifying roles and responsibilities, stakeholders can streamline communication channels, optimize resource allocation, and foster a culture of accountability and transparency. This enables project teams to navigate uncertainties, capitalize on opportunities, and deliver successful outcomes in line with stakeholder expectations.

# 4. Budgeting

1. ***Budget for Risk & Opportunity Management***

**Allocation:** The project's overall budget plan should include a clear definition of the budget for risk and opportunity management. It includes all of the materials needed for risk analysis, identification, planning of the appropriate course of action, and monitoring and control.

**Determinants:** Usually, the amount of money allotted for risk management is determined by the complexity, size, duration, industry standards, and organizational policies of the project.

**Stakeholder Involvement:** To decide on the proper budget for risk management initiatives, project managers, sponsors, and risk management teams work together as stakeholders.

1. ***Protocol for Deriving Contingency and Management Reserves***

**Contingency Reserves:** Contingency reserves are funds set aside to address identified risks that may impact the project's objectives. The protocol for deriving contingency reserves involves:

* carrying out a thorough risk analysis to evaluate the possibility and possible impact of hazards that are identified.
* estimating each risk's cost and schedule impact using both quantitative and qualitative methods, then adding them together to get the total amount of contingency.
* computing the contingency reserve by applying a predefined contingency percentage or by utilizing particular risk-based models.

**Management Reserves**: Management reserves are additional funds held by project sponsors or management to address unforeseen risks or opportunities that are not included in the project's contingency reserves. The protocol for deriving management reserves involves:

* Determining the right amount of management reserves involves taking into account various factors, including market conditions, stakeholder expectations, regulatory changes, and project uncertainties.
* Applying a portion of the overall project budget or estimating the management reserve amount based on past performance and professional judgment.
* defining precise requirements and approval procedures for the use of management reserves and their accessibility during project execution.

3. ***Budget Exceedance Protocol***

**Monitoring and Control:** Throughout the course of the project, risk management teams and project managers keep a close eye on and manage the budget for risk and opportunity management.

**Early Identification**: Project managers quickly identify and evaluate the reasons for budget exceedance, such as unforeseen risks, scope changes, resource limitations, or inaccurate estimations, if budgetary concerns arise.

**Mitigation Strategies**: Project teams employ various strategies to mitigate budget exceedance, including resource reallocation, risk response plan revision, prioritizing critical risks, and requesting approval from sponsors or stakeholders for additional funds.

**Documentation and Reporting:** To guarantee accountability and alignment with project objectives, all budgetary deviations, mitigation measures, and approvals pertaining to Risk & Opportunity Management are transparently reported to stakeholders and duly documented.

To put it briefly, proper budgeting for Risk & Opportunity Management entails setting aside enough money, creating procedures for calculating management and contingency reserves, and taking proactive steps to deal with overspending. Effective project budget management and financial risk mitigation depend on clear communication, teamwork, and stakeholder involvement.

# 5.Timing

Timing is a critical factor in determining when and how often risk and opportunity management processes should occur throughout the project lifecycle. Let's explore the timing considerations for various risk and opportunity management processes.

**Risk Identification:**

* ***Initiation Phase:***Initial workshops or sessions are held to capture high-level risks and opportunities.
* ***Planning Phase*:** Detailed risk identification exercises are conducted to identify specific risks related to project objectives, scope, resources, schedule, and stakeholders.
* ***Ongoing Basis*:** Regular risk identification processes are conducted to capture new risks, review existing ones, and integrate lessons learned from project activities.

**Risk Analysis:**

* ***Planning Phase*:** Risk analysis techniques are applied to prioritize identified risks based on their potential impact on project objectives.
* ***Throughout Execution:*** Continuous risk analysis is performed to accommodate changes in project conditions and ensure the relevance of risk responses.

**Risk Response Planning:**

* ***Planning Phase:*** Risk response strategies are developed for prioritized risks based on severity and potential impact.
* ***Throughout Execution:*** Risk response plans are reviewed and updated as necessary to address emerging risks and changes in project circumstances.

**Risk Monitoring and Control:**

* ***Throughout Execution:*** Continuous monitoring and control of identified risks are conducted to track triggers and assess the effectiveness of responses.
* ***Regular Reviews:*** Formal risk review meetings are scheduled at predefined intervals to analyze risk trends and communicate information to stakeholders.

**Opportunity Management:**

* ***Integrated Approach:*** Opportunities are identified, assessed, and managed using similar processes and timing considerations as risks.
* ***Early Identification:*** Opportunities are proactively sought during project planning and execution to enhance outcomes and maximize value delivery.

**Adjustments Based on Project Phases:**

* The timing and frequency of risk management activities are adjusted based on project phases, complexity, and criticality.
* Project managers and risk management teams modify processes to align with project deliverables, milestones, and goals.

In summary, active risk and opportunity management procedures should be conducted regularly, integrated into the project lifecycle, and adjusted as needed. These processes ensure that potential risks are addressed, opportunities are seized, and project goals are achieved successfully and efficiently.

# 6. Risk Categories

Grouping risks into categories based on major Work Breakdown Structure (WBS) activities is a systematic approach to risk management that enhances the project's ability to identify, assess, and address potential threats effectively. For the Adelaide Underpass project, utilizing the WBS as a framework for categorizing risks enables project stakeholders to align risk management efforts with specific project activities and objectives.

## 6.1 Project Risks by Major WBS Activity:

The Work Breakdown Structure (WBS) is a hierarchical decomposition of the project scope into manageable components, each representing a specific deliverable or aspect of the project. By organizing risks according to major WBS activities, the project team can gain insights into the potential risks associated with each phase or element of the project.

Here's an elaboration on how risks can be categorized based on major WBS activities for the Adelaide Underpass project:

* ***Excavation and Construction of Underpass*:** Risks associated with excavation, foundation construction, and structural integrity fall under this category. Examples include unforeseen ground conditions, construction delays, and structural failures.
* ***Traffic Management and Safety Measures*:** This category encompasses risks related to managing traffic flow, ensuring worker safety, and implementing safety measures during construction. Risks may include accidents, traffic disruptions, and safety violations.
* ***Materials Procurement and Supply Chain*:** Risks associated with procuring construction materials, managing suppliers, and ensuring timely delivery fall under this category. Examples include material shortages, supplier delays, and quality control issues.
* ***Environmental Impact and Regulations*:** Risks related to environmental regulations, permits, and compliance fall under this category. Environmental risks may include soil contamination, habitat disruption, and regulatory non-compliance.
* ***Stakeholder Engagement and Community Relations*:** Risks associated with stakeholder engagement, public relations, and community outreach efforts are categorized here. Examples include public opposition, community protests, and stakeholder conflicts.
* ***Project Management and Governance*:** Risks related to project management processes, governance structures, and decision-making frameworks fall under this category. Examples include budget overruns, schedule delays, and scope creep.

By categorizing risks according to major WBS activities, the project team can prioritize their risk management efforts, allocate resources effectively, and develop targeted mitigation strategies tailored to specific project phases and objectives. This approach enhances the project's overall risk management capabilities and contributes to its successful execution and completion.

*Example*: Risks associated with equipment failures, utility interruptions, traffic interruptions, community opposition, supply chain disruptions etc.

## 6.2 External Risks using STEEPLE Classification:

***Social Risks*:** Risks related to community opposition, public protests, stakeholder conflicts, or social unrest affecting project progress and public perception.

***Technological Risks*:** Risks associated with technological failures, equipment malfunctions, software glitches, or integration challenges impacting project delivery.

***Economic Risks:*** Risks stemming from economic downturns, inflation, currency fluctuations, budget constraints, funding shortages, or cost overruns affecting project viability.

***Environmental Risks:*** Risks arising from environmental regulations, pollution, soil contamination, ecological impact assessments, or natural disasters disrupting project operations.

***Political Risks:*** Risks linked to changes in government policies, political instability, regulatory compliance issues, permits, or approvals delaying project timelines.

***Legal & Regulatory Risks*:** Risks related to legal disputes, litigation, non-compliance with regulations, zoning restrictions, permits, licenses, or contractual obligations impacting project outcomes.

***Ethical Risks*:** Risks arising from ethical dilemmas, conflicts of interest, corruption, bribery, or unethical behaviour compromising project integrity and reputation.

**Approach:**

Risks will be systematically identified and assessed within each category to understand their potential impact and likelihood of occurrence.

Specific risk response strategies will be developed and implemented to mitigate, transfer, accept, or enhance risks based on their categorization and severity.

Continuous monitoring and control mechanisms will be established to track the status of identified risks, evaluate the effectiveness of risk responses, and communicate risk-related information to stakeholders.

By grouping risks based on major project activities and external factors using the STEEPLE classification, the Adelaide Underpass project can effectively identify, assess, and manage risks across various dimensions, ensuring proactive risk mitigation and successful project delivery.

The risk could turn out to be an opportunity as well as a disadvantage. If the task is completed on a strict timetable, and budget, and with forward planning, the opportunities might be attained. Opportunity risk is an uncertainty that, should it materialize, would have a beneficial effect on project objectives. As a result, we might respond to it by exploiting, enhancing, sharing, or accepting it in one of these four ways: Conversely, threats represent unpredictability that could have unfavourable results and necessitate responses such as risk reduction, risk transfer, risk avoidance, or risk escalation. Risk can be categorized as follows depending on a project's activities and nature:

* Contractual
* Financial
* Execution
* Technical
* Commercial

Some examples of risks:

* Improper Construction
* Unskilled labor
* Workplace injury
* Poor Indoor Air Quality
* Inappropriate Coating
* Bad Weather

## 6.3 Risks related to Sustainability:

To identify and address sustainability-related risks effectively, project teams should conduct a thorough analysis of potential environmental, social, and economic impacts throughout the project lifecycle. Begin by compiling a comprehensive list of sustainability risks relevant to the project context, considering factors such as regulatory requirements, stakeholder expectations, and industry best practices. Next, assess the probability and potential impact of each risk, considering its likelihood of occurrence and severity of consequences. Prioritize risks based on their ranking, considering both the probability and impact scores. Once risks are prioritized, develop risk response strategies, including mitigation, avoidance, transfer, or acceptance measures. Document these strategies in a risk management plan and assign responsibilities to team members or stakeholders for implementation. Regularly monitor and review risks throughout the project to ensure proactive management and timely response to emerging sustainability challenges.

***Environmental Sustainability Issues:***

* Habitat Destruction: Risks related to the destruction or degradation of natural habitats, including forests, wetlands, and wildlife habitats.
* Pollution: Risks associated with the release of harmful substances into the environment, such as air pollution, water pollution, and soil contamination.
* Climate Change: Risks stemming from greenhouse gas emissions, leading to climate-related impacts such as extreme weather events, sea-level rise, and altered precipitation patterns.
* Biodiversity Loss: Risks linked to the loss of biodiversity, including species extinction, ecosystem degradation, and disruption of ecological balance.

***Social Sustainability Issues:***

* Community Displacement: Risks associated with the displacement or disruption of communities due to infrastructure projects, leading to social unrest, loss of cultural heritage, and inequalities.
* Health and Safety: Risks related to the health and safety of workers, local residents, and communities, including exposure to hazardous materials, accidents, and occupational health issues.
* Community Engagement: Risks associated with inadequate or ineffective engagement with stakeholders, including communities, indigenous groups, and civil society organizations, leading to mistrust, resistance, and project delays.
* Human Rights Violations: Risks related to the violation of human rights, including land grabbing, forced labor, and violations of indigenous peoples' rights.

***Economic Sustainability Issues:***

* Cost Overruns: Risks associated with budget overruns and financial instability, leading to project delays, increased costs, and financial losses.
* Economic Displacement: Risks related to the displacement or disruption of local businesses, livelihoods, and economies, leading to unemployment, loss of income, and economic downturns.
* Market Volatility: Risks stemming from fluctuations in market conditions, including changes in commodity prices, interest rates, and currency exchange rates, leading to financial uncertainties and investment risks.
* Long-Term Viability: Risks associated with the long-term viability and economic sustainability of projects, including inadequate financial planning, poor cost-benefit analysis, and lack of long-term revenue streams.
* Resource Scarcity: Risks related to the scarcity or depletion of resources, including raw materials, energy sources, and water, leading to supply chain disruptions, production delays, and increased costs.

**Approach:**

In approaching sustainability concerns within the Adelaide underpass project, a thorough and systematic strategy is paramount. The first step entails a meticulous identification process, wherein potential sustainability risks are carefully unearthed. These may span environmental, social, and economic realms, encompassing factors like habitat disruption, community displacement, and cost overruns due to regulatory requirements. Following this, stakeholder engagement assumes crucial importance. By involving local communities, regulatory bodies, and environmental organizations, the project can glean invaluable insights into sustainability expectations and concerns.

Subsequently, a rigorous risk assessment and prioritization exercise are undertaken to gauge the likelihood and severity of identified risks. Once risks are ranked, robust mitigation and management strategies are developed. These encompass a spectrum of measures, from implementing environmental protection initiatives to fostering community engagement programs and integrating sustainable construction practices. Continuous monitoring and reporting mechanisms are then established to track the effectiveness of these strategies, ensuring transparency and accountability.

Lastly, a culture of continuous improvement is fostered, where lessons learned from project implementation and stakeholder feedback inform ongoing refinements to sustainability risk management practices. By adhering to this comprehensive approach, the Adelaide underpass project can effectively navigate sustainability challenges, fostering long-term success while positively impacting the environment, society, and economy.

# 7. Opportunity Categories

Opportunities for the Adelaide Underpass project may be divided into many types to help with efficient opportunity management. The following explains how opportunities will be categorized according to project activities and outside elements, such the STEEPLE framework:

## 7.1 Project Opportunities by Major WBS Activity:

The Adelaide Underpass project's main Work Breakdown Structure (WBS) activities will be used to classify opportunities. For instance, to concentrate on optimizing advantages for each activity, opportunities pertaining to creative building methods, cost-cutting strategies, timetable acceleration, quality enhancements, and stakeholder involvement may be grouped independently.

## 7.2 External Opportunities using STEEPLE Factors:

Public relations, social responsibility initiatives, community involvement, and optimizing project benefits for the community are examples of social possibilities.

***Technological opportunities:*** Are those that arise from automation, digitalization, data analytics, and the application of state-of-the-art equipment or construction methods to improve the standard and productivity of projects.

***Economic opportunities*:** Include those that arise from value engineering, cost-cutting measures, revenue generation, economic expansion, job creation, and maximizing return on investment for project stakeholders.

***Environmental Opportunities*:** Over the life of a project, there may be opportunities to lessen environmental effect, embrace sustainable practices, promote green infrastructure, and bolster ecological conservation programs.

***Political possibilities*:** Are those that have to do with government backing, finance, incentives from regulations, political will, and policy changes that encourage stakeholder participation and project execution.

***Legal and Regulatory Opportunities*:** Chances to lower legal risks, make sure relevant laws and regulations are followed, hasten the issuance of permits, and handle regulatory needs.

***Ethical Opportunities*:** Chances to promote moral conduct, corporate social responsibility, transparency, equity, and honesty in project implementation, fostering a sense of trust and confidence among stakeholders.

**Approach:**

Opportunities will be systematically identified and evaluated within each area to ascertain their potential value, feasibility, and compatibility with project objectives. Certain strategies and activities will be established in order to successfully harness resources, competencies, and stakeholder connections in order to capitalize on opportunities that have been recognized.

To maximize value creation for project stakeholders, monitor the opportunity realization process, and adapt to changing circumstances, mechanisms for continuous assessment and monitoring will be implemented.

By using the STEEPLE framework to group opportunities based on project activities and external factors, the Adelaide Underpass project can proactively identify and capitalize on favorable conditions, optimize resource allocation, and enhance project outcomes in alignment with broader strategic objectives.

# 8. Stakeholder Preferences

Preferences of stakeholders have a significant role in risk management strategies. This speaks to the particular interest or worry of the project's stakeholders. Effective risk management requires an understanding of stakeholder preferences and matching them with the risk.

## 8.1 Qualitative Risk Analysis

***Risk Progression:*** Depending on the magnitude of the possible effect and the probability of occurrence, risks will advance in the qualitative analysis process. High impact and high likelihood risks will be given priority consideration since they represent a bigger threat to the goals of the project. The decision-making process will be influenced by qualitative analysis, which will take into account stakeholders' opinions on the significance and urgency of certain risks.

***Opportunity Progression*:** Depending on how well an opportunity is thought to contribute to project goals, it will move forward. The preferences of the stakeholders will be considered in order to find possibilities that match their expectations and objectives. Evaluating the viability and desirability of seizing certain chances to improve project performance is a key component of qualitative analysis.

* The qualitative risk analysis process identifies the variables that present a danger or opportunity as the project moves forward.
* This entails a thorough investigation of the likelihood of occurrence, the consequences that come with it, and the importance of that specific risk or opportunity.
* A comprehensive understanding of the circumstances in which the dangers or opportunities could develop as the project moves forward is given by qualitative analysis.

If the opportunities are utilized to benefit of, the project can be finished in 1643 days and for less than $9,110,400, according to the EMV analysis of the costs of the nine risks that exceeded the threshold. In the worst-case scenario, however, the project can only be finished in 2950 days and will cost $14,558,000. In order to prevent the project from going over budget and having an unsatisfactory completion date, it is crucial that the project team implement all risk management strategies and responses.

## 8.2 Quantitative Risk Analysis

***Risk Progression*:** In the quantitative analysis, risks will be analyzed according to their Expected Monetary Value (EMV), which takes time and cost into account. In risk prioritizing, risks with greater EMV—which suggest possible bigger losses—will be given more consideration. The choices made by stakeholders about the appropriate degree of risk exposure will direct the process of establishing the time and expense thresholds that will initiate additional investigation.

***Opportunity Progression:*** In the quantitative analysis, opportunities will advance according to their Expected Monetary Value, which takes time and cost savings into account. In quantitative evaluations, opportunities with greater EMV—a sign of significant benefits—will be given priority. In order to set thresholds for initiating more research and the use of opportunity exploitation tactics, stakeholder preferences for particular kinds of gains or advantages will be taken into account.

By integrating qualitative and quantitative studies, the risk and opportunity management procedure for the Adelaide Street North – CP Grade Separation project will be customized to stakeholder preferences. This will ensure that choices are taken taking into account the risk tolerance and expectations of stakeholders for the success of the project.

* In quantitative analysis, the expected monetary worth of a risk or opportunity is calculated, taking into account both the time and cost implications.
* Expected financial value is equal to (probability of time or cost) \* (effect of time (days) or cost (value).
* We obtain numerical figures of the financial and temporal effect linked to the risks and opportunities through the computations. Therefore, the quantitative method of risk analysis offers a precise standard for determining the biggest dangers or opportunities

Quantitative analysis carried out within the risk analysis is influenced by the percentage of probability of risk (P) to occur in the project and the impact of the risk (I) on the project, the impact is calculated in cost and days. Finally, the values are multiplied to get the end value of the risk that shows the overall threat or opportunities of the risk within the project. The project team must be highly prepared for any threats that cross the threshold marks whereas the project team must grab the opportunity and contribute to project benefit.

The EMV analysis of the cost of the 40 risks and 12 opportunities that crossed the threshold shows that the project can be completed within 1643 days and under $9,110,400 if the opportunities are utilized but in the worst-case scenario the project can only be completed within 2950 days and will cost $14,558,000. Therefore, it is very essential for the project team to carry out all the risk management strategies and responses to eliminate all the risks associated with the project to save the project from over-expenditure and unacceptable completion date.

# 9. Definition of Terms

**Risk**: Any even or condition which can impact achieving the objectives of the project.

**Opportunity**: Any circumstances that happening will ultimately result in generating positive outcomes for the project.

**Risk Register**: It is a documented record which identifies, evaluates, and manages the risks associated with the lifecycle of the project.

**Opportunity Register**: It is an organised document which identifies, evaluates, and manages the opportunities associated with the project.

**Risk response:** It is the planned actions developed to deal with the risk to either avoid, mitigate, accept, or transfer the risk.

**Stakeholders:** Individuals or group of people who shows interest or either directly or indirectly involved in the project.

**Risk Assessment:** It is the process of identifying and evaluating the risks associated with the project.

**Opportunity assessment:** It is the process of identifying and evaluating the opportunities associated with the project which positively impacts the project.

**Risk Tolerance:** It is a predetermined value of risk which can be accepted, which doesn’t affect the objectives of the project.

**Probability:** In risk assessment, probability is the likelihood that an event will occur within a given time range. It calculates the likelihood that a risk event would transpire that might jeopardize a project's, company's, or system's objectives.

**Impact:** In the context of risk assessment, "impact" refers to the possible results or consequences that might result from a particular risk occurrence. Understanding the impact of risks is necessary to assess their size and choose the appropriate risk management strategies.

**Probability score:** A probability score is a numerical representation of the likelihood or potential that something will occur. In risk management, probability scores are used to quantify the likelihood that specific risk events or scenarios would transpire within a given time frame. These ratings may be used by stakeholders to assess the level of uncertainty surrounding certain risks and to help them make decisions about risk management and reduction strategies.

**Impact score:** A numerical representation of the potential consequences or impacts that might arise from the occurrence of a certain risk event is used in the context of risk management. Stakeholders may utilize the impact score to prioritize and assess risks based on their relevance and severity, allowing them to decide which needs to be handled first for efficient risk management.

**Risk score:** Using a combination of likelihood and effect, a risk score is a numerical representation that assesses the total degree or severity of a risk occurrence. It helps stakeholders prioritize risks and allocate resources for risk management activities in an effective manner. The risk score helps organizations make decisions by providing a quantitative basis, which allows them to address the most critical problems first.

**Contingency plan:** A contingency plan is a proactive strategy intended to predict and handle any hazards, emergencies, or unanticipated events that could interfere with ongoing projects or commercial operations. It enumerates planned actions, procedures, and resources to mitigate the impact of adverse events and ensure business continuity. Contingency planning aids businesses in mitigating downtime, monetary losses, and reputational damage in the event of a crisis. It is a crucial component of risk control.

**Trigger:** A trigger is a situation, event, or threshold that, in conjunction with risk assessment and backup plans, sets off predetermined reaction plans or courses of action. Triggers are early warning signs of approaching catastrophes, disasters, or high-risk occurrences. They support businesses in taking prompt, appropriate action to lessen the effects of unfavourable incidents and maintain company continuity.

**Fallback plan:** Also known as a contingency plan or fallback strategy, a backup plan serves as a backup plan in the event that an organization's primary plan isn't implemented or encounters unanticipated conditions. It serves as a safety net in trying times, reducing the impact of disruptions and ensuring that projects, operations, or other activities continue.

**Mitigated ranking:** When used in relation to risk management, the term "mitigated ranking" describes the most recent assessment or rearranging of hazards after the use of risk treatment programs or mitigation techniques. It shows the most current risk exposure level while accounting for the effectiveness of risk management and the steps done to reduce risks to decrease their likelihood or impact.

# 10. Reporting Format

The process of documenting, analysing, auditing, and disseminating the findings of the risk and opportunity assessment to different stakeholders is outlined in the risk management plan's reporting format.

**Documentation:**

This includes the opportunity and risk register, which includes a thorough description of each, as well as the outcomes of both qualitative and quantitative analysis and an assessment of the opportunity's potential effects. These registers serve as a tracking tool for determining the risk and examining its specifics. This serves as a clear record that can be utilized to obtain information about the many tactics that may be taken to reduce the risk. The project manager and the risk management team are in charge of the risk register's documentation procedure.

**Analysis:**

The comprehensive analysis of the risk and opportunities register is necessary to comprehend the consequences and choose the approach taken to address the risk. Analysing the risk register is the responsibility of the risk analyst and the subject matter specialists.

**Evaluation:**

As the project moves forward, it is important to keep the stakeholders informed about the risk and opportunity management operations. This may be accomplished by setting up meetings, contacting stakeholders via email, or creating online presentations. Updating all the facts on a regular basis will ensure smooth progress and help to keep the project transparent and on schedule. In general, the project manager is in charge of discussing the risks and possibilities with the team and other stakeholders.

**Audit:**

Audits must be conducted on a regular basis to ensure the project moves forward effectively. This is done in order to assess the project's efficacy and, in turn, determine what steps to take to increase the efficiency with which the objectives are met. Certain teams conduct audits, both internal and external.

**11. Measuring and Maintaining sustainability to preserve the environment, waste, and lowering the project carbon footprint:**

1. **Environmental Impact Assessment (EIA):** Before a project is initiated, a thorough EIA aids in identifying potential environmental dangers and strategies for mitigation. Variables including habitat disturbance, protecting natural resources, and air and water quality are all taken into consideration in this assessment.
2. **Green Design and Construction Practices:** Infrastructure projects may significantly reduce their adverse environmental consequences by implementing green design concepts and methods. This might mean adopting sustainable materials, optimizing energy efficiency, and using the least amount of water feasible during construction and operation.
3. **Waste Management and Recycling:** Using efficient waste management strategies is necessary to cut down on the amount of construction waste that is disposed of in landfills. Recycling materials such as asphalt, concrete, and steel can lessen their detrimental effects on the environment and help save resources.
4. **Energy Efficiency and Renewable Energy:** By adding energy-efficient technology and renewable energy sources to infrastructure projects, greenhouse gas emissions and overall energy consumption may be decreased. To do this, it could be required to install solar electricity, energy-efficient lighting, and smart building systems.
5. **Transportation and Traffic Management:** Reducing traffic, lowering car emissions, and enhancing air quality in metropolitan areas may all be achieved by enhancing transportation infrastructure and putting traffic management plans into practice. This might entail encouraging carpooling, putting up bike lanes, and boosting public transportation.
6. **Monitoring and Reporting:** To assess the success of sustainability programs and pinpoint areas for development, regular monitoring and reporting of environmental performance measures is crucial. This might entail monitoring waste production, water use, energy use, and greenhouse gas emissions during the course of the project.

By putting these sustainability practices and concepts into practice, stakeholders in infrastructure projects like the Adelaide Street Underpass may help lessen their impact on the environment, conserve resources, and advance long-term sustainability for future generations.

# 12. Conclusions

To sum up, the Adelaide Street North Underpass project's risk and opportunity management plan provides a thorough framework for locating, evaluating, addressing, and taking advantage of risks and opportunities during the course of the project. To improve project performance and stakeholder satisfaction, the project team strives to proactively address possible risks and seize opportunities by utilizing a disciplined methodology, well-defined roles and duties, and strong reporting and monitoring procedures. Risks and opportunities will be thoroughly assessed according to their effect, probability, and alignment with project objectives using qualitative and quantitative evaluations. Decision-making procedures will be informed by stakeholder preferences and comments, guaranteeing that resources are distributed efficiently to handle high-priority risks and take advantage of advantageous possibilities.

The effectiveness of the risk and opportunity management process will depend on the project stakeholders' capacity to collaborate and communicate effectively, which will promote responsibility, openness, and well-informed decision-making. Frequent reporting and auditing will offer constant insight into opportunity and risk management operations, allowing prompt corrections and continual development. To minimize possible setbacks, maximize project results, and optimize resource allocation, the project team incorporates risk and opportunity management into the planning, execution, and monitoring phases of the project. The Adelaide Street North – CP Grade Separation project will improve neighborhood safety, dependability, and quality of life while delivering improved transportation infrastructure via proactive risk management and smart opportunity exploitation. Through a thorough analysis of each risk, the team has developed a clear plan for taking decisive action. In order to preserve openness and guarantee successful stakeholder involvement, steps are made to notify all stakeholders of any developments. In order to effectively analyze project progress and manage risks, audits are conducted on a regular basis. There is a clear definition of roles and corresponding distribution of tasks. Taking initiative and managing risks are principally the responsibility of the project manager and risk owners. The risk register provides a clear definition of backup and contingency plans, ensuring a proactive approach to risk management. Every detail is thoroughly recorded and made available to the team upon request.

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