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PROJECTS

Process Document

Sourcing & Procurement

Procurement Risk Management

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Change Authorization History

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1.0	Original Documents

Head Sourcing & Procurement (Power)
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Date

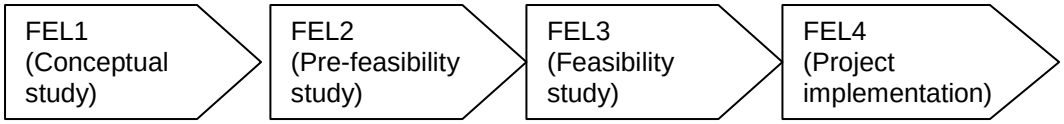
Head Sourcing & Procurement (Mining)
Date

INDEX

Abbreviations

Standard Abbreviations:

KPI	Key Performance Indicator
SIPOC	Supplier, Input, Process, Output, Customer
RASCI	Responsible, Accountable, Support, Consult, Inform
FEL	Front End Loading



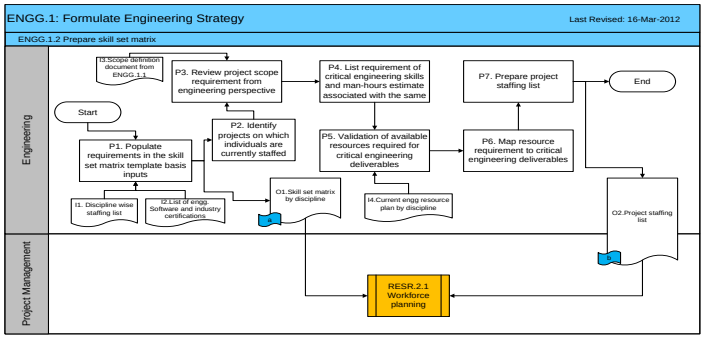
Process Specific Abbreviations:

BoQ	Bill of Quantities
RM	Raw material
FX	Foreign exchange
LLI	Long Lead Item
LME	London Metal Exchange
MoU	Memorandum of Understanding
NYMEX	New York Metal Exchange
QAP	Quality Assurance Plan
S&P	Sourcing & Procurement

Process Document Structure

This Level 2 process document comprises of Level 3 sub-processes as separate chapters. Each chapter consists of the following sections:

1. Process Map



The process map details the sub processes highlighting functions/roles involved. It also demonstrates the flow of activities in the process.
The phases of the process are also defined in the process map as separators (vertical line).

2. Process Notes

ENGG.1.1: Prepare engineering scope definition- Process Notes

Phase I - FEL 3

P1. The Project engineering manager (PEM) collects inputs for scope definition (Bankable detailed project report, technical design basis(discipline wise) and preliminary design basis report(package wise)).Inputs for the engineering scope definition for the execution phase (FEL3,4) are part of the 'Prepare and update Project definition'(FEAS.2.2) process completed as part of the Feasibility Assessment process.
P2. The PEM circulates the technical design basis for review of basic engineering scope

Process notes detail out the activities carried out in each of the process elements. They also cover additional details required to complete the process, that do not get covered as part of the process map and SIPOC.

3.SIPOC (Supplier, Input, Process, Output, Customer)

Trigger- Closure of Toll gate 2
Frequency- One time

Supplier	Input		Output	Customer
EC	Bankable detailed project report Technical design basis (discipline wise),		Technical design basis Design basis (major packages) PFD P&ID GAD	PEM PM

SIPOC tabulates the following:

- Supplier of inputs
- Inputs to the process
- Process* (and steps involved)
- Output of the process
- Customer of the output

* Process gets covered in the process map

4. RASCI(Responsible, Accountable, Support, Consult, Inform)

Activity	Responsible	Accountable	Support	Consult	Inform
P1. Collect input for Scoping study	PEM	PEM	DL	HE	PM
P2.Review technical design basis for scope coverage	DL	PEM	PEM,PM,EE,CA	HE	PEM,DL,DE

RASCI table maps all activities defined in the process to all roles which participate in the respective activities in various capacity (Responsible, Accountable, Support, Consult, Inform)

5. KPI

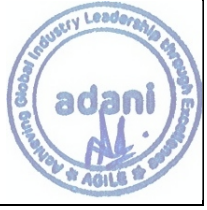
KPI	Objective	Formula	UoM
Design changes related to scope	Minimize design changes	Number of design changes per packages	No.

The KPI of the process is defined in this table; process efficiency is measured based on KPI

6. Templates

Number	Name	Template
ENGG.1.2.b	Project staffing list template	Project staffing template

This table lists the templates that will be used to execute the process.



Organizational Roles

Function	Roles	Abbreviations	Project/Function Resources
Corporate	Chairman	CMN	Top management
Corporate	Managing Director	MD	Top management
Corporate	Chief Executive Officer	CEO	Top management
Corporate	Chief Operating Officer	COO	Top management
Corporate	Chief Financial Officer	CFO	Top management
Human Resources	Head HR (Business)	HHR	Functional head
Information Technology	Head IT (Business)	HIT	Functional head
Accounts	Head Accounts	HAC	Functional head
Legal	Head Legal	HLL	Functional head
Business Development	Head Business Development	HBD	Functional head
Project Management	Director Projects	DP	Project
Project Management	Project Director	PD	Project
Project Management	Head Contract Administrator	HCA	Functional head
Project Management	Project Contract Administrator	PCA	Project
Project Management	Contract Administrator	CA	Project
Project Management	Risk Analyst	RA	Project
Project Management	Document Controller	DC	Project
Project Control	Head Project Control	HPC	Functional head
Project Control	Project Control Manager	PCM	Project
Project Control	Planning Engineer	PE	Project
Project Control	Cost Controller	CC	Project
Engineering	Head Engineering	HE	Functional head
Engineering	Project Engineering Manager	PEM	Project
Engineering	Discipline Lead	DL	Functional
Engineering	Discipline Engineer	DE	Project
Engineering	Field Engineer	FE	Project
Engineering	Owner's Engineer	OE	Project
Engineering	Other External Consultants	EC	Project
Estimation	Head Estimation	HES	Functional head
Estimation	Estimation Engineer	EE	Functional
Sourcing & Procurement	Head Sourcing & Procurement	HSP	Functional head
Sourcing & Procurement	Category Lead	CL	Functional
Sourcing & Procurement	Category Buyer	CB	Functional
Sourcing & Procurement	Project Procurement Manager	PPM	Project
Sourcing & Procurement	Expeditors	EX	Project
Sourcing & Procurement	Site Procurement Manager	SPM	Project
Sourcing & Procurement	Logistics Manager	LM	Project
Sourcing & Procurement	Stores Manager	SM	Project
Construction	Construction Manager	CM	Project
Construction	Area Manager	AM	Project
Commissioning	Commissioning Manager	COM	Project
Operations & Maintenance	O&M Manager	OMM	Project
HSE	HSE Head	HHS	Functional Head
HSE	HSE Manager	HSM	Project
Quality	Head Quality	HQ	Functional Head
Quality	Quality Manager	QM	Project
Equipment management	Head Equipment Management	HEQ	Functional Head
Equipment management	Equipment Manager	EQM	Project
Land Acquisition	Land Acquisition Manager	LAM	Functional

Note: The above defined roles do not correspond to organization level. All functional heads have been referred to as senior management in process note

Objective and Applicability

Objective:

Procurement Risk Management is the systematic approach for managing all supply side risks an organization is exposed to. Procurement risk management takes into consideration downside risk (threats) as well as upside risk (opportunities), across all procurement risk categories. Procurement risk is an integral part of project risk in a capital project.

The objective of procurement risk management is:

- To ensure that procurement related risks are highlighted and acted upon in advance to reduce the impact on cost, schedule and quality of the project.
- To ensure that procurement risks are quantified and mitigation strategies prepared for the identified risks.
- To identify risk owners and define timelines for resolution of risk elements.

The user should go through the process document in conjunction with below mentioned processes that act as input and output to the process.

Input:

- Project risk management (*PRMC.6)*
- Supply market analysis (*PROC.2.1)*
- Define long term procurement plan and strategy (*PROC.1.1)*
- Define project procurement plan and strategy (*PROC.1.2)*

Output:

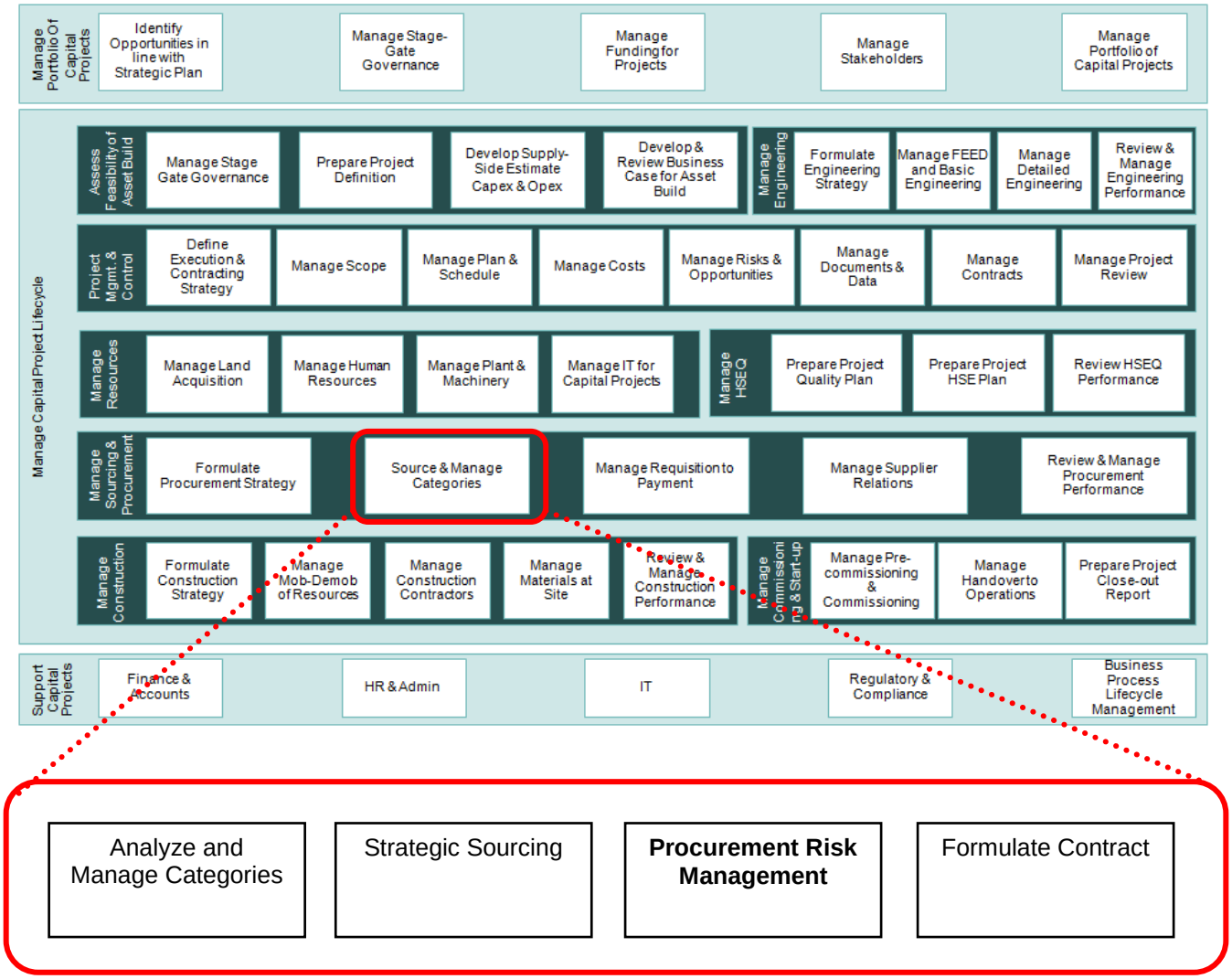
- Define long term procurement plan and strategy (*PROC.1.1)*
- Define project procurement plan and strategy (*PROC.1.2)*
- Analyze and manage categories *(PROC.2.1)*
- Formulate Contracts *(PROC.2.4)*
- Project risk management (PRMC.6)

1.1

Applicability:

This process is applicable for all capital build projects across existing business units (Power, Ports and Mining).

Operating Framework

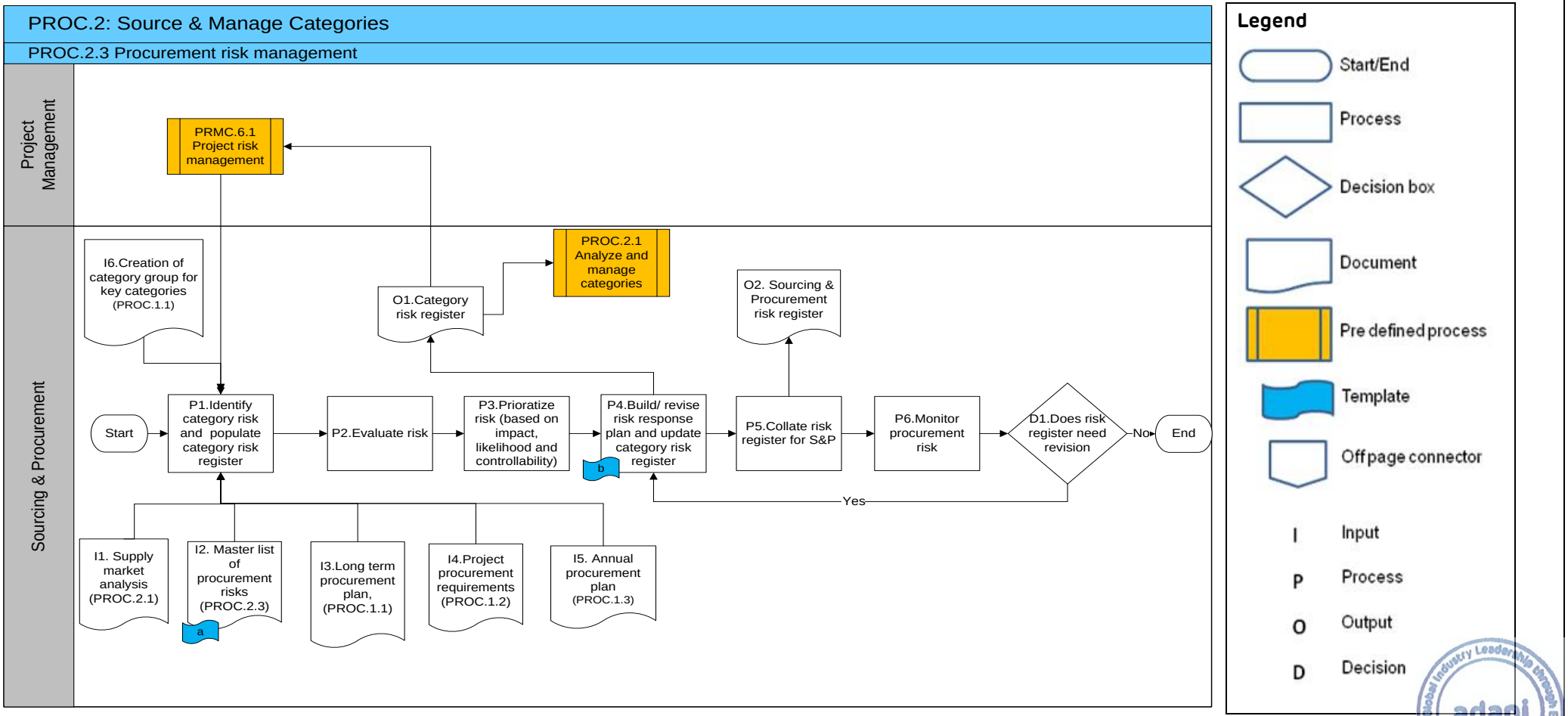


Process Documentation

PROC.2.3: Procurement risk management

1.1

PROC.2.3: Procurement risk management - Process map



PROC.2.3: Procurement risk management - Process notes

Procurement risk management process is based on an integrated risk management framework (*Exhibit 1a*). Closed loop approach of risk identification, assessment, analysis, response, monitoring, control and refinement should be adhered to while following this process.

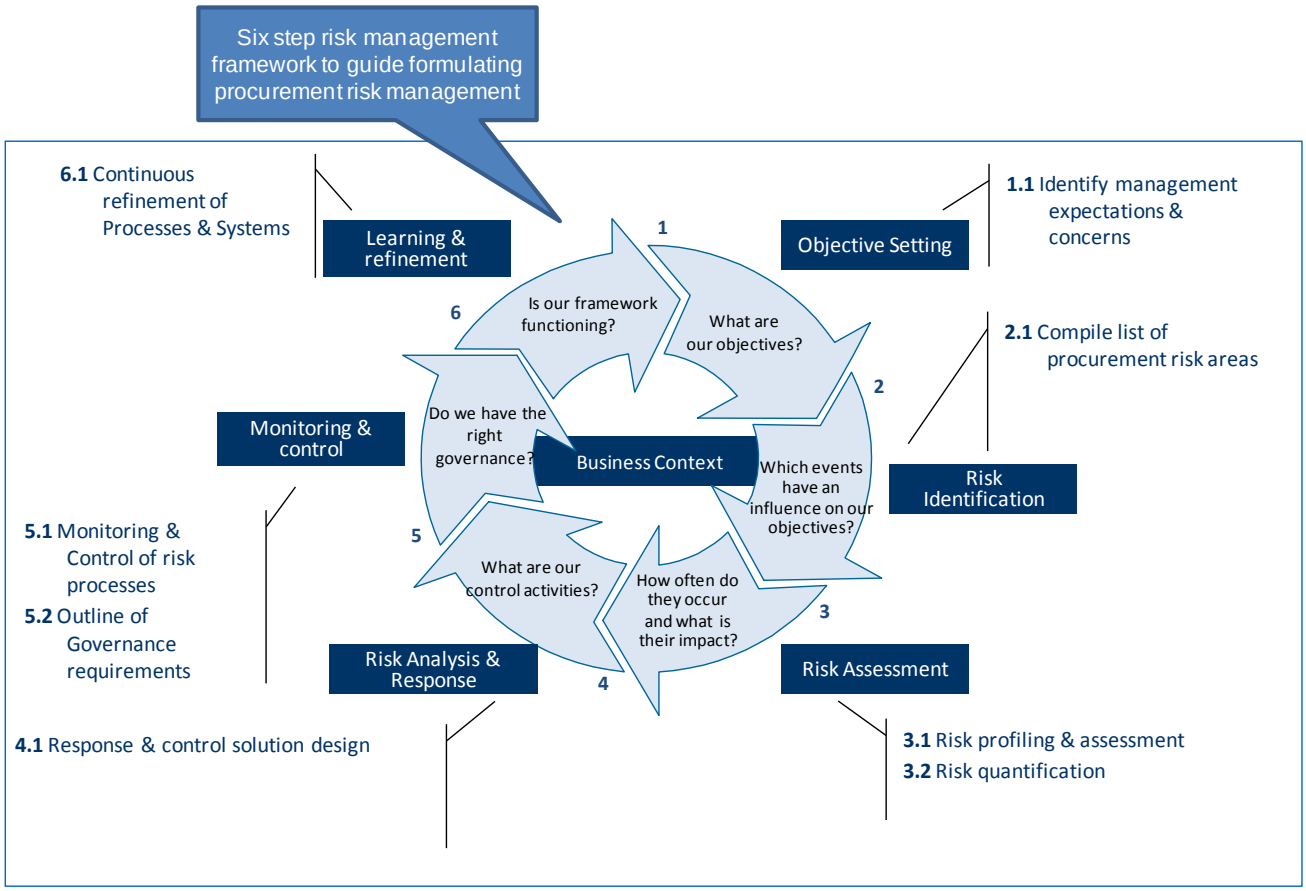


Exhibit 1a: Framework for procurement risk management

P1. CL shall identify all the procurement risk for the category. The inputs for risk identification shall be master list of procurement risk (refer *template 2.4.a*), supply market analysis, long term procurement plan, annual procurement plan and project risk register.

Exhibit 1b classifies the various elements of procurement risk in a project. Risks are identified on a continuous basis and a risk master is maintained which is updated on an ongoing basis as illustrated in *Exhibit 1c*. These risks will be populated in the category risk registeras shown in *Exhibit 1d.*

Impact, likelihood and controllability are defined as:
Impact- Measures the extent of impact on cost and schedule due to the risk
Likelihood- Probability of occurrence of the risk
Controllability- Measures the extent to which the risk element can be mitigated and controlled

Procurement risk identification activity shall be initiated whenever there is a:

- Receipt of project procurement requirements from PPM (*PROC.1.2)*
- Creation of project risk register (PPM initiated procurement risk identification on a project)
- Initiation of annual demand forecasting exercise (*PROC.1.1)*
- Creation of a category group/ appointment of a new category lead

Project specific/ category specific cross functional risk identification may be held as part of project risk identification process which will provide input to Procurement risk management. PPM will create project procurement risk register which will have procurement risks identified. The procurement risk register will be circulated to HSP within two weeks of compilation by PPM. HSP will share the risks identified with CL, as applicable.

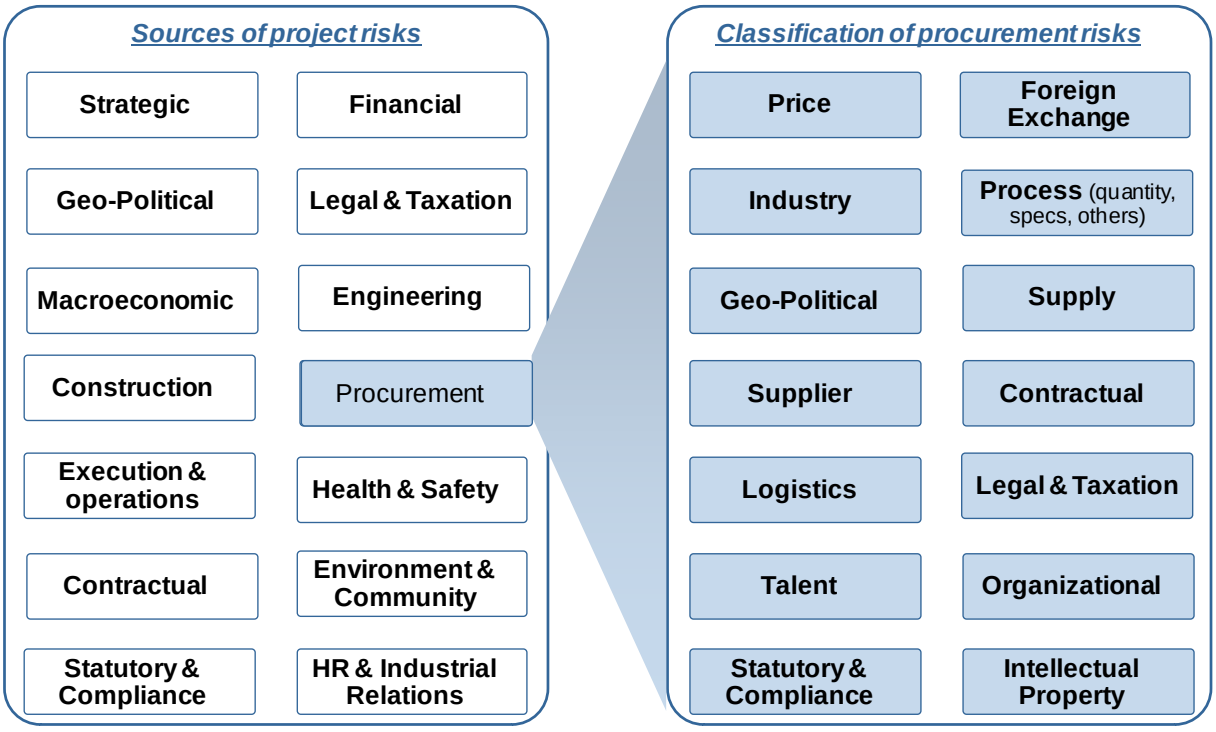
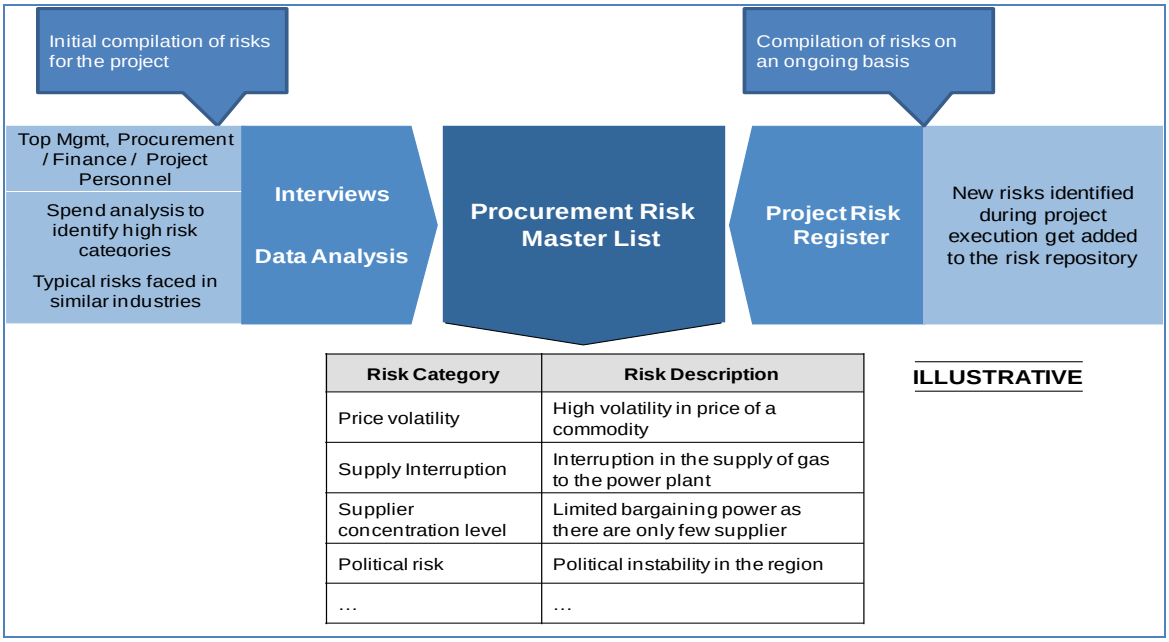


Exhibit 1b: Classification of procurement risk in a project



Risk Category	Risk Description
Price volatility	High volatility in price of a commodity
Supply Interruption	Interruption in the supply of gas to the power plant
Supplier concentration level	Limited bargaining power as there are only few supplier
Political risk	Political instability in the region
…	…

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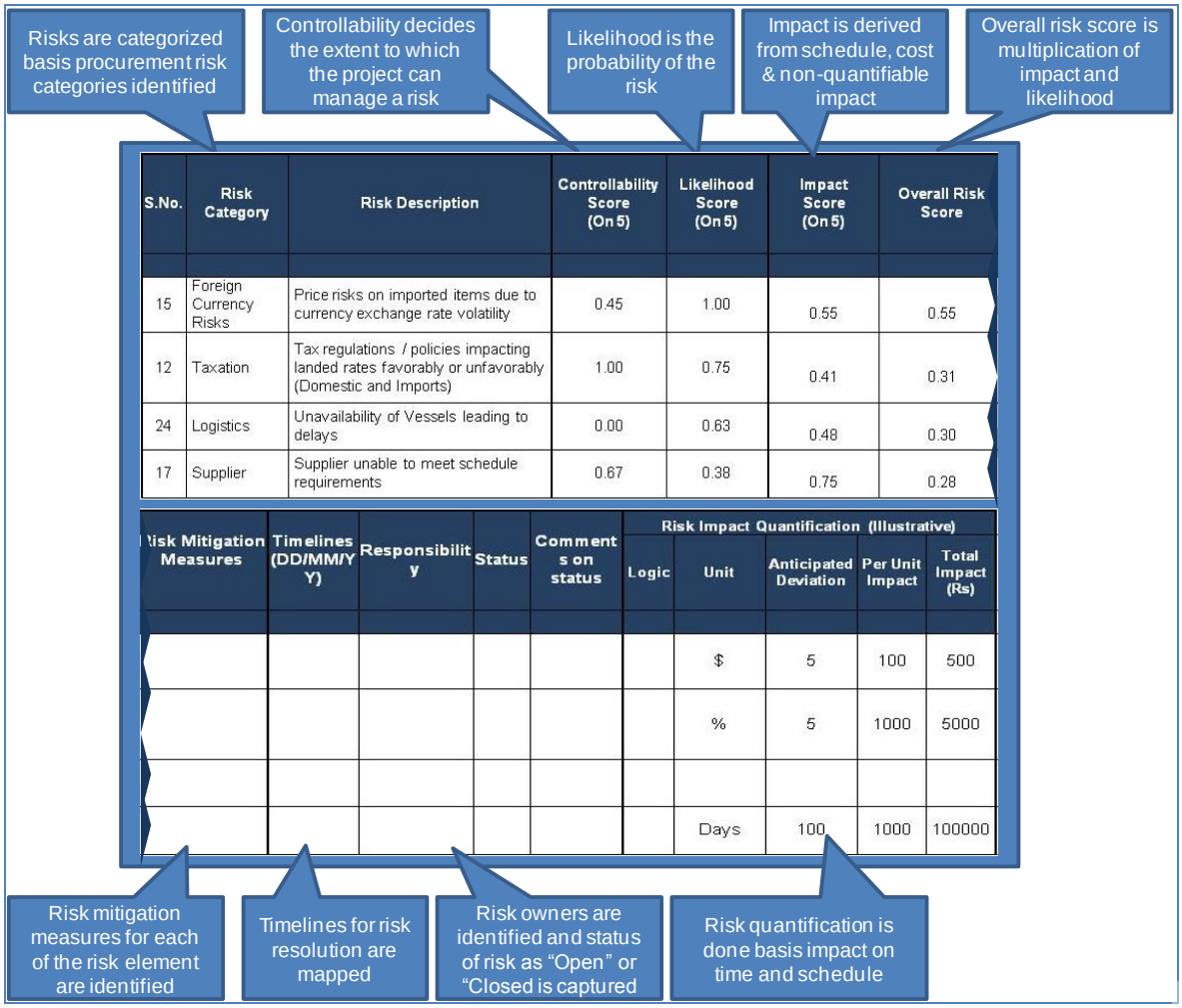
Exhibit 1c: Risk identification process



S.No.	Risk Category	Risk Description	Controllability Score (On 5)	Likelihood Score (On 5)	Impact Score (On 5)	Overall Risk Score
15	Foreign Currency Risks	Price risks on imported items due to currency exchange rate volatility	0.45	1.00	0.55	0.55
12	Taxation	Tax regulations / policies impacting landed rates favorably or unfavorably (Domestic and Imports)	1.00	0.75	0.41	0.31
24	Logistics	Unavailability of Vessels leading to delays	0.00	0.63	0.48	0.30
17	Supplier	Supplier unable to meet schedule requirements	0.67	0.38	0.75	0.28

Risk Mitigation Measures	Timelines (DD/MM/YY)	Responsibility	Status	Comments on status	Risk Impact Quantification (Illustrative)				
					Logic	Unit	Anticipated Deviation	Per Unit Impact	Total Impact (Rs)
						$	5	100	500
						%	5	1000	5000
						Days	100	1000	100000

Exhibit 1d: Illustrative risk register

P2. CL with support from CB, PD, PPM, RA and HSP shall evaluate the identified risks on their likelihood, impact and controllability. Each of the identified risk will be scored on the parameter of impact of the risk element, likelihood of risk element occurring and controllability of the risk.

The guidelines for scoring on these parameters have been given in the *Exhibit2: Risk scoring methodology.*

	IMPACT SCORE (SEVERITY LEVELS)				
Score	**1**	**2**	**3**	**4**	**5**
Impact	**Incidental**	**Minor**	**Moderate**	**Major**	**Severe**
Cost	Small loss / Insignificant cost increase project budget by < 0.1%	Can increase project budget by 0.1 - 0.5%	Can increase project budget by 0.5 - 1%	Can increase project budget by 1 - 3%	Can increase project budget by more than 3 %
Time	Slight Slippage against internal targets	Slight slippage against key milestones or published targets	Delay can affect key stakeholders & cause loss of confidence on the project schedule	Failure to meet deadlines in relation to project schedule	Delay jeopardizes viability of the project

	LIKELIHOOD SCORE				
Score	**1**	**2**	**3**	**4**	**5**
Description	**Rare**	**Unlikely**	**Possible**	**Likely**	**Frequent**
Frequency How often might it/does it happen	This will probably never happen/recur (0 to 5% chance of occurrence)	Do not expect it to happen / recur but it is possible it may do so (6 to 20% chance of occurrence)	Might happen or recur occasionally (21 to 50% chance of occurrence)	Will probably happen / recur but it is not a persisting issue (51 to 80% chance of occurrence)	Will undoubtedly happen / recur, possibly frequently (81 to 100% chance of occurrence)

	CONTROLLABILITY SCORE			
Score	**1**	**2**	**3**	**4**
Description	**Directly Controllable**	**Indirectly Controllable**	**Partially Controllable**	**Uncontrollable**

Exhibit 2: Risk scoring methodology

P3. Based on scoring of impact, likelihood and controllability factors CL shall prioritize the risks for mitigation action. Risks having high impact and high likelihood of occurrence should be given high priority.
A risk with very high impact, but with an extremely low likelihood, might not be as relevant to the company as a risk with a somewhat smaller impact, but high likelihood. In order to better prioritize risks, it is useful to combine likelihood and overall impact into a single attribute – the severity of the risk.
Risk severity is defined through a risk map, which plots risk impact against likelihood, and assigns severity levels to different areas in the map. *Exhibit 3* shows the risk prioritization framework for risk mitigation.

Likelihood	Impact				
	1 - Incidental	2 - Minor	3 - Moderate	4 - Major	5 - Severe
1 - Frequent	Low	Medium	High	Very High	Very High
2 - Likely	Low	Medium	High	High	Very High
3 - Possible	Very Low	Low	Medium	High	High
4 - Unlikely	Very Low	Very Low	Low	Medium	Medium
5 - Rare	Very Low	Very Low	Very Low	Low	Low

Exhibit 3: Risk map depicting risk impacts and likelihood

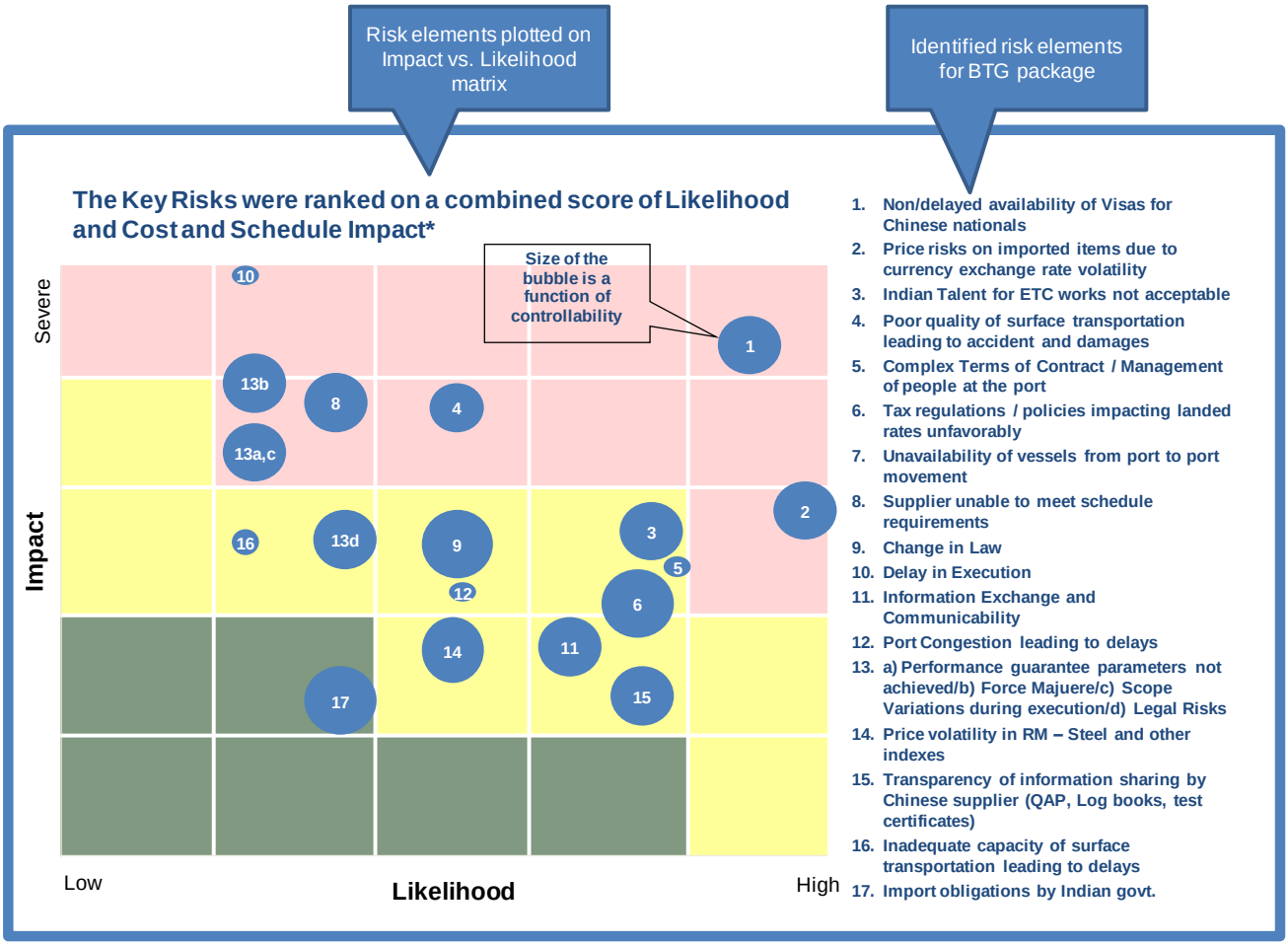


Exhibit 4: Illustrative risk assessment and prioritization mapping for BTG package

On receipt of project wise procurement risk register, HSP may qualify projects based on their impact on project from a procurement perspective. The three levels of classification are:

Alpha: Projects that are the least risky from a procurement perspective.
Beta: Projects are average risk projects from a procurement perspective.
Gamma: Projects are higher than average risk projects.

Basis the above classification, HSP will prioritize his risk review and monitor closely procurement risks.

P4. For the prioritized risks CL shall prepare mitigation plan and update the category risk register. For every procurement risk identified, an appropriate risk response technique needs to be selected based on impact of risk and likelihood of risk occurrence. The risk response matrix is illustrated in *Exhibit 5a* below which facilitates decision making for mitigation plan. *Exhibit 5b* illustrates the detail description of the risk response.

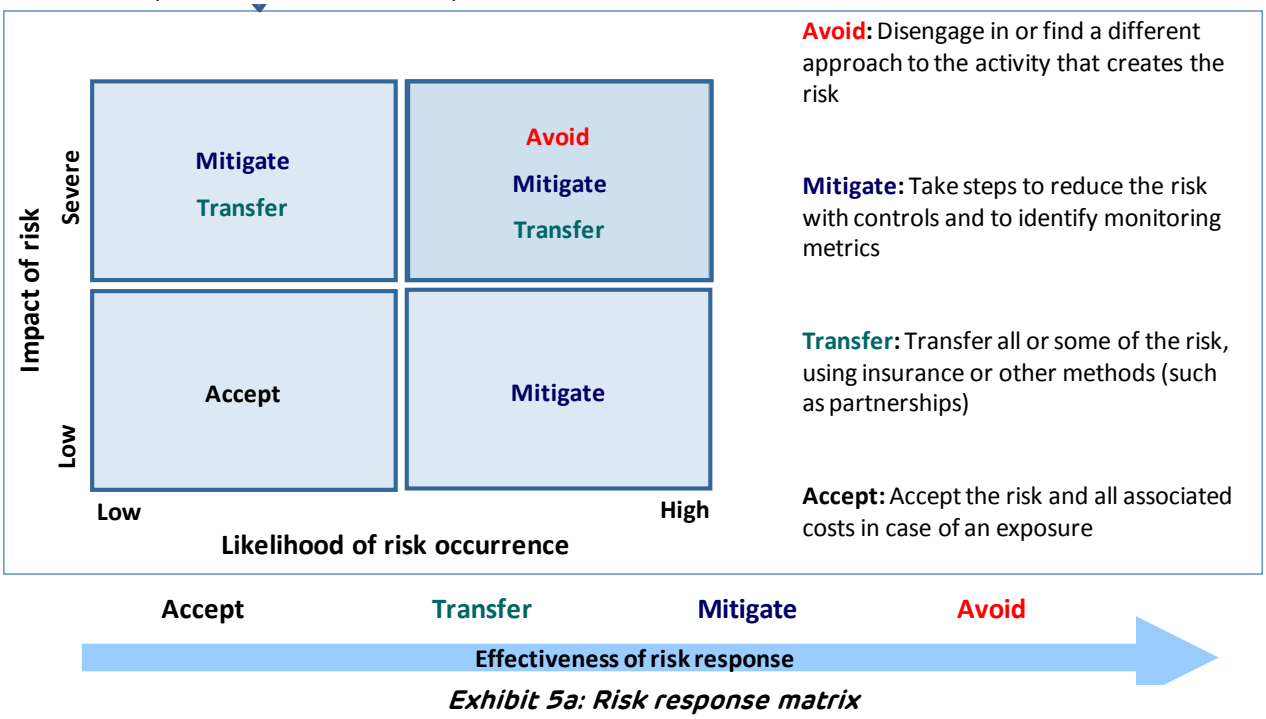


Exhibit 5a: Risk response matrix

In general, the most preferred risk response should be to 'avoid' a particular risk such that it does not impact any stakeholder.
Next preferred response strategy should be to 'mitigate' a risk such that no stakeholder is impacted by the risk, however cost of mitigation may be shared by all stakeholders.
'Transfer' of risk between stakeholders should be adopted as a risk response only if 'Avoid' or 'Mitigate' cannot be adopted. 'Transfer' of risk will result in at least one stakeholder getting impacted by the risk.
Risk response to 'Accept' risk is the least preferred option as it will add to project cost and / or schedule.

Various risk responses and their definition is given in the table below:

Risk Response	Definition
Risk Acceptance	Risk Acceptance consists in consciously deciding to do nothing, accepting the positive and negative consequences of the risk. Acceptance is the strategy of choice for small risks, where the cost of any response would exceed the benefit or the avoided loss. Some other risks (which can be very significant) cannot be avoided, mitigated, or transferred to a third party; therefore they have to be accepted as an inevitable part of one's business.
Mitigation	Mitigation consists in taking action to reduce the probability of occurrence and/or the impact of a risk to below an acceptable threshold.
Sharing	Sharing means to assign a portion of opportunity ownership to a third party that is better equipped to capture the benefit, for example setting up a Joint Venture.
Transfer	Transfer consists in shifting the impact of a risk to a third party, for example an insurance company or a main contractor
Avoidance	Avoidance consists in making sure the risk event does not happen or does not affect the company's objectives

Exhibit 5b: Risk response strategies

Depending on the risk response strategy, CL shall identify the preventive and corrective controls which will be updated as action plan in the "Risk mitigation measures" column of risk register *(Exhibit 1c)*.
CL shall use the risks identified and risk response as an input for finalizing into category strategy.
Updated category risk register shall be communicated to respective Risk Analyst (RA) for updation of project risk register.

An illustrative risk mitigation strategy adopted for Steel is shown in *Exhibit 6a and 6b* below:

Key risks involved with Steel are highlighted

Key mitigation strategies are listed for risks

Key Risks Involved	Key Mitigation Strategies*	
Price Risk : Highly exposed to commodity price fluctuations. Price fluctuations strongly linked to global price trends and macro economic trends	Material Usage Reduction	Avoid
FX Risk : All related products imported from low cost countries exposed to FX fluctuations	Use of Alternate Material	Avoid
Industry Risk : Highly cartelized industry	Strategic & Contracted Buying	Mitigate
Contracting Risk : Contractors exposed to steel related risks leading to high amount of claims	Global Sourcing	Mitigate
	Contractual Terms	Transfer
	Natural Hedging	Transfer
	Inventory Build-up	Mitigate

Other Notes

- Use of Hedging instruments could become an applicable mitigation strategy in future

Exhibit 6a: Key mitigation strategies for Steel

Key mitigation techniques are detailed out in descending order of applicability

Drivers for mitigation technique are captured

Mitigation Technique*	Applicability (Very Low → Very High) 1	2	3	4	5	* In descending order of applicability — Supporting Remarks
Material usage reduction					✓	• Value engineering especially at the design stage to optimize steel usage • Validation of quantity estimation to ensure optimal usage • Procurement from steel service centre to leverage volumes and optimize usage • Use of rebar couplers, exact cut lengths to reduce rebar usage
Use of alternate materials				✓		• Value Engineering techniques to optimize grade of steel • Standardization of grades of steel
Strategic buying				✓		• For specialized steel requirement, enter into MOU with select suppliers with standard terms & conditions defined to ensure long term good relationships and availability of supplies • For generic steel requirement, use multiple suppliers based on availability and price dynamics. Block upstream capacities to ensure the availability.
Alternate / Global sourcing				✓		• Global sourcing from low cost countries like China & Eastern Europe countries depending on the commodity cycles in these countries • Domestic multi-sourcing of steel would ensure price and supply consistency

Key mitigation techniques are detailed out in descending order of applicability

Drivers for mitigation technique are captured

Mitigation Technique*	Applicability (Very Low → Very High) 1	2	3	4	5	* In descending order of applicability — Supporting Remarks
Contractual / Commercial terms			✓			• Contractual clauses like a price escalation clause to ensure appropriate balance of price risk with the contractor
Natural Hedging			✓			• Building variable pricing contract with customer to cover for steel price fluctuations (e.g. fee issue) • Providing for steel fluctuations in the contract price
Inventory Build-up			✓			• Steel is highly capital intensive, bulky in nature, difficult & expensive to handle and could deteriorate if stored for long • However, steel could be stocked for short to medium term
Hedging using futures & options		✓				• Derivatives for steel in global market like LME & Nymex are still new and would take time to mature
Hedging using forward contracts		✓				• LME steel futures are similar to the futures contracts
Make / Buy (Vertical Integration)	✓					• Steel is a capital intensive and high gestation period business. • Having an in-house steel service center can be explored • Hence vertical integration would need to be a business decision and not a procurement decision

Exhibit 6b: Key mitigation strategies for Steel

P5. HSP shall collate category level risk and risk response entries from individual category risk registers and build the Sourcing & Procurement risk register.

P6. CL shall monitor the risks and review it on a quarterly basis or in case of any major change in internal or external conditions. CL shall monitor and update the status of risk response plan and any changes in the likelihood and impact of the risk element. In case there is any additional identified risk, same should be updated in procurement risk register.

D1. CL shall review the need for change in risk response plan, in case any change is required, it will be updated in the risk register and communicated to HSP for updation of S&P risk register and respective RA for updation of project risk register.

PROC.2.3: Procurement risk management - SIPOC

Trigger – Start of new project, setup of new category team
Frequency – as required

Supplier	Input		Output	Customer
CL	Supply market analysis		List of category risk	CL, HSP, RA, PD, PPM
HSP	Master list of procurement risks			
PPM, PD, CL	Project specific factors			
CL	Long term procurement plan, Annual procurement plan			
PPM	Project plan			
RA	Project risk register			
CL	List of category risk		Category risk register (Category Risk response plan) Project risk register	CL, HSP, PD, RA, PPM

PROC.2.3: Procurement risk management - RASCI

Activity	Responsible	Accountable	Support	Consult	Inform
P1.Identify category risk and populate category risk register	CL	CL	PD, PPM, RA, CB	HSP	
P2.Evaluate risk	CL	CL	CB, PD, PPM, RA, CB	HSP	
P3.Prioritize risk (based on impact, likelihood and controllability)	CL	CL	HSP, PD, PPM, RA, CB		
P4.Build / revise risk response plan and update category risk register	CL	CL	HSP, PD, PPM, RA, CB		
P5.Collate risk register for S&P	HSP	HSP	CL, CB		
P6.Monitor procurement risk	CL	HSP	PPM, CB		
D1.Does risk register need revision	CL	HSP	CB, PD, PPM, RA		

1.1

PROC.2.3: Procurement risk management - KPI

KPI	Objective	Formula	UoM
Reduction in the impact of risk identified	To measure the effectiveness of the risk mitigation and control process	Actual impact of risks closed / Quantified impact of risks closed	% age

PROC.2.3: Procurement risk management - Templates

Number	Name	Template
PROC.2.3.a	Master list of procurement risks	PROC.2.3a procurement risk mas Risk questionnaire
PROC.2.3.b	Category risk register	Risk register.xlsx
PROC.2.3.c	Sourcing & procurement risk register	Same as 2.3.b – consolidated at department level for all categories