Vedanta Resources Plc

Sustainability Governance System

Guidance Note GN07

Risk Assessment

Guidance Document – Risk Assessment

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1. INTRODUCTION

1.1. Who is this Guidance Note aimed at?

This Guidance Note is aimed at all Vedanta subsidiaries, operations and managed sites, including new acquisitions, corporate offices and research facilities and to all new and existing employees and contractor employees. This Guidance Note is applicable to the entire operation lifecycle (including exploration and planning, evaluation, operation and closure).

This Guidance Note provides guidance on ensuring sustainability-related risks are identified and managed in an effective manner and that Vedanta follows a structured and standardised approach to risk assessment, in relation to environmental, health and safety and social risks. Vedanta aims to comply with its corporate objective to significantly reduce risks through a process of proactive assessment of risk.

1.2 What is the aim of this Guidance Note?

The aim of this Guidance Note is to outline the company requirements which Vedanta implements in order to assess the risks to the environment and people at its operations.

This Guidance Note is focused on qualitative risk assessment of operational/task based activities and excludes detailed Quantitative Risk Assessment (QRA) and other similar risk assessment methodologies.

1.3 What issues does this Guidance Note address?

This Guidance Note presents the framework for managing risks potentially applicable in a wide range of different contexts for all Vedanta operations, showing the key technical activities that may apply in each of these contexts, and identifying the main decisions at each stage. A risk assessment process will need to be carried out for all types of sustainability risks ranging from health and safety operational tasks (e.g. working at height) to managing environmental risks to those associated with reputational and stakeholder issues. This Guidance Note has been designed to accommodate a standard approach to assessing sustainability risks although it is noted that additional processes may also be appropriate for particular risk management topics associated with the sustainability agenda.

The focus of the Guidance Note is to provide preferred methods and outcomes rather than prescriptions whilst at the same time representing a practical “how to” guide for all Vedanta operators. It is intended that this Guidance Note is standard baseline guidance for all Vedanta staff within all the operations. It does this whilst recognising the need for flexibility at the site and activity level which may depend upon project specific circumstances or regulatory specific requirements.

1.4 How should this Guidance Note be used?

This Guidance Note is not mandatory and is intended to reflect good practice and provide the basis for continual improvement of sustainability issues across the Vedanta business. However, where this Guidance Note is not used, operations will need to demonstrate (and document) how an equivalent risk assessment process is in place and how it achieves good practice.

The remainder of this Guidance Note is structured as follows:

- *Section 2*: Risk Management
- *Section 3:* The Risk Assessment Process
- *Section 4:* Risk Evaluation
- *Section 5:* Risk Assessment Team and Communication

At the end of the Guidance Note there is information on Definitions and Related Documentation and Annexes as follows:

- Annex A –Baseline Risk Assessment (and template)
- Annex B – Task/Issue/Area Risk Assessment (and template)
- Annex C – Pre-Use and Continuous Risk Assessment (and template)

2. RISK MANAGEMENT

Risk management is a central part of the Vedanta Group's strategic management. It is the process through which we methodically evaluate the risks associated with our activities to achieve sustained benefit within each activity and across the portfolio of all our activities. We have recognised that good management focuses on the identification and appropriate management of risk. Our overall objective is to add maximum sustainable value to all the activities undertaken within the organisation. Good risk management practice can facilitate the following:

- Recognition and understanding of factors, both positive and negative, which have the potential to impact our organisation; and
- Assistance in meeting the company's strategic objectives by the early identification of factors/issues that have the potential to prevent those strategic objectives from being met.

The risk management process enables the company to identify and objectively verify existing control measures and where necessary to introduce additional control measures designed to eliminate, reduce or control residual risks to a tolerable level.

Figure 1 below demonstrates how risk assessment fits into a wider risk management framework (as described in ISO 31000:2009).

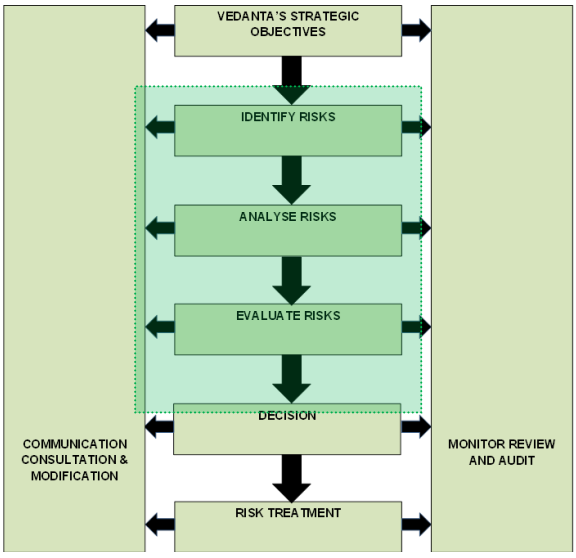

Figure 1: The shaded area indicates where risk assessment contributes to the risk management process

Risk is the likelihood that a given level of harm from an identified hazard will occur. Risk assessment therefore involves the consideration of both the severity of the effects (or consequences) of an identified hazard and the probability (or likelihood) of the hazard occurring.

Risk = Likelihood of Occurrence x Severity of Consequences

As part of the process Vedanta operations should seek to eliminate risk wherever possible using the hierarchy of control approach e.g. starting with avoidance/elimination of the risk and working through substitution, engineering controls, separation, administration and, as a last resort, personal protective equipment (PPE). Where a risk cannot be completely eliminated, operations should take reasonable steps to ensure that the residual risk is adequately controlled and remains at a tolerable level. All residual risks will be periodically reviewed, in order to identify opportunities to reduce the risk level further where possible (e.g. where new technological solutions become available).

The risk assessment process is designed to generate information, which should be used by operations to address the following key questions:

- What can happen and why?
- What are the consequences?
- What is the probability of it happening again?
- Are there any existing controls that mitigate the consequence of the risk or reduce the probability of the risk?
- Is the residual level of risk tolerable or acceptable?
- If the risk level is not tolerable or acceptable, are any additional practicable measures available that would further control the risk? If not the task must be stopped and alternative solutions must be identified, where risk is acceptable.

In order to ensure a consistent approach, risk assessments must be carried out in a structured manner consistent with the process described in Section3.

3. THE RISK ASSESSMENT PROCESS

3.1. Approaches to Risk Assessment

Risk assessment alone does little or nothing to reduce risks, particularly if risk assessment is seen as an end in itself. Rather, risks are reduced by using the risk assessment process in an active and intelligent way, as a tool to help focus the process of continual improvement within the sustainability management system.

Active engagement in the process of risk assessment, with a view to gaining an understanding of the risks and their relative priorities, is to be encouraged at all levels of the workforce. The Risk Assessment purpose is to identify and rank risks so that they can be adequately managed. It is part of the process of deciding whether or not additional controls are required or justified and hence to provide assurance to management that sustainability risks are adequately managed and controlled.

The level of detail required by the risk assessment depends on the magnitude of the risk. In many cases where the risks are low, experience, engineering and operational judgement, reference to statutory limits, regulatory and industry codes of practice, standards and guidance or company

practices and specifications may be enough to identify and establish adequate control measures. However, certain activities or facilities have major hazard potential. In these cases a more comprehensive, formal and, where appropriate, detailed quantified method of risk assessment is required.

Qualitative methods are best used for risk assessments of simple facilities or operations, where the exposure of the workforce, public, environment, and/or asset is not high hazard. Qualitative risk assessments are typically a combination of judgment, opinion, and experience, using structured review techniques with as much available risk information as possible. Qualitative methods adopt a numerical scoring system for hazard and likelihood.

This guidance note does not cover quantitative methods for high hazard activities but provides information on qualitative risk assessment methodologies.

Risk assessments shall be carried out with input from those people directly involved with the risk, using a team approach. The logic here is that those directly involved with the risk have the greatest self-interest and "buy-in" to subsequently control it.

3.2. Defining the System

Risk management can only be achieved via management of known and potential hazards and this requires the definition of a Hazard Assessment/Risk Management System.

To facilitate the successful analysis and subsequent evaluation of hazards/risks, it is first necessary to identify them.

Vedanta businesses should have programmes and procedures (e.g. management systems) which:

- Identify hazardous activities, the potential hazardous event, and consequences
- Assess and prioritise risks in a cost effective way
- Ensure that design of new facilities incorporates sustainability risk reviews
- Ensure that acquisitions and asset disposal are evaluated for sustainability risks (also refer to the MS08 Management Standard on *Acquisitions, Divestment and Joint Venture Due Diligence*)
- Ensure that sustainability hazards from equipment and facility decommissioning are managed.

Effective application of Risk Assessment involves four steps: identify, assess/evaluate, manage, and review/verify as indicated in the diagram above. These steps cover identification of the hazards to people, the environment, and social issues, assessment of the related risks, as well as implementing measures to control these risks and plans for recovery in case these measures fail.

Although these steps are often described separately, in practice they overlap and are not always distinct. Risk Management is an iterative process, i.e. a repetitive process wherein the Risk Management cycle is on-going and dynamic because the risk picture is always subject to change.

Operations should aim to ensure that sustainability hazard identification, risk evaluation and risk management conforms to the basic concepts of the risk framework and requirements detailed in Figure 1. Risk analysis and management follows a uniform process to ensure consistency and high quality. The four elements of the risk management cycle are:

- **Risk Identification:** Identify all hazards and their possible effects i.e. what could go wrong in connection with all activities, products or services. Rank the hazards using screening criteria to determine their significance;

- **Risk Evaluation:** Assess the risk. i.e. how likely is it that the hazard or unwanted event will occur; how serious would it be to any combination of personnel, the environment, property, image, etc; how could the risk be controlled;

- **Risk Management:** Develop risk solutions by setting performance standards / management programmes to allow objective measurement and monitoring of the effectiveness of risk control measures. Design and implement control measures by comparing the risk assessment results to the performance standards;

- **Review and Verification:** Monitor performance. Improve the process through review, feedback, audit, etc. and if necessary revisit or modify to ensure continuous improvement.

The methodology applied needs to be efficient (cost-effective) and detailed enough to enable the ranking of risks in order and then consider risk reduction. The rigour of assessment needs to be proportionate to the complexity of the problem and the magnitude of risk. See also Sections 3.4 to 3.7 for types of risk assessment that should be undertaken.

3.3. Defining the scope

Risk assessment of sustainability hazards(includes Environment, Safety, Occupational Health & Social facets) and effects should cover the following:

- All activities, and/or services controlled by Vedanta and those influenced by Vedanta, such as supplier, contractor, and sub-contractor activities.

- All activities, and/or services carried out by all personnel having access to the workplace and facilities at the workplace including suppliers, contractors, and sub-contractors. This extends to risks to which Vedanta personnel are exposed to by third parties e.g. other operations or contractors.

- Routine (frequently performed), non-routine (infrequently performed), and/or emergency operating conditions and activities. Sometimes the categories of normal and abnormal operating conditions are also considered.

- The lifecycle of an asset or activity, from the planning stage, through operation to decommissioning, and disposal and restoration.

Before starting a risk assessment it is essential that the operational parameters of the individual assessment are understood by all stakeholders. In the case of a specific risk assessment this would involve a clear definition of parameters of the risk assessment, for example:

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- Date and time of assessment;
- Location of assessment;
- Activities/processes/areas to be assessed;
- Internal and external stakeholders;
- Relevant policies and processes;
- Relevant legislative requirement/internal standards; and
- Individual roles and responsibilities.

This detailed information should be clearly included within any written documentation resulting from the risk assessment process (e.g. within the risk assessment form).

To facilitate a structured approach to risk assessment, operations should adopt a three tier risk assessment process as follows:

- Level 1 – Site-wide baseline assessment;
- Level 2 – Task, issue and/or area risk assessment;
- Level 3 – Pre-use or continuous risk assessment.

The three levels of risk assessment are briefly outlined in the following sections and the methodology and example templates for the three levels are provided in Annexes A to C.

3.4. Level1 - Site-wide Baseline Risk Assessment

Baseline risk assessments provide the first level in the Vedanta risk management framework. The object of this risk assessment approach is to take a look at the whole of a specific operation (e.g. a mine, refinery, or processing plant) and create a risk profile that would form the top level or starting point for assessing the hazards and risks (and controls required) and also form the basis of Level 2 below.

The baseline risk assessment should:

- Identify the hazards and risks;
- Allow unwanted events to be prioritised;
- Highlight major risks to the operation and/or Vedanta as an organisation and the management plans that are required to manage the major risks; and
- Provide the detail for the Operation Risk Register.

The output would typically be a documented Operation Risk Register with management programmes which would connect with wider business risk issues, facilitate planning and would identify the major hazards associated with the whole operation. The Operation Risk Register should be updated periodically. Once an operation has assessed potential hazards and the associated risks, this would inform what further task/issue/area-based risk assessments are needed in Level 2 because they might be considered significant to the operation e.g. ‘working at height’ or ‘workplace transport’ might be identified from the baseline assessment as issues where there are inadequate controls in place and where further assessment is needed.

The methodology to be adopted and template for undertaking a baseline risk assessment is provided in Annex A.

3.5. Level2–Task/Issue/Area Risk Assessment

Issues identified from the baseline assessment in Level 1 above as requiring further risk assessment should be included in this level of risk assessment. This should include risk assessments of a particular task/issue or area that might need assessing (e.g. an area assessment where several independent machines operate in close proximity, a task-based risk assessment for a new maintenance task or an issue-based assessment for workplace transport etc.). However, this level also includes risk assessments that are required for particular routine/non-routine tasks/changes that might be undertaken, or of a particular activity/project. Task/issue/area based risk assessments should facilitate the development of operational procedures e.g. Standard Operating Procedures (SOPs) to control the risks identified for routine tasks and operations.

In a multi-disciplinary, dynamic and complex operation it is advisable to break up the organisation, premises and/or activities into more manageable and more easily defined sections/activities for the purpose of identifying what task/issue or area based risk assessments are required (if this has not already been done via the baseline risk assessment). Examples of such section/activities include but are not limited to the following:

- Underground activities;
- Working at height;
- Use and maintenance of pressure vessels;
- Use and maintenance of electrical equipment;
- Smelter potlines;
- Storage of explosives and use of explosives;
- Warehouse activities;
- Driving of vehicles (on-site and off-site as separate activities);
- Storage and use of hazardous materials.

The methodology to be adopted and template for undertaking task/issue/area based risk an assessment is provided in Annex B.

3.6. Level3–Pre-use or Continuous Risk Assessment

If the risk assessment approach outlined in this document is followed a Level 2 risk assessment (and possibly an SOP) would be in place for all tasks. However, in reality, it is not always possible to foresee, and therefore assess, all relevant hazards in Level 1 and 2 assessments. In addition, some tasks may be performed in varying conditions (e.g. hot/cold, dry/wet etc) and by different people and may be undertaken relatively infrequently. As such, pre-use or continuous risk assessment should be used to ensure everyone pauses/stops and thinks about their activities or task before they start work and only then proceed once it is safe to do so.

The objective of this risk assessment is to look for hazards related to specific tasks before they are undertaken, identify unwanted events that could occur and to review the controls that are in place / that are required to minimise the risk. The pre-use/continuous risk assessment process should ensure Operations have mechanisms in place to make appropriate decisions whether to go ahead and proceed with the task being considered or to take appropriate actions if it is decided that it is unsafe to proceed with the task. If a decision is taken to not proceed, further assessment (possibly a review or repeat of the relevant Level 2 risk assessment) will be needed in order to make the task safe to proceed with.

The methodology to be adopted and template for undertaking pre-use or continuous risk assessments is provided in Annex C.

Examples of when pre-use or continuous assessments might be needed include:

1. During routine, non-routine maintenance works;
2. Shut down jobs/periods; and
3. Works which require a permit to work.

3.7. Documenting findings and implementing controls

The risk assessment process should be appropriately documented, together with the results of the assessment. The risk assessment records should be managed in accordance with the Vedanta Management Standard MS09 *Documentation and Records Management* and with a defined review and retention period, i.e. how long to keep the documents.

Identified risks should also be expressed in terminology that can be understood by the intended audience and the units used to define the level of risk should be well defined.

Once risk assessments have been completed (Level 1, 2 or 3), the following should also be done:

- Update existing procedures (e.g. SOPs) or develop new ones based on the findings of the risk assessments; and
- Develop action plans such as management programmes with timescales and responsibilities for completing the risk reduction actions and rigorously follow these up to completion.

3.8. Monitoring and Reviewing risk assessments

In order to ensure that risk assessments continue to be relevant to the specific hazards/risks identified and that associated controls remain effective, it is necessary to periodically review the risk assessment process and individual risk assessments. Risk assessments should be reviewed when there is reason to believe they may no longer be relevant (e.g. as a result of activity or process changes) or at least annually, where no specific changes have occurred. For risks which impact local communities, the review should be done in consultation with the relevant community and its representatives.

Any variable factors within the risk assessment process should be recorded, in order that these factors can be assessed during the periodic reviews.

Additionally, any data which is evaluated as part of the risk assessment process should be identified and collected, which can then be used during the review process.

4. RISK EVALUATION

4.1 Determining the likelihood of exposure/impact

Taking into account the hazards/risks, those that may be harmed and any existing control measures, it is necessary to determine the likelihood of exposure. When determining the likely level of exposure it is advisable to take into account the opinions of relevant workers or others potentially affected or knowledgeable in the risks, particularly off-site impacts on the environment and communities, and any previous accident or incident experiences, including stakeholder grievances.

As part of this process, it may be advantageous to demonstrate to other stakeholders how a resultant risk factor was determined and it is therefore often beneficial to use a basic quantified risk assessment. As an example of this approach, the table in Figure 4.1 illustrates some appropriate definitions used to assign a numerical factor that best describes the likelihood of exposure or impact:

Figure 4.1: Numerical factors for likelihood of exposure/impact

5	Almost certain	The unwanted event has occurred one or more times per year at the site and is likely to happen again within 1 year.
4	Likely	The unwanted event has occurred less than once per year at the site but is likely to happen again within 5 years
3	Possible	The unwanted event/has occurred in the business at some time: or could happen within 10 years.
2	Unlikely	The unwanted event has occurred in the industry at some time: or could happen within 20 years.
1	Rare	The unwanted event has never been known to occur in the industry: or it is highly unlikely to occur within 20 years.

For environmental impact, the likelihood aspect needs to be considered in terms of known and permitted releases causing an impact to the environment or to communities, such as air emissions or effluent discharges, rather than the likelihood of the environmental releases themselves (which may be routine and on-going).

4.2 Determining the consequences of exposure/impact

For each of the hazards/risks identified, a judgement needs to be made about severity. Identifying the probable consequences requires determining the nature and type of consequence which could potentially occur as a result of an event/incident or impact.

When establishing probable consequences it is important to take into consideration any existing control measures and the likely effect that they would have on the outcome. It is also important to consider both immediate consequences and any potential secondary consequences that may occur at a later stage (e.g. additional impacts on stakeholders or local communities where they are not an immediate consequence of the risk and impact). When evaluating consequences of impacts on local communities or other human receptors, it is important to consider the sensitivity (or vulnerability) of those individuals, e.g. pollution of groundwater will have a more significant impact on communities reliant on groundwater as a drinking water source than on those who have other sources of fresh water.

To facilitate the calculation of an overall risk factor, this stage of the risk assessment process requires the assessor to consider the possible consequences from the identified hazards/risks and assign a numerical value. The table in Figure 4.2provides the appropriate definitions, which preferably are to be used to derive a numerical factor for consequences of exposure to the risk and which are those used in the Incident Reporting system (see Vedanta Management Standard MS11*Incident Reporting, Classification and Investigation*)

Figure 4.2: Numerical factors for probable consequence and Vedanta incident reporting

	Classification	Environmental	H&S	Social	Reputational
5	Catastrophic	Serious environmental harm/damage from uncontrolled releases, with medium-term effect, requiring significant remediation	Fatality (or fatalities); Extensive operational shut-downs.	Receipt of multiple complaints/grievances on same topics from (or to) government agencies/bodies; Work interrupted.	Very significant legal penalties; sustained national adverse media coverage; boycotting of the company; site closure from regulatory intervention.
4	Serious	Major harm/damage from uncontrolled releases, with short-term effect and significant remediation.	Major injuries; Prolonged operational shut-downs.	Receipt of multiple complaints on same topics from (or to) government agencies/bodies. Work temporarily interrupted.	Major breach of legislation considerable legal penalties; major national media coverage and stakeholder concerns.
3	Moderate	Moderate reversible impact with short-term effect and moderate remediation.	Restricted work injuries. Temporary operational area shut-downs.	Receipt of multiple complaints on varying topics from (or to) government agencies/bodies or from stakeholders. Work not interrupted.	Serious breach of legislation and possible warnings, moderate legal penalties. Short-term stakeholder and media concerns/coverage.
2	Minor	Releases primarily limited to within the operational area. External impact minor and reversible requiring minor remediation.	Medical treatment injuries. Minor operational disruption/changes.	Receipt of multiple complaints from external sources/employees.	Minor legal issue of non-compliance, minor media coverage or attention.
1	Negligible	Minimal harm/damage: no operation disruption, low-level legal issue.	First aid cases. No operational disruption/changes.	Localised community complaints/grievances.	No operation disruption, low-level legal issue. No media coverage or attention.

4.3 Overall risk factor

The qualitative approach also uses a risk potential matrix as a guide in determining risk potential. A matrix such as the one in Figure 4.3facilitates quick reference and assignment of risk levels for the appropriate risk categories.

Hazards identified during risk assessments (or during audits, inspections, reviews, accident/incident investigation, etc.) may be assessed using this matrix.

The overall risk factor in a qualitative risk assessment methodology should be derived by multiplying the numerical figures for '*likelihood of occurrence'* by those for '*probable severity of consequence'*. For example, if a risk assessor at an Operation perceives that the likelihood of a hazard/risk occurring is "Likely" he/she may apply a numerical factor of 4. A risk assessor might apply a factor of 2 (Minor) for the probable severity of consequence.

These two numerical factors should then be multiplied by each other to provide an overall risk factor. Such a number can be interpreted using a risk matrix such as the one shown in Figure 4.3. In this example, an overall risk factor of 8would be derived, indicating a "medium" level of risk.

Once the analysis of risk has been done, the two factors *'likelihood of occurrence'* and *'probable severity of consequence'* should be used to derive an overall risk factor. For evaluation purposes the resultant overall risk factor should be compared to predetermined control strategies.

Figure 4.3: An example 5 by 5 matrix for determining overall risk factor

		LIKELIHOOD				
SEVERITY		1	2	3	4	5
		Rare	Unlikely	Possible	Likely	Almost Certain
Catastrophic	5	5	10	15	20	25
Serious	4	4	8	12	16	20
Moderate	3	3	6	9	12	15
Minor	2	2	4	6	8	10
Negligible	1	1	2	4	4	5

For the table provided in Figure 4.3presented, the risk categories are as follows:

- *Risk Factor 20 to 25 - Very High* – A risk factor in this range would indicate an "unacceptable" level of risk. It would be appropriate to prohibit the activity until suitable improvements have been implemented to reduce the level of risk to an acceptable level;
- *Risk Factor 10 to 16 - High* –". Hazards within this range should be proactively managed to reduce the risk to a level as low as reasonably practicable;
- *Risk Factor 5 to 9 - Medium* – Risk factors within this range may be regarded as "tolerable" and identified hazards within this range should be actively managed; and
- *Risk Factor 1 to 4 - Low* - Risk factors within this range would indicate that the level of risk is "acceptable" and therefore no further action would be necessary. However it would still be important to ensure that any existing controls are maintained.

Plotting these risks on the Risk Matrix is relatively simple. There are also risks of a long term nature relating to environmental discharges and emissions or exposure to health hazards. These 'chronic' or 'routine' risks are the ones where the pre-defined limits are exceeded over time, and can also be plotted on the Risk Matrix. The Risk Matrix may also be used on a scenario by scenario basis to prioritise risk reduction efforts. It is adaptable to varying levels of information and depths of evaluation

By adopting the Risk Matrix approach to risk tolerability criteria, it brings transparency into the evaluation, using the experience and consensus of the risk assessment team, and thus an understanding of the risk can be reached fairly easily. Business management should determine whether the risk levels inherent in the business/operations are tolerable and whether they fit with current corporate policies and objectives.

4.4 Risk Treatment and Hierarchy of Control

Upon completion of the risk evaluation, all stakeholders should agree on the most suitable options for treating the risk. This may require a consultation process if local communities are affected. Any areas where a residual level of risk has been determined that is above a "Low" rating should be reviewed in order to reduce the risk so far as is reasonably practicable. Treatment of risk will seek to reduce the likelihood of occurrence, probable severity of consequences or both.

Managing risks in this manner will inevitably lead to a reduction in the overall residual risk factor. After deciding on the most appropriate form of risk treatment, it would be appropriate to reassess the activity to determine the new level of residual risk. When deciding on the most appropriate method of risk treatment it is appropriate to balance the cost and benefits of implementing control measures against the level of risk reduction that they achieve.

The application of additional control measures should be carried out in accordance with the following hierarchy of control:

- Avoidance/elimination – the possibility of stopping the activity completely should always be explored before moving onto the next stage of the hierarchy;
- Substitution – where it is not possible to eliminate the risk, it may be possible to substitute the activity with a less dangerous alternative;
- Engineering - it may be possible to introduce technology-based risk control measures;
- Separation - in some cases it may be possible to physically separate the hazard/risk from its receptor, i.e. the people or environment it impacts;
- Administration– the application of appropriate administrative control measures may be required(e.g. improved procedures and provision of relevant training); and
- Personal protective equipment (PPE) where the control measures above have been considered (as a priority over PPE) and implemented, PPE may be required as an additional control measure.

4.5 Cost Benefit Analysis

A Cost Benefit Analysis (CBA) approach is an effective risk management tool as it helps with consistency in decisions for health, safety and environmental and social resource allocation. The CBA approach requires monetary evaluation of risks or the monetary evaluation of the loss. Some typical examples are:

- Loss of plant, assets (e.g. rebuild cost)
- Loss of product and/or revenue
- Loss of sales or customers (e.g. through loss of reputation)
- Loss of life
- Loss of or damage to a natural resource
- Cost of clean-up (e.g. following accidental and/or chronic contamination)

The evaluation of measures to avert loss of life requires 'Valuation of life' for which different figures have been used by various industries and countries.

5. RISK ASSESSMENT TEAM AND COMMUNICATION

5.1. Risk Assessment Team

Within their procedures, operations should define the individuals that have responsibilities associated with the risk assessment processes and who form the structure of the risk assessment team.

Risk assessment teams should typically include, at a minimum:

- A mix of individuals from operations that might be involved in the activity and/or exposed the risk;
- Technical experts in processes/equipment;
- Supervisors and departmental managers;
- Safety/health/social/environment representatives;
- Union representatives, where appropriate; and
- Senior management.

Where internal operation expertise is not available, external experts may be required to support on the development of risk assessments.

Operations should have procedures to ensure that those carrying out, reviewing and approving risk assessments have the necessary competencies.

It is recommended that risk assessment managers (or those individuals with assigned risk assessment responsibilities) should:

- Have attended a recognised externally accredited/certified/recognised course in risk assessment;

- Have some familiarity with the technical aspects of the risks being assessed (although they do not have to be an expert as additional technical skills can be brought into the team); and
- Have previously participated in risk assessment development.

5.2. Communicating risk assessments

The purpose of risk assessments is not only to help operations understand, prioritise and manage risks to acceptable levels but also to be used as a communication tool to advise the workforce and other stakeholders of how the operation measures and controls risk. The outcomes of the risk assessment process, including the hazards, controls and action plan, shall be communicated to personnel who are exposed or potentially exposed to the hazard. Risk assessments should be available to anyone internally who requests them and, as a minimum, to workers potentially affected by the risks identified. Risk assessments can be used to consult with external stakeholders in accordance with the Vedanta Technical Standard TS05*Stakeholder Engagement.*

DEFINITIONS

Definitions of key terms and concepts used in this document are shown in the following table.

Term	Definition
Competency	A combination of knowledge, experience and the ability to recognise the limit of an individual's abilities, which enable individuals to undertake responsibilities and perform activities to a recognised standard and quality on a consistent basis.
Competent person	An individual who has the necessary knowledge, experience and recognises the limits of their ability in relation to their responsibilities/job functions.
Contractor	Any third party organisation which is engaged or commissioned by Vedanta to undertake work or provide services.
Employee	An individual who is engaged to work directly for Vedanta on either a part-time or full-time basis and for a fixed period or on permanent basis and is salaried. By virtue of the individual's contract of employment, the employee is obliged to adhere to Vedanta's terms and conditions of employment (specific to Group or the subsidiary employing the individual), and is protected by national (where it exists) and international laws concerning labour and working conditions.
Harm	Resultant injury or adverse health effect e.g. ill health and injury, damage to property, plant, products or the environment, production losses or increased liabilities.
Hazard (in relation to risk assessment processes)	Source or situation with a potential for harm in terms of injury or ill health, damage to property, damage to the workplace environment, or a combination of these (OHSAS definition)
Hierarchy of controls	A system of controls to be applied in a particular order including avoidance/elimination, substitution, redesign and separation/isolation, training and, as a last resort, personal protective equipment (in the case of safety).
Resources	Resources may include financial, human and specialised skills, organisational infrastructure, plant, equipment and technology.
Regulatory requirements	Regulatory requirements are set out in legislation and are enforced by law. These requirements may be enshrined in Acts, Regulations, Standards/Guidelines that are cited in legislation, or Permits/Licences that are developed under legislation. Regulatory requirements may be enacted at a local, regional, state, national or international level.
Risk	Combination of probability or frequency of certain hazardous occurrences and severity of impacts resulting from an occurrence. The ISO13001 Standard on Risk Management -- Principles and Guidelines defines risk as the effect of

Term	Definition
	uncertainty on objectives, uncertainties including events (which may or not happen) and uncertainties caused by a lack of information or ambiguity.
Risk Assessment	Risk assessment is the overall process of risk identification, risk analysis, risk evaluation and review.
Risk Management	Coordinated activities to direct an organisation and control an organisation with regard to risk. (as defined by the ISO 31010 Standard)
Risk Treatment	Process of selection and implementation of measures to modify risk. The term “risk treatment” is sometimes used for the measures themselves. Risk treatment measures can include avoiding, optimizing, transferring or retaining risk. (as defined by the ISO/IEC GUIDE 73:2002)
So Far as Reasonably Practicable	This involves balancing the level of risk against the cost of risk mitigation (in terms of time, cost and operational feasibility) to implement the measures necessary to avoid/manage the risk. Risk control measures should be implemented unless it can be shown that the cost is disproportionate to the resulting level of risk control.
Stakeholder Engagement	An umbrella term encompassing a range of activities and interactions between Vedanta and its stakeholders over the life of a project that are designated to promote transparent, accountable, positive, and mutually beneficial working relationships. Stakeholder engagement includes stakeholder identification and analysis, information disclosure, problem/conflict anticipation and prevention, ongoing consultation, formation of partnerships, construction of grievance resolution mechanisms, negotiated problem solving, employee involvement in project monitoring, regular reporting forums and procedures, and other related management activities.
Tolerable	Risk level which is accepted in a given context based on the current values of society. (as defined by the ISO/IEC guide 51:99)
Vedanta Company	A subsidiary of Vedanta Group either fully or majority owned that has its own management structure (e.g. Hindustan Zinc Limited, Vedanta Aluminium Limited, Sterlite Industries Limited).

RELATED DOCUMENTATION

A summary of the references and supporting documents relevant to this document is provided in the following table.

Doc. Ref.	Document name
ISO 31000:2009	Risk Management -- Principles and Guidelines http://www.iso.org
ISO/IEC guide 51:99	Guidelines for the inclusion of safety aspects in standards.
ISO/IEC GUIDE 73:2002	Risk management -Vocabulary, Guidelines for use in standards
ISO 31010:2009	Is a supporting standard for ISO 31000 and provides guidance on selection and application of systematic techniques for risk assessment.
ISO14001:2004	Guidelines for environmental management systems.
OHSAS 18001	Guidelines for occupational health and safety management systems.
MS 02	Stakeholder Materiality and Risk Management
MS 08	Acquisition, Divestment and Joint Venture Due Diligence
MS 09	Documentation and Records Management
MS 11	Incident Reporting, Classification and Investigation
TS 05	Stakeholder Engagement

ANNEX A - BASELINE RISK ASSESSMENT

Methodology

The process for undertaking a baseline risk assessment should include a number of consecutive stages as set out below, although the extent of each stage will depend on the overall type of Operation and its activities.

1) Identify Processes and Activities

Operations should consistently identify all the processes and activities that take place in the overall lifecycle of the Operation, within the physical perimeter/boundary of the site and which might affect the operation e.g. in the case of mines, smelters, and power plant operation activities, this should include consideration of exploration and design, construction and operational activities (e.g. removal of material through to handling and processing and preparation), and consideration of closure and rehabilitation processes that will be associated with the whole mine area and neighbouring locations. This will provide the basis for assessing the individual hazards that are associated with the activities that take place at the Operation.

2) Hazard Identification

Operations should identify all the hazards that apply to the processes and activities as outlined in Stage 1 above. This should include consideration of the physical location of the hazard, the magnitude, nature of the hazard and the potential impacts on the Operation, people and the environment. Hazard identification should consider employees knowledge and experience but should also consider Vedanta information within the organisation and external information (e.g. industry standards) where the hazards are already known and documented.

The overall purpose of the identification stage is to identify what might happen, and/or what situations might exist that could potentially have a negative impact on the company's stated sustainability objectives. This is achieved by objectively reviewing an activity, property/area, or situation that in certain circumstances could potentially lead to harm, damage and/or loss and therefore result in a negative impact upon the company's sustainability performance.

Risk/hazard identification can be achieved through a variety of techniques, which for the defined activity/process being assessed may typically include:

- Review of activities, processes and operational controls;
- Review of previous incidents and/or within the wider Vedanta organisation;
- Review of the site's location and stakeholders in the area;
- Review of historical community relations and any previous incidents;
- Consultation with local communities in the case of risks which may impact them;
- Consultation on industry case studies; and
- Reference to regulatory requirements.

Following identification of the hazard(s), it is important to identify how a specific hazard may adversely affect the organisation. This would typically involve identifying who or what may be exposed to the hazard(s).

This step should typically aim to understand the effect(s) that the identified hazard(s) have on:

- Visitors;
- Maintenance workers;
- Contractors;
- Property;
- Environment (local or transboundary i.e. crossing various areas or even countries);
- Local community;
- Neighbours; and
- Other business assets.

For every person, group of persons, property/asset, environmental receptor or societal receptor identified, it is important to consider how they may be impacted. In the case of impacts on local communities, it will be important to undergo this step in consultation with them in order to ensure that all hazards and risks have been fully identified, understood and agreed upon by all parties. This may also require consultation or at least communication with local communities (See TS05 on Stakeholder Engagement).

3) Unwanted Events/Risk

Following Stage 2, the unwanted events or risks associated with the identified hazards should be evaluated. The unwanted event or risk should include consideration of what can 'go wrong' in the worse-case scenario and include a description and nature of the separate events that could occur and the potential impacts that might arise (either short-term or long-term).

4) Identify Controls and Risk Rating

Once the hazards and risks have been identified an evaluation of the controls currently in place should be undertaken. Typical control measures may include:

- Physical safeguards and pollution abatement;
- Mechanical controls;
- Provision of training and awareness raising campaigns;
- Consultations with local neighbours;
- Surveys and inspections;
- Detailed work instructions (including policies and procedures, signage etc.);
- Emergency response equipment; and
- Personal protective equipment (always considered as the last resort in the hierarchy of control).

Good qualitative risk assessments should highlight where the existing control measures are positioned in relation to the hierarchy of risk controls, and the associated reliability and effectiveness of those control measures.

Once the events/risks and controls have been evaluated, the consequence and likelihood should be ranked using the example risk matrix provided in Section 4.3 of this Guidance Note to determine the overall risk rating for each unwanted event/risk. The output should facilitate a prioritisation of risk ratings that apply to the whole Operation and its activities from negligible impact to potentially catastrophic impact.

5) Identify Further Actions

The effectiveness of existing controls should be evaluated and where the risk is deemed to be mitigated the decision may be taken that no further action is required, although this should be revisited from time to time to ensure the risks have not changed and the controls remain effective. However, existing controls may not be effective in mitigating the risks or unwanted events to an acceptable level and further actions may be required. This may include consideration of additional physical or mechanical controls or procedures to be put in place; further issue/area risk assessments may also need to be undertaken to more effectively control the unwanted event/risk. This latter process would be considered as part of Level 2 (see Annex B).

6) Compile/Update Operation Risk Register

The outputs from Stages 1 to 5 should be used to compile a documented Operation Risk Register (ORR). The ORR should include all sustainability-related hazards and risks (e.g. should consider environment, health, safety and social aspects and issues), should have management programmes to address the risks and should be updated periodically (at least annually) and as processes or activities change. The content of the risk register should also allow any major hazards and risks to be considered as 'material' to the business (either the Operation or Vedanta as an organisation) and, where such hazards and risks are identified, should be communicated to Vedanta Group as appropriate for further consideration and inclusion in the Group risk register.

Once the register has been compiled, the content should be prioritised so as to focus on the significant risks that remain and require further assessment – these risks should be subject to task, issue or area risk assessments as set out in Annex B.

A template example for an ORR is set out below.

ANNEX A (CONTINUED) – EXAMPLE OPERATION RISK REGISTER TEMPLATE

Operation Area	*Process*	*Sustainability Impact Category (E,H,S,C etc.)*	*Hazard*	*Unwanted Event / Risk*	*Existing Controls*	*Potential Consequence Severity (1 to 5)*	*Potential Likelihood (1 to 5)*	*Risk Rating*	*Further Actions/Controls Required*
Tank farm	*Refuelling*	*E*	*Diesel use and handling*	*Spillage leading to fire*	*Spill control materials and procedure*	*4*	*3*	*12*	*Risk assessment and procedure required for refuelling activities*
Etc.									

ANNEX B – TASK/ISSUE/AREA RISK ASSESSMENT

Methodology

Task/issue/area risk assessments should be undertaken as the next step following on from risks that have been identified during the Stage 1 process (baseline risk assessment) where further assessment is required. The aim of this next stage of risk assessments is to make sure that the risk management process looks at the tasks being undertaken in more detail and to outline what procedures and plans need to be put in place to ensure the risks are as low as reasonably practicable. It is also possible that a task/issue/area risk assessment would be needed to manage risks that may not have been identified or addressed during the Operation baseline risk assessment undertaken in Stage 1.

The methodology for undertaking these assessments should consider day-to-day routine and non-routine tasks and situations, in addition to potential emergency situations e.g. non-routine tasks would include activities such as a contractor entering a confined space to carry out emergency maintenance work etc.

The risk assessment process should identify and consider the hazards, risks, controls and actions relating to, but not limited to, the following:

- Introducing or using new equipment/machinery in the workplace;
- Moving existing equipment to a new location/area;
- Maintenance tasks;
- Introducing (and purchasing) new products or materials;
- Changing activities or processes;
- Planned and/or unplanned changes in the workplace;
- Introducing new employees to work on specific tasks;
- Contractors working at Vedanta Operations.

Where the need for a task/issue/area risk assessment is identified, the risk assessment should be appropriately scoped to ensure it is relevant to the risk being reviewed.

To ensure a wider understanding of risk, and to reduce any bias or lack of knowledge of the task or issue, any physical inspection of operations/activities or document review should also include consultation with relevant persons and/or their representatives (e.g. those involved in undertaking the activity, working in a specific area, union representation, where applicable, etc.).

The identification of the hazards, risks, controls and risk rating should adopt a similar process to that outlined in Annex A for the baseline risk assessment. However, the following points are noted with regard to conducting task/issue/area risk assessments:

- Identification – in the process of hazard identification, the process should also include a review of, or make reference to, more detailed information including, for example, manufacturer's instructions, insurance reports; previous assessment activities (such as hazard and operability study, failure mode and effects analysis etc.);exposure monitoring information/results; communications with relevant personnel and physical inspections of the location, operation or activity; and other compliance/inspection reports.

- Exposure to the risk – for particular tasks, it is important to ensure the individuals who are potentially exposed to the hazard are involved in the risk assessment process.

A template example for a task/issue/area risk assessment is set out below.

ANNEX B (CONTINUED) – EXAMPLE TASK/ISSUE/AREA RISK ASSESSMENT TEMPLATE

Process/Area	*Hazard*	*Unwanted Event / Risk*	*Person(s) Potentially Exposed*	*Existing Controls*	*Potential Consequence Severity (1 to 5)*	*Potential Likelihood (1 to 5)*	*Risk Rating*	*Additional Actions/Controls Required*	*Residual Risk Rating*	*Person Responsible*

ANNEX C –PRE-USE OR CONTINUOUS RISK ASSESSMENT

Methodology

Everyone should pause or stop work prior to starting a task to ensure it is safe to proceed – questions that should be asked include:

- What could go wrong?
- How could it impact me, my colleagues, others or the environment?
- Is the task safe to undertake?
- Are all the potential consequences understood?
- Are the hazards understood?
- Are there effective controls in place?

If the answers to these questions are 'Yes', then it is likely that the risks associated with the task to be completed are minimised to an acceptable level and work can proceed (although it should be noted that if this is the case and the task is started, the same questions should be asked during the task to ensure they remain valid and correct).

However, if the answer to some of these questions is 'No', then further assessment is needed using a pre-use assessment approach. In particular, this process should be used:

- before the task commences (at the start of the working day/shift);
- when something changes during a task or activity;
- when an individual has not undertaken the task before or has not undertaken it recently (e.g. worked on other tasks, returning from maternity leave etc.);
- the task involves some significant hazards (and therefore potential risks); and/or
- because the operator (or supervisor) thinks a pre-use assessment is necessary and is uncomfortable with the situation.

Pre-use assessments can be informal or formal. Informal assessments can involve day to day pre-task assessments completed by individuals or informal daily workplace assessments or talks (often referred to as Toolbox Talks) – these are delivered by or facilitated by operating teams to allow two-way communication of risks identified in the workplace. Supervisors should develop a communication forum at the start of each shift or working day to allow individuals/teams to share knowledge of hazards that have been identified in normal tasks.

A typical, more formal, approach is to use a job safety analysis (JSA) approach where a team of supervisors and operators (or working group):

- Discuss the nature of the task to be undertaken so the operator/team understand the method of the task from its start to finish;
- Discuss the hazards associated with the task;
- Review of the equipment involved in the task;
- Identify unwanted events relating to the task; and
- Establish the controls to mitigate the unwanted event (existing and new, where required).

A JSA approach should usually involve a review of relevant information and documentation and an inspection of the work area or task to be completed.

Once the JSA has been undertaken, and the risks are deemed to be as low as reasonably practicable, then the assessment should be signed off by a competent person and the assessment kept on record. If the risks are still not deemed to be minimised to an acceptable level, additional workplace risk assessments (as set out in Annex B) should be conducted until the risks are at an acceptable level.

Pre-use assessments / JSA's are recommended to be used in conjunction with work permits.

Pre-use assessments can also be used for tasks that do not relate to the workplace directly e.g. for travel purposes to other Vedanta locations. Risk assessment processes associated with vehicles and transportation are considered under the Vedanta Guidance Note GN23 on *Fleet Management*.

A template example for a formal pre-use or continuous risk assessment is set out below.

ANNEX C (CONTINUED) – EXAMPLE PRE-USE OR CONTINUOUS RISK ASSESSMENT TEMPLATE

Person completing risk assessment:	

Date:		**Relevant Procedure:**	

Task Description:	

Person(s) Completing the Task:	

Task Step	*Unwanted Event/Risk*	*Controls in Place and to be Used*	*Additional Comments*

Signed by (person completing task):	

Approved by:	