A practical guide to catchment-based water management for the mining and metals industry

ICMM
International Council on Mining & Metals

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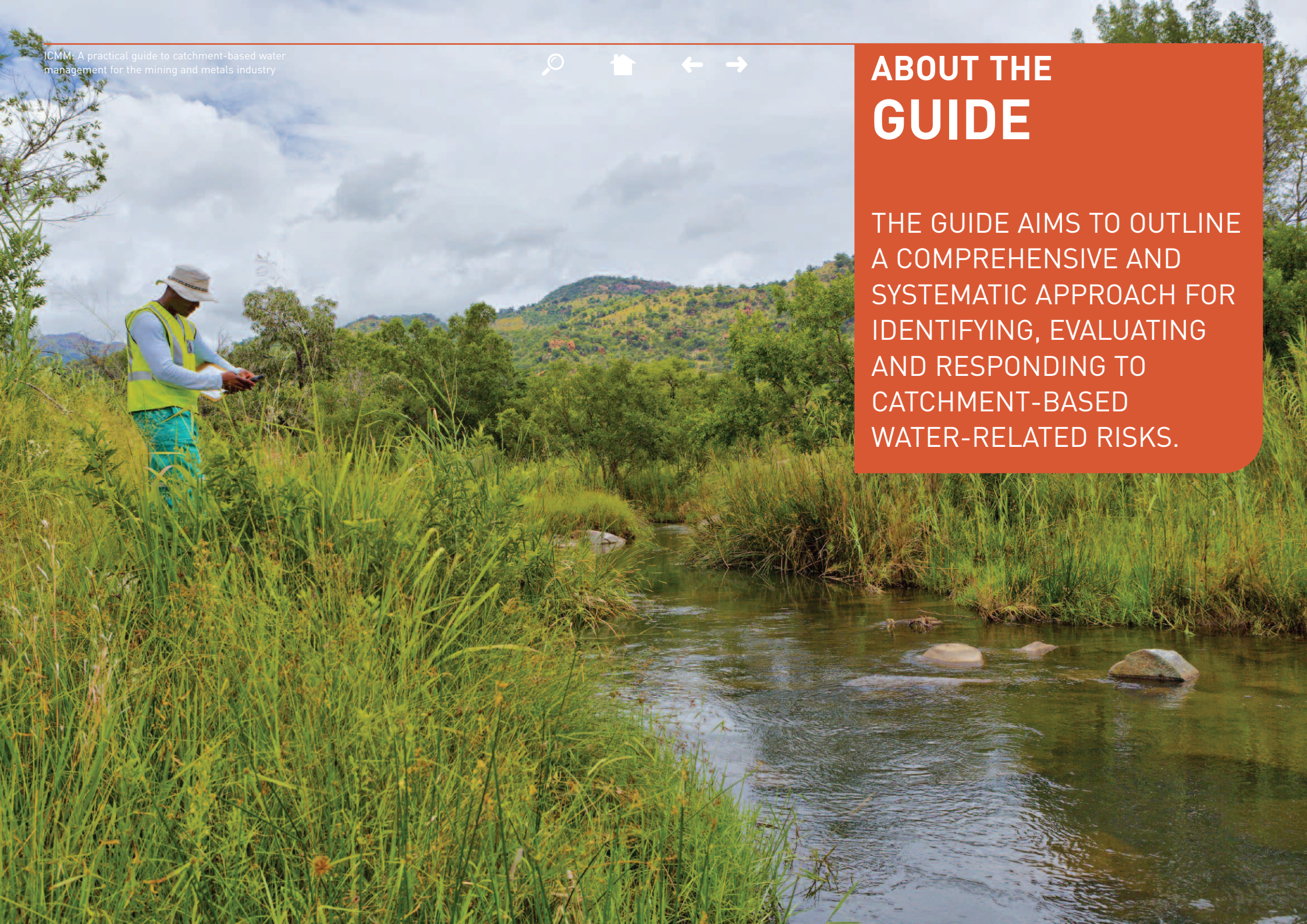

ABOUT THE GUIDE

THE GUIDE AIMS TO OUTLINE A COMPREHENSIVE AND SYSTEMATIC APPROACH FOR IDENTIFYING, EVALUATING AND RESPONDING TO CATCHMENT-BASED WATER-RELATED RISKS.

Overview of the guide

ABOUT THE GUIDE

1. AWARENESS

Stakeholder engagement

2. ASSESSMENT

Stakeholder engagement

3. RESPONSE

Stakeholder engagement

Foreword

Water is a precious shared resource, with significant social, cultural, environmental and economic value. It is a basic human right and a fundamental requirement for healthy, functional ecosystems that are vital to sustaining life on earth.

Water is also a critical resource for all mining and metals operations, used in every process from dust management, power generation and mineral processing to the drinking and sanitation needs of employees. Without water, there can be no mining.

Many mining areas are located in water-stressed areas and are increasingly facing competition from different users, presenting challenges to security of supply. Concerns around access to water are exacerbated by the fact that operations are typically long lived, needing to reliably secure suitable quality water over periods spanning 30–50+ years.

Historically, the industry has approached water as an operational issue – one that is largely managed "inside the fence" with a focus on water use efficiency and control over effluent discharges to demonstrate good practice and minimize risk. International Council on Mining and Metals (ICMM) member companies have come to understand that even the most water-efficient operations that stringently manage water discharges can still be subject to significant water risks manifesting outside the operational fence line at the catchment level.

In practice, this means that consideration of other water users and communities within an area of operation is critical – and that the water demands for sustaining functional ecosystems also need to be recognized. Successful risk management must be based on understanding the complete suite of water issues within the catchment and finding solutions that work for the business and other water users.

Through collaborating or partnering with others to mitigate shared risks, address shared impacts and effect the responsible management of water resources, the industry has an opportunity to play a leadership role in local water catchments where operations are located. This document serves as a guide for understanding and managing external water-related risks in line with ICMM's water stewardship principles.

R Anthony Hodge
President, ICMM

Introduction

Water stewardship for the mining and metals industry

A water disclosure survey of the industry[1] by the Carbon Disclosure Project (CDP) in 2013 identified that 92 per cent of respondents see water risks as generating a substantive change in their business operations, revenue or expenditure in the next five years. With the critical role that water plays in operations, metals and mining companies are aware of their responsibilities and interests in acting as effective water stewards.

A holistic approach to water management is reflected in ICMM's *Water stewardship framework* (Figure 1), which identifies four strategic imperatives. Through responding clearly to these imperatives, the framework can help support mining companies in ensuring water use is socially equitable, environmentally sustainable and economically beneficial.

The framework clarifies the benefits of adopting a catchment-based approach both to limit material risks and maximize opportunity. This approach requires a holistic view of the social, cultural, environmental and economic value of water at a catchment scale, an understanding of high-value water assets and the ability to identify and assess current and long-term cumulative impacts of operations with the catchment, as well as the consideration of current and future water users in the system.

Principles for water stewardship

First, it requires transparency and accountability, with the emphasis on meaningful disclosures and clear accountabilities throughout the organization.

Second, it rests on proactive and inclusive engagement. This requires the identification of stakeholders to understand their concerns and to provide a basis for partnership approaches to mitigate shared risks.

Third, it requires careful management of water resources – in a manner that optimizes water usage through exploring and implementing efficiency measures.

Lastly, it requires that a catchment-based approach[2] to water management is adopted – one that understands high-value water assets, that appreciates the needs of existing and future water users and that takes a holistic view of impacts at the catchment level.

Figure 1: ICMM's water stewardship framework

Be transparent and accountable

Publicly report material water risks, management activities and performance.

Engage proactively and inclusively

Engage stakeholders in an open and transparent manner to understand their priorities, share plans and collaborate on solutions.

Effective water resource management

Manage operational water (quantity and quality) inputs, use and outputs to maximize resource sustainability, operational flexibility and economic benefit.

Adopt a catchment-based approach

Understand the social, cultural, economic and environmental value of water at the catchment scale to identify material water stewardship risks and provide context for corporate and operational water management.

1 CDP (2013). *Metals and mining: a sector under water pressure*, in a survey of 57 members.

2 This guide uses the term "catchment" but recognizes that, depending on the country, users may be more familiar with the term "watershed" or "drainage basin". Note that "catchment" is defined on page 15.

Objective, audience and limitations of the guide

ICMM recognizes that, at present, members' approaches to implementing catchment-based water management strategies are varied and depend on individual company strategies, the particular characteristics of individual mining operations and the unique local context surrounding them. This guide has been commissioned to support ICMM members and other interested industry stakeholders to:

- understand the relevance, risks and opportunities of a catchment-based approach to water risk management
- support companies to define and deliver their own catchment-based water risk management strategies.

The guide aims to outline a comprehensive and systematic approach for identifying, evaluating and responding to catchment-based water-related risks. It is not exhaustive, but rather serves as a structured prompt to guide companies in the development of their water strategies and plans in accordance with the local context and hydrology in which mining and metals operations take place. The guide also aims to complement existing external initiatives and codes, many of which are referenced throughout the document.

The guide has been developed in consultation with ICMM members, but provides advice to organizations across the sector

Consultations with numerous ICMM members and external experts have helped illuminate a range of approaches and practical experiences in managing water and dealing with catchment-based water risk. These consultations identified a clear need for the guide to be adaptable and suitable for use by mining and metals companies located in different geographical, regulatory and climatological situations. As a result, the guide aims to outline an approach that is relevant across the industry, both for leaders and for those who may not yet have begun their water stewardship journey.

The guide is intended for three principal audiences:

- **at an operational group level** for individuals looking primarily at water as an issue of corporate strategy or risk management, who may find the high-level approach to catchment-based water management proposed here informative
- **at a commodity or business unit level** for individuals looking at water as an operational issue, who may wish to use this guide and the framework as a means to evaluate water as a business and operational risk
- **at a site level** for site managers or technical water specialists who may wish to use this guide as a practical tool to evaluate and inform operational-level strategies and plans, and to drive different approaches to water risk management across the operation and surrounding areas.

What the guide is not

The guide is not intended to be prescriptive, nor to be used as an exhaustive technical handbook. Instead, it recognizes that water issues are inherently local and aims to provide appropriate prompts that should guide and support operations to critically assess water risks in an iterative and pragmatic manner.

The guide is underpinned by four core concepts

This guide is designed to take users through the three-phased approach to build awareness (Step 1), conduct an assessment (Step 2) and deliver an appropriate response (Step 3). It is underpinned by four core concepts that should be kept in mind when users are applying the guide.

Core concept 1

Early, open and inclusive stakeholder engagement

The guide provides a range of suggested steps to help the mining and metals industry conduct a water risk assessment, plan its responses and effectively implement them. However, it should be recognized that early, frequent and inclusive stakeholder engagement is a cornerstone of any effective response. While the guide is structured as a series of sequential steps, it should be noted that stakeholder engagement is vital at every stage of a mining or metals operation. Efforts should also be made to align any water-related engagement with wider corporate stakeholder and community engagement plans.

Core concept 2

Iterative risk assessment and response

No company can afford to approach risk assessment as a one-off exercise. Assessing catchment-based water risk is no different. A dynamic approach to risk assessment and response is required and the steps outlined in this guide, as well as the conclusions that are drawn from them, need to be continually challenged and updated in light of new information.

Core concept 3

Thinking across multiple timescales

Catchment dynamics are constantly evolving, and their interaction with mining and metals operations can cause material risks to emerge at different stages of the life cycle of a mine. For this reason, many of the steps outlined in the risk assessment portion of this guide (Step 2) require not only an understanding of historic trends, but also the ability to forecast how dynamics, such as water supply, climate change and catchment user demand, may evolve in the future. To manage catchment risks, mining and metals companies need to think in multidecadal timeframes.

Core concept 4

Dealing with uncertainty

Implementing appropriate and effective water management options relies on a thorough understanding of catchment hydrology. The natural variability in water conditions and uncertainties caused by climate change, combined with the difficulty in accurately estimating resources and changing geochemical and ecological conditions, can create significant technical uncertainty and elevated risk. Identifying, communicating and integrating uncertainty and the limitations of technical knowledge throughout the strategic approach and assessment stages will help ensure management plans and assumptions are practicable and adaptable to the range of scenarios that may eventuate over the life cycle of the mine.

Resources

A number of water stewardship tools and resources are highlighted throughout this guide. A listing of these resources and additional tools and guidance is included here.

Water risk assessment and data sources

BirdLife International, Conservation International, International Union for Conservation of Nature and UNEP World Conservation Monitoring Centre (2014).
Integrated Biodiversity Assessment Tool (ibat)
www.ibatforbusiness.org/login

Ceres (2015).
The Ceres Aqua Gauge
www.ceres.org/issues/water/corporate-water-stewardship/aqua-gauge/aqua-gauge

Global Environmental Management Initiative (GEMI) (2013).
GEMI Local Water Tool
www.gemi.org/localwatertool

ISO (International Organization for Standardization) (2014).
ISO 31000 Risk Management
www.iso.org/iso/home/standards/iso31000.htm

Natural Capital Project.
InVEST Integrated Valuation of Ecosystem Services and Tradeoffs tool
www.naturalcapitalproject.org/InVEST.html

National Integrated Drought Information System (NIDIS) (2015).
Global Drought Information System
www.drought.gov/gdm/content/welcome

World Business Council for Sustainable Development (2007).
WBCSD Global Water Tool
www.wbcsd.org/work-program/sector-projects/water/global-water-tool.aspx

World Resource Institute (2015).
Forest Watch
www.wri.org/our-work/project/global-forest-watch

World Resource Institute (2015).
WRI Aqueduct tool
www.wri.org/our-work/project/aqueduct

World Wildlife Fund (WWF) (2013).
Water Stewardship: Perspectives on business risks and responses to water challenges
http://awsassets.panda.org/downloads/ws_briefing_booklet_lr_spreads.pdf

World Wildlife Fund (WWF) (2015).
WWF water risk filter
http://waterriskfilter.panda.org/

Water stewardship guides and resources

Alliance for Water Stewardship (2014).
International Water Stewardship Standard
http://www.allianceforwaterstewardship.org/assets/documents/AWS_Standard_Full_v1.0_English.pdf

Alliance for Water Stewardship (2015).
Become a water steward
www.allianceforwaterstewardship.org/become-a-water-steward.html

European Water Stewardship (2012).
Standard
www.ewp.eu/wp-content/uploads/2012/04/EWS+European-Water-Stewardship-Standard-v4.8-Dec-2012-Doc.pdf

Government of Western Australia (2013).
Western Australian water in mining guideline
www.water.wa.gov.au/PublicationStore/first/105195.pdf

ICMM (2008).
Planning for Integrated Mine Closure Toolkit
www.icmm.com/document/310

ICMM (2014).
Water stewardship framework
www.icmm.com/water

North and South Rivers Watershed Association (NSRWA) (2015).
What is a watershed?
www.nsrwa.org/education/fun-facts-watershed/

United Nations Global Compact (2015).
Water Action Hub
https://wateractionhub.org/resources

Stakeholder engagement guides

CEO Water Mandate (2013).
Guide to Water-Related Collective Action
http://ceowatermandate.org/wp-content/uploads/2013/09/guide-to-water-related-ca-web-091213.pdf

ICMM (2012).
Community Development Toolkit
www.icmm.com/document/4080

International Finance Corporation (2014).
A strategic approach to early stakeholder engagement
https://commdev.org/userfiles/FINAL_IFC_131208_ESSE%20Handbook_web%201013.pdf

International Finance Corporation (IFC) (2014).
Water, mining and communities: creating shared value through sustainable water management
http://commdev.org/userfiles/IFC_140201_Water%20Mining%20Communities_0519c%20web.pdf

Resources (cont)

Water valuation

Ecolab and Trucost PLC (2014).
Water Risk Monetizer
http://waterriskmonetizer.com

International Finance Corporation (IFC) (2015).
Financial valuation tool
www.fvtool.com/index.php

Morgan Stanley (2014).
Investing with impact: creating financial, social and environmental value
www.morganstanley.com/globalcitizen/pdf/investing-with-impact.pdf

World Business Council for Sustainable Development (2012).
Water valuation: building the business case
www.wbcsd.org/Pages/EDocument/EDocumentDetails.aspx?ID=15099&NoSearchContextKey=true

World Business Council for Sustainable Development (2013).
Business guide to water valuation
www.wbcsd.org/Pages/EDocument/EDocumentDetails.aspx?ID=15801&NoSearchContextKey=true

Corporate water reporting and disclosure

Carbon Disclosure Project (2013).
Metals and mining: a sector under water pressure, in a survey of 57 members
www.cdp.net/CDPResults/Metals-Mining-sector-under-water-pressure.pdf

Carbon Disclosure Project (2015).
Submissions
www.cdp.net/en-US/Results/Pages/responses.aspx

CEO Water Mandate (2014).
Corporate Water Reporting Guidelines
http://pacinst.org/publication/corporate-water-disclosure-guidelines

Global Reporting Initiative (GRI)
G4 Sustainability reporting guidelines
www.globalreporting.org/reporting/g4/Pages/default.aspx

ISO (International Organization for Standardization) (2014).
ISO 14046 Environmental management – Water footprint – Principles, requirements and guidelines
www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=43263

Human rights to water, sanitation and hygiene

CEO Water Mandate (2014).
Exploring the Business Case for Corporate Action on Sanitation
http://ceowatermandate.org/files/Sanitation.pdf

CEO Water Mandate (2015).
Guidance for companies on respecting the human rights to water and sanitation: bringing a human rights lens to corporate water stewardship
http://pacinst.org/publication/guidance-for-companies-on-respecting-the-human-rights-to-water-and-sanitation/

WaterAid (2013).
Why water, sanitation and hygiene are key to post 2015 discussions
www.wateraid.org/policy-practice-and-advocacy/post-2015

WaterAid, Freshwater Action Network, Rights and Humanity, WASH United, and End Water Poverty (2014).
The Rights to Water and Sanitation
www.righttowater.info

WaterAid (2014).
Universal access by 2030: will there be enough water?
Briefing note.
www.wateraid.org/uk/what-we-do/our-approach/research-and-publications/view-publication?id=f0b57497-8bf8-47c7-90a4-e3a01f20c0fe

World Business Council for Sustainable Development
WASH pledge, guiding principles for implementation, and self-assessment tool
www.wbcsd.org/washatworkplace.aspx

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Consulting Team

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ICMM Working Group

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External experts

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Greg Koch, Coca-Cola
Jason Morrison, CEO Water Mandate
Stuart Orr, WWF International
Tien Shiao, World Resource Institute

ICMM Team

Ross Hamilton and Hayley Zipp led the process to develop this guide on behalf of the ICMM Secretariat. The ICMM Social and Economic team provided input during the guide's development. Ruth Thomas and Meera Thankey also provided support on the internal review and finalization of the guide.

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STEP 1
AWARENESS

A CATCHMENT-BASED APPROACH TO MANAGING WATER RESOURCES LOOKS AT ACTIVITIES AND ISSUES IN THE CATCHMENT AS A WHOLE. IT REQUIRES A DIVERSE RANGE OF PROCESSES TO BE CONSIDERED, INCLUDING THE HYDROLOGY AND LAND-USE, AS WELL AS BROADER POLITICAL, ECONOMIC, SOCIAL AND ECOLOGICAL DYNAMICS.

Key content of this step

1.1 The business case for catchment-based water management

Outcome

Clarity on the relevance and value of a catchment-based approach

1.2 Corporate approaches to water stewardship

Outcome

Clarity on what water stewardship would entail for your company across the mine life cycle

1.3 Broader catchment activities, processes and regimes

Outcome

Clarity on institutional and catchment management issues that may be relevant for your company

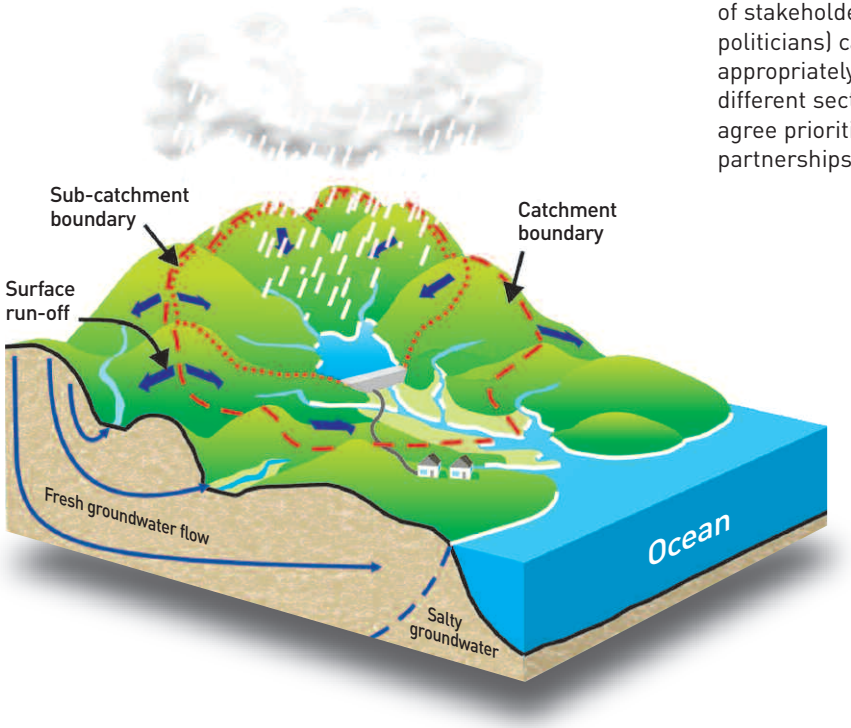
Stakeholder engagement

1.1 THE BUSINESS CASE FOR CATCHMENT-BASED WATER MANAGEMENT

1.1.1 What is a catchment-based approach to water management?

A catchment (Figure 2) is the area of land from which all surface run-off and subsurface waters flow through a sequence of streams, rivers, groundwater aquifers and lakes into the sea or another outlet at a single river mouth, estuary or delta; and the area of water downstream affected by the site's discharge.[3] Whilst the catchment is a practical scale at which to understand and manage water stewardship issues, the interface with the connecting groundwater aquifers and administrative boundaries needs to be considered. The term catchment is sometimes used interchangeably with drainage basin or watershed.

Figure 2: An illustrative example of a water catchment



Source: Adapted from the North and South Rivers Watershed Association (NSRWA) website, www.nsrwa.org.

Taking a "catchment-based" approach to water management helps conceptualize and manage complex water resource challenges

A catchment-based approach to managing water resources looks at activities and issues in the catchment as a whole, rather than considering different aspects separately. It requires a diverse range of processes to be considered, including the hydrology and land use, as well as broader political, economic, social and ecological dynamics that influence water availability and quality. A catchment-based approach encourages organizations to consider holistically how competing demands on water resources from a range of stakeholders (domestic water users, industry, regulators, politicians) can create pressures and lead to conflict if not appropriately managed. It also requires that people from different sectors be brought together to identify issues and agree priorities for action, and ultimately build local partnerships to put these actions in place.

Mining and metals activities impact water resources, and are also impacted by activities in the catchment that may sit outside their direct control

It is clear that mining and metals operations, both by virtue of their physical footprint and the use of water through extraction, processing and operational discharge processes, can impact catchment dynamics. Mining and metals companies can, however, also be impacted by physical and socioeconomic dynamics in the catchment.

Catchment characteristics such as water availability, quality and withdrawal rates can all impact mining and metals operations. While these dynamics may seem obvious, they are complex and require a relatively sophisticated understanding of the multiple and competing pressures on water resources from a range of users. Social pressures, developmental priorities and national, regional or local policy changes may also impact the operation. The catchment-based approach to water management seeks to draw attention to the complex nature of water risks and identify response options in instances where risks arise, or require action, outside the operational boundaries of the mine.

3 Alliance for Water Stewardship (2014). *The AWS International Water Stewardship Standard*.

1.1 THE BUSINESS CASE FOR CATCHMENT-BASED WATER MANAGEMENT

1.1.2 Understand the true value of water

Water is a fundamental resource for both people and mining and metals operations

Water is fundamental to life, human dignity and functional ecosystems. Water is also the lifeblood of many industries, from agriculture to manufacturing, energy generation and mining. Yet, this critical shared resource is under increasing stress, highlighted by business leaders as one of the great sustainability challenges of the twenty-first century.[4]

Pragmatic solutions to this challenge will require a deep understanding of the way that a diverse range of stakeholders value water and a critical recognition that managing water is fundamentally different and more complex than managing carbon or other natural resources.

Why water is different

- Catchments are fragile ecosystems on which human settlements have historically depended for drinking water and sustenance, as well as social, cultural, economic and spiritual well-being. However, these social, cultural and ecological dimensions are juxtaposed with the economic value of water related to its use in various production processes. Without understanding the value of water from the perspective of diverse stakeholders, mining companies may pursue behaviours and take actions that could undermine trust and destroy relationships, while also increasing the cost of doing business.
- Water availability is variable in time and space, while the short- and long-term future availability is uncertain. One river catchment may be suffering extended drought while neighbouring catchments may be experiencing devastating floods. Equally, a catchment may experience droughts and floods in quick succession. Understanding operational and strategic risk around water is therefore different from other natural resources.
- Water is a finite but renewable resource, the availability of which is physically constrained by infrastructure and legally constrained by historical water rights systems. Although it may be more efficiently used, water cannot be substituted in most domestic and productive activities, and so even the most efficient operations can have an impact. The risks associated with scarcity are therefore very real at a catchment scale. Put simply, while there may be substitutes for carbon in energy production, only water can be used to drink or for irrigation.
- Water is, essentially, a regional product. It is bulky and costly to move in the volumes typically required for production, which limits the distance it can be transferred between catchments. Because of this, and because of the fundamental flow of water from upstream to downstream users, risks and responses must be understood at a catchment scale.

From water management to water stewardship

The multidimensional nature of water presents a complex set of challenges and requires that mining companies see water management as more than simply a supply cost to operations. In reality, operations, corporate head office and senior management need to understand the value of water to their operations and their social licence to operate in order to prioritize resources and mitigations of risk accordingly. This requires a fundamental shift in traditional operations-based water "management" approaches towards a holistic, business-wide understanding, communication and integration of material water risks into company governance and resourcing structures.

4 World Economic Forum (2015). *Global risks 2015: 10th edition*. Insight report.

1.1 THE BUSINESS CASE FOR CATCHMENT-BASED WATER MANAGEMENT

1.1.2 Understand the true value of water (cont)

Water valuation

While mining and metals companies understand the immediate economic cost of water (such as water input costs), there are a range of other environmental, social and political risks associated with water that can have significant tangible financial implications for the business. For example, mining companies often fail to reflect the true cost of managing water from a technical perspective across the life cycle of a mine. Technical uncertainty can lead to poor management of issues around water surplus, water deficit, failure to dewater ahead of mine plan or lack of environmental compliance, resulting in significant operational risk. In addition, mine closure plans have often been observed to underestimate the costs of rehabilitation and the long-term liabilities of treating mine-impacted water for many years after the point of closure.

Poor social management of water (for example, lack of inclusive community engagement, participatory monitoring programs, etc) can lead to the erosion of stakeholder relationships and ultimately the loss of the company's social licence to operate. Several mining companies have had operations shut down or put on hold due to community-led protests, many of which centred around water issues. This can result in costly delays, regulatory pressure, lack of access to permits and challenges to future mine expansions.

The costs of operational controls and mitigation programs to deal with the risks outlined above are hard to quantify and often subsumed in operating and capital expenditure figures. However, the consideration and integration of water valuation across the daily planning and operating processes of mining and metals companies should enable innovative forward-looking solutions to be developed that both protect and create significant business value.

How does water valuation benefit mining and metals companies?

Understanding water costs
Identifying water-related risks, and the cost of interventions, allows for the development of more comprehensive and accurate planning and cash-flow forecasts.

Enhancing decision making
By estimating the cost of inaction, budget owners are provided with a decision support tool and motivation to take action to manage water resources and protect the value of the operation. This can enhance collaboration and inform behaviours and actions. Valuation can allow companies to make better decisions about capital allocation – with a fuller understanding of project costs across its life cycle.

Protecting value
Valuation can help companies deliver and demonstrate how interventions can create shared value, providing a communication tool to support building trust and enhance licence to operate through improved transparency.

Supporting tools

World Business Council for Sustainable Development's (WBCSD)
Water valuation: building the business case and
Business guide to water valuation

International Finance Corporation's (IFC)
Financial Valuation Tool and draft discussion paper
Water, mining and communities: creating shared value through sustainable water management

Morgan Stanley's
Investing with impact: creating financial, social and environmental value

Ecolab and Trucost's
Water Risk Monetizer

1.1 THE BUSINESS CASE FOR CATCHMENT-BASED WATER MANAGEMENT

1.1.3 Understand water as a business risk

Mining and metals operations may face a range of risks as a result of water-related events as shown in Figure 3. This guide will help the industry better understand those risks and support the identification of appropriate responses through taking a catchment-based approach to water management. While many companies already have sound operational water management strategies and protocols in place, there is a fundamental need to consider water use in the context of its local availability and demand. This means that while operational performance is key, locally effective water management strategies will need to take into account a number of direct, indirect and catchment-scale risks that extend beyond the operational fence line.

Each of these risk categories may result in reduced operational performance, increased costs, short-term shutdowns and even mine closure. Collectively, these risks have the potential to create a severe and negative impact on the net present value of the mine and thus impact shareholder value.

Figure 3: **Different catagories of water risks encountered**

DIRECT RISKS	INDIRECT RISKS	CATCHMENT RISKS
Occurrence When water issues directly impact the operations, such as through physical constraints and security of supply	**Occurrence** As a result of the operation's impacts on downstream water resources, manifesting through, for example, social activism disrupting operations, regulatory changes or stringent licensing conditions	**Occurrence** Relating to conditions within the catchment that may not be directly related to the mine, but may have implications for broader catchment governance, management, regulation and socio-political conditions
Potential impacts • Project delivery overruns and escalating costs • Output slow-downs with the potential for suspension of operations • Supply chain disruption	**Potential impacts** • Increased costs of regulatory compliance • Remediation costs • Failure to secure licences and permits or limits on extraction quantities • Social activism – community outrage	**Potential impacts** • Reduction in social licence to operate from negative brand and reputation • Erosion of shareholder value • Disinvestment • Future land access curtailed
Example Widespread flooding of coal-producing regions in Queensland during 2011 resulted in billion dollar production losses	**Example** Concerns regarding the impacts of mine expansion plans on water security at Minera Yanacocha S.R.L's mine led to community resistance and the ultimate suspension of planned exploration of a nearby mountain	**Example** The health of community members in the Witbank Coalfield area was impacted by contaminated drinking water from upstream users. This led to community protests and costly delays to operations despite the incident not being directly related to the mine

1.1 THE BUSINESS CASE FOR CATCHMENT-BASED WATER MANAGEMENT

1.1.3 Understand water as a business risk (cont)

Different operations face different challenges

Mining and metals operations will face different water-related risks depending on the specific operation's vulnerability to different water issues and the presence or likelihood of those risks occurring in a specific catchment. A list of generic water-related risks for the industry are outlined in Figure 4 together with some examples of how these risks could arise during the operation's life cycle.

Figure 4: Commonly encountered water risks

RISK CATEGORY	EXAMPLES (NON-EXHAUSTIVE)
Water security in the catchment	Climate-induced rainfall variability and supply system variability
Water supply system reliability	Failing or inadequate supply infrastructure
Dewatering and drawdown	Failure to dewater ahead of mine plan
Regulatory compliance	Challenging or changing compliance standards
Flooding	Extreme rainfall events causing excess surface run-off and water inundation
Surplus water management	Costs involved in moving surplus water to local demand point, or treating and injecting water back into the aquifer
Deterioration of receiving water from operation activities	Airborne contaminants emitted by smelting operations affecting sensitive water and terrestrial ecosystems in the catchment
Cumulative impacts	Impacts of multiple mining or metals companies operating in the catchment affecting both the physical operation of the mine or the regulatory regime for mine approvals
Post-closure water treatment	Re-establishing the hydrological regime post closure to meet stakeholder expectations
Catchment water degradation by other water users	Pollution from other water users that affect the quality of drinking water
Community issues and concerns	Communities opposed to development of the operation due to water-related concerns; failure to engage communities and respond to their priorities
Catchment governance (social, economic, environmental)	Changes in the developmental priorities of policymakers that impact licensing or availability
Institutional performance	Variable or limited institutional capacity to manage and administer water

1.2 CORPORATE APPROACHES TO WATER STEWARDSHIP

1.2.1 Review what water stewardship means for your company

Effective stewardship of water resources has become a priority across the mining and metals sector. However, companies understand stewardship in different ways, and the local context of individual operations will mean that water stewardship translates into different management strategies in different locations. In reviewing what water stewardship means for your company, it is important to understand the local context, current policies/strategies in place and internal capacity for addressing water risks at a catchment scale.

Be aware of your corporate strategy for water stewardship

Aligning activity to a clearly stated corporate objective will help secure support and buy-in across the business. In order to do this, individuals responsible for water management and performance should:

- review current corporate sustainability strategies, annual sustainability reports and water management strategies
- look to identify guiding principles that may already be established in environmental and cumulative impact assessments, environmental management systems or internal company water standards and management protocols
- understand the way in which operational risks imposed by external factors are proactively managed and what plans are in place to respond if these events occur
- consider recent statements by leadership/management on the issue of water management and stewardship.

Be aware of what resources exist and where the company's areas of excellence are regarding water management

In order to obtain a thorough understanding of the company standards, individuals should consult with company experts or centres of excellence to consider what leading practice in holistic water management means for their organization. Corporate water submission to the CDP (or other disclosure platforms such as the Global Reporting Initiative (GRI) etc) should be consulted along with leading practice guidance (such as the Alliance for Water Stewardship framework, *Western Australia water in mining guideline*, etc).

This exercise should be thought of as a current state assessment or internal benchmarking exercise to identify areas of excellence within the company to aid understanding of how water risks may be incorporated into corporate risk management, strategies and reporting.

"In order to obtain a thorough understanding of the company standards, individuals should consult with company experts or centres of excellence to consider what leading practice in holistic water management means for their organization"

1.2 CORPORATE APPROACHES TO WATER STEWARDSHIP

1.2.2 Be aware of how peers are approaching water issues

Considering how others manage water risks can help prioritize areas for action

Considering your own operation's or company's performance against peers, within and outside the sector, will help prioritize and motivate areas for action. Benchmarking performance against other water users (agribusiness, hydroelectricity providers, etc) operating in the same landscape will also help raise awareness of common water risks and help identify the level of activity and leadership required for a more comprehensive, locally suited water management approach.

In order to conduct qualitative benchmarking, companies can download peer-group submissions to the Carbon Disclosure Project, reviewing metals and mining sector-specific summary reports and looking at other relevant industry sustainability reports. It is worth noting that many companies view water risks as "pre-competitive" and are willing to share approaches to assessing and managing catchment-based water risk.[5] This exercise should begin with looking at operational water management, and it should consider the extent to which catchment-based water risks are recognized, tracked and acted upon.

From this basis, decisions can be made about where there may be:

- standard industry practices that are not being met, where immediate action is required
- areas of opportunity as a result of high performance
- opportunities for collaboration and sharing of resources to manage mutual potential risks
- lessons that can be learned from others' approaches to addressing water issues, such as alternative stakeholder engagement practices or new technologies.

These insights should inform decisions about the preferred level of performance for the company, taking into consideration the local context, overall business strategy, risk appetite and an assessment of the resources required for moving to a position of leadership versus the impacts of minimal action.

Qualitative benchmarking should be a prelude to establishing a corporate or operational-level ambition for water risk management.

5 For an example of how this works in practice, members may wish to explore the experience of the IFC in convening roundtable industry and community workshops in Mongolia, in: IFC (2014). Water, mining and communities: creating shared value through sustainable water management. Draft discussion paper.

1.2 CORPORATE APPROACHES TO WATER STEWARDSHIP

1.2.3 Consider water stewardship across the mine life cycle

Consider how different water stewardship issues could emerge at different stages of the mine life cycle

The evolving nature of catchment conditions and mining activities, compounded by potential impacts from climate change and an unpredictable hydrological landscape, result in various water risks emerging at different stages across the life cycle of the mine. To anticipate likely water demands, changes to conditions in the catchment and their associated risks, the interplay between baseline conditions (prior to operations), current operating conditions, the natural variability of hydrological conditions and the social, developmental and political landscape in which the mine is operating must be understood. More detail on assessing these risks is provided in Step 2 of this guide.

It is important to recognize that the magnitude of water risk will change across the mine life cycle and that the identification and mitigation of risks that may occur in the future (such as at the point of closure) requires operational decisions and adaptive management plans to be put in place in the very early stages of the mine's life cycle.

To understand how water stewardship issues may arise across the different stages of the mine life cycle, users of this guide may wish to consider the following hypothetical scenario in Figure 5 in which a new coal mining site is to be established.

Figure 5: Hypothetical scenario in which a new coal mining site is to be established

WATER STEWARDSHIP ACROSS THE MINE LIFE CYCLE

ESTABLISHMENT	OPERATIONS	CLOSURE
Exploration (Pre-)Feasibility Studies Construction	Production Expansion	Decommissioning Rehabilitation
Water intake at the mine is required to be of a sufficient quality, therefore water quality concerns could surface most prominently during the establishment stage. These concerns will also resonate with local stakeholders, reflecting their experiences with historical acid rock drainage (ARD) in the region. This may increase community resistance for expanded mine activities in the future.	While the mine is in operation, water availability could, in water-constrained regions with poor access, cause both antipathy from local communities and introduce operational constraints through restricted water supplies. These constraints could be compounded should the region experience increased physical water stress due to drought or sustained reduction in surface water due to climatic changes.	During the closure stage, the mine would need to invest in efforts to ameliorate the impact of ARD. This may mean treating mine-impacted water in perpetuity. The mine may also need to respond to the introduction of new and costly regulatory requirements in order to secure closure permits. While the cost of these activities will take place during operations and closure, mitigation responses and resources for closure activities will need to be considered at the establishment phase of the mine life cycle.

1.3 BROADER CATCHMENT ACTIVITIES, PROCESSES AND REGIMES

1.3.1 Be aware of catchment institutional arrangements

Institutional arrangements shape the regulatory environment in which mining and metals operations take place

Mining and metals companies are keenly aware of the compliance requirements for their operations. However, close attention should also be paid to understanding the institutional dynamics and factors that can cause these rules to change in the future. This applies across the national, state/provincial and local scale where different institutions may be involved in regulating or setting the rules under which mines must operate.

For this reason, it is important to understand which institutions are responsible for key-related functions in the catchment. These include:

- water resources regulation, including water allocation, management and licensing – this may be a government department, water authority or catchment agency/authority
- water resources infrastructure development and operation – a government department, utility provider or a private concessioner
- water supply and sanitation services (including bulk water supply) – national, state or local government departments or alternatively a public or private water company
- setting regulations relating to the environment, mineral resources, land or agriculture and other catchment functions such as waste discharge or catchment rehabilitation – regulatory authorities, government ministries or development agencies.

Companies should also be aware of:

- the time horizons over which institutions may adjust regulation of the water sector
- the major national developmental imperatives and the implications these may create for how institutions govern and regulate water now and in the future.

In addition to institutional arrangement and regulatory timeframes, the institutional strength and capacity of local authorities to deliver services and manage catchment challenges as they arise should also be assessed. Limited resources of local government institutions may have implications for the expectations communities have of mining operations and other industrial water users in the catchment along with implications for the reliability of water supply over time. More detail on assessing institutional arrangements and capacity is provided in Step 2 of this guide.

It is useful to identify whether compliance standards set by policymakers exceed or fall short of company best practice. In instances where national, regional or local regulation is weaker than global company protocols, there may be an opportunity to engage with the regulator(s) on good practice and/or take a leadership position.

1.3 BROADER CATCHMENT ACTIVITIES, PROCESSES AND REGIMES

1.3.2 Be aware of catchment management planning and strategies

Catchment management planning frameworks and strategies may be a source of useful information for the sector. They may also impact mining and metals operations over time.

Many water management authorities will have catchment management guidelines and planning frameworks in place. In some instances, these guidelines are produced by government entities to support more effective industry approaches to catchment-based water risk management.[6] However, on the whole, these documents usually serve to assist authorities in integrating different administrative, planning and regulatory systems along with multiple water user demands across the catchment for more strategic and cohesive land, water and biodiversity management.

Catchment management strategies (CMSs) are informed by these planning frameworks and often provide useful insights into how water risks can be identified, while also outlining general management principles and action plans for interventions by local authorities in the catchment. From the perspective of mining and metals operations, CMSs are valuable in their provision of synthesized information, highlighting key areas of concern, singling out high-value water assets and providing insight into evolving regulatory requirements. As such, they should be understood and used to inform company-specific water management objectives and limitations as part of the planning and assessment stage.

CMSs can also be used as key reference documents for data-gathering purposes on technical information such as the hydrological and water user dynamics in a given area or a particular operation. They also help provide a holistic overview and link to other spatial, infrastructure and sector development plans at state/provincial or local level, which are critical sources of information about demographic and economic projections, as well as strategic intent and resource allocation by government.

To ensure full awareness of relevant catchment management planning and CMSs, mining and metals companies should consider whether they:

- understand what existing and pending CMSs may cover in the area in which their operation functions
- understand which agency/institution is responsible for developing and delivering that strategy
- have read the strategy and ascertained if there are likely to be implications, on water availability, quality or cost, that would materially affect the operation in the short, medium and long term.

6 See *Western Australian water in mining guideline* and *European water stewardship standard*.

INTERNAL ACTION

Motivate a team and assess governance

Purpose of this step

To mobilize internal resources and optimize internal structures and processes to achieve the outcomes of the awareness phase. The steps listed here should be considered concurrently with the other steps associated with the awareness phase.

1. Motivate and align a cross-functional team

a. Mobilize a team with a combination of relevant skills (water specialist, community relations, risk, finance, planning)

b. Consider the need to train business functions in the technical, social, cultural and political aspects of water management

c. Define high-level roles and responsibilities for the team to ensure effective water management

d. Codify and agree on a simple team charter, a set of objectives and criteria for evaluating success

2. Assess internal governance structures

a. Consider the maturity and effectiveness of the company's internal governance structure for managing water

b. Secure executive sponsorship and buy-in from senior executives

c. Raise awareness around key decision points, resources required and long-term timeframes for water management – as distinct from mine development timeframes

d. Establish an appropriate water stewardship champion

3. Assess internal processes

a. Assess current internal understanding of water and water-related issues, and identify gaps/barriers to effective water stewardship (eg skills and resources, as well as robust political and social understanding that reflects the nuances of particular cultural contexts)

EXTERNAL ENGAGEMENT

Identify stakeholders, clarify concerns and aspirations

Purpose of this step

To allow for an understanding of who the stakeholders in the catchment are and which engagement forums exist, as well as the risks and opportunities of partnering with identified stakeholders/forums. Early stakeholder engagement will inform the understanding of social risk, so the steps listed here should be considered concurrently with other aspects of the awareness phase and in particular when mobilizing internal teams and establishing the business case for catchment-based water management.

"When stakeholders experience or perceive a problem during exploration, development, or mining operations, it generally becomes a 'real' problem for the company, irrespective of whether there is evidence of company impacts. When there is a relationship built on trust between the company and the community, dialogue and meaningful participation can assuage fears, suspicions, and anxieties"

IFC (2014). Water, mining and communities: creating shared value through sustainable water management. Draft discussion paper.

1. Map the relevant stakeholders in the catchment

a. Establish who the water users in the catchment are

b. Evaluate the perceptions of other water users – map issues as a basis for monitoring

To undertake these steps, companies can utilize ICMM's Stakeholder Identification, and other community development tools, which can be found in ICMM's Community Development Toolkit. Companies can also refer to the IFC's A strategic approach to early stakeholder engagement.

2. Understand local practices, beliefs and customs regarding water resources

a. Gain awareness of local practices, customs and beliefs around water resources

b. Be aware of local society's understanding of water cycle functions and water issues

c. Access stakeholders' current understanding of the catchment and what activities can impact water access and quality

d. Assess stakeholder understanding and perceptions of mining processes and how they relate to water use and quality in the catchment

3. Evaluate existing stakeholder forums and identify opportunities for dialogue and collaboration

a. Establish which stakeholder forums already exist – local water committees, dialogue tables, data-sharing or industry/user forums, etc

b. Identify external experts/parties who could be engaged to serve as advisors to the company and to support building constructive partnerships in the greater catchment

c. Identify opportunities for collaboration and/or sharing of resources among other mining and metals operations or cross-sector peers in the catchment

d. Consider how information is shared on water issues in the catchment, and whether there is a need to develop a water training program to build common knowledge across stakeholders

4. Clarify aspirations and concerns of key stakeholders

a. Establish stakeholders' expectations of the engagement process

b. Establish stakeholders' expectations and concerns regarding the operation of the mine or metals project

c. Convene internal company and trusted external advisors to assess early opportunities for engagement, levels of knowledge sharing and information required, level of company participation in forums/stakeholder groups and level of external stakeholder participation in catchment collaboration plans

STEP 2
ASSESSMENT

THROUGH SCREENING A COMPLEX MIX OF POSSIBLE ISSUES IN THE CATCHMENT, COMPANIES CAN IDENTIFY MATERIAL RISKS.

Key content of this step

2.1 Define the operation's functional boundary and identify major issues

Outcome

Identification of the operation's functional boundary and associated major issues

2.2 Understand the water issues in the catchment

Outcome

A clear understanding of the catchment characteristics and how they may evolve over time

2.3 Understand water issues across the mine life cycle

Outcome

A clear understanding of the vulnerability and total cost of managing water for the operation

2.4 Understand the operation's catchment risks

Outcome

Prioritization of the operation's water risks in the catchment across its life cycle

Stakeholder engagement

An explanatory note on Step 2

This step provides guidance on the water issues that may arise both from a catchment and operational lens. It will provide users with a series of prompts and questions to ensure that the most relevant information is being collected and considered. It should be noted that although the following steps are laid out sequentially, this is not a purely linear process. Constant iteration and refinement is needed in light of new information and changing circumstances.

An Excel-based action register (see the attachments panel) has been developed as a resource to help users note down responses to the questions and prompts contained in the Assessment step of the guide.

2.1 DEFINE THE OPERATION'S FUNCTIONAL BOUNDARY AND IDENTIFY MAJOR ISSUES

2.1.1 Identify physical, social, economic and environmental elements

Purpose of this step

To define the functional boundary of the mining or metals operation by:

- evaluating the physical characteristics of the hydrological system
- identifying environmental, social, economic and institutional systems operating within the catchment
- identifying the areas that stakeholders perceive the company has influence over (see Step 2.1.2), which could include:
  - catchments associated with the upstream water supply
  - groundwater aquifers that cross catchment boundaries, which are relevant if boreholes are being used.

QUESTIONS	CONSIDERATIONS ON HOW TO DO THIS	RESOURCES
What is the hydrological extent of the catchment in which the mining or metals operation is situated?	Defining the relevant biophysical aspects of the catchment helps identify the area and hydrological dynamics that can both impact and be impacted by operations: • Have you defined the catchment's hydrological boundary, upstream and downstream of the operation? • Have you identified all surface and groundwater sources, as well as the relationship between the two? • Can you identify groundwater aquifers that cross the catchment boundary and their recharge rates? • Can you identify the water supply that supports the operation and if this originates outside the catchment? • Are there any other transfer systems in the catchment? • At what scale have relevant physical studies been undertaken (catchment or sub-catchment)? • To what extent has the catchment's biophysical dynamics been assessed and understood – where are the unknowns? • Have you engaged other mining and metals companies to explore opportunities to share useful hydrological data?	• Hydrological and geohydrological assessments • Mine operational plans • Local catchment institutions • Water resources institutions • Environmental impact assessments (EIAs)
What are the ecological, social, economic and institutional systems of the catchment?	Ecological, social, economic and institutional systems also need to be identified when defining the functional boundary of an operation: • Is this a primarily rural, agricultural, urban or industrial catchment? • What is the jurisdiction of any water management institution responsible for the catchment? • Do local or district administrative boundaries cross into another catchment? • Are there holes or inconsistencies in the jurisdiction/institutional boundaries? • Do land/native title agreements/informal agreements exist, and if so what do they cover? • Is the operation in a development zone or corridor that crosses catchments? • Are there plans for new mines or other industrial operations to open or close, either upstream or downstream of your operation? How will this affect existing operations in terms of water requirements? • Are there ecologically sensitive or protected biodiversity areas in the catchment? • Are there areas or water bodies within the catchment that have specific cultural or spiritual significance to local communities?	• Natural resources management plans/ strategies for the basin • Water service provider • Environmental and social impact assessments (ESIAs) and EIAs • Local municipality documents on the area • Regional catchment assessments • Biodiversity resources • Natural Capital Project's Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) tool • Integrated Biodiversity Assessment Tool (ibat)

2.1 DEFINE THE OPERATION'S FUNCTIONAL BOUNDARY AND IDENTIFY MAJOR ISSUES

2.1.2 Identify stakeholder concerns and perceptions

Purpose of this step

To define the areas that stakeholders perceive the company has influence over. Local stakeholder concerns about mining and metals operations' impacts in the water catchment, whether real or perceived, need to be understood and proactively managed as social risks to effective water management can be substantial.

QUESTIONS	CONSIDERATIONS ON HOW TO DO THIS	RESOURCES
Map stakeholders	• Who are the other water users in the catchment and have their needs been modelled/mapped? • Have you identified industrial, commercial and domestic users? • Have you distinguished between upstream and downstream users?	• Catchment forums • Local government databases
What are the local stakeholder concerns for the catchment?	Local stakeholders within the catchment may have particular concerns with regards to water quality or quantity, as well as broader institutional and social-related grievances that link to water issues: • Are there concerns around extreme or seasonal events (floods or droughts)? • Are there issues related to reliable access to basic human needs such as drinking water or sanitation? • Are there concerns around equitable access to water? • Are there water-sensitive ecosystems or cultural areas in the catchment? • Are there community economic concerns or perceptions that mineral resources are not benefiting local people?	• Operation's community relations department • Catchment supply and quality statistics • Water Action Hub • WaterAid's briefing note Universal access by 2030 • Perception surveys, social media • CEO Water Mandate's Guidance on human rights to water
Are any of the local stakeholder concerns linked with the operation's activities, and what is the nature of stakeholders' perceptions?	Local stakeholder concerns in the catchment may be directly or indirectly associated with the operation itself, and may result in social licence or reputational risks to the operation: • Are local community members employed by the operation aware of water issues, and could this be an opportunity for education and communication with the broader community? • Are there non-water-related issues fuelling resistance to the operation, such as noise pollution or dust? • Is there political rhetoric about the operation, which may translate to water-focused issues? • Are other users voicing concerns over water allocation or water quality impacts, and are concerns being channelled through appropriate catchment/governance forums? • Are there water-related cumulative impacts in the catchment from other industrial water users or from previous mining or metals operations that could cause resistance to current operations?	• Operation's community relations department • Stakeholder forums • Local media • Perception surveys, social media • Municipal forums • Catchment forums
Which areas do stakeholders perceive the operation to have influence over?	To determine how stakeholder concerns influence the functional boundary of the mining or metals operation, companies should ask: • Do stakeholders perceive watercourses far downstream to be impacted by the operation? • What are the areas in proximity to the operation that stakeholders are concerned about and/or perceive as being impacted by the operations	• Perception surveys, social media • Operation's community relations department

HYPOTHETICAL EXAMPLE

Defining the scope of the catchment

Purpose of this example

This hypothetical case study has been developed to help bring to life the process steps and guidance provided above. It aims to provide a narrative to illustrate how the above steps might be applied. It is not intended to be exhaustive.

Background

Your mine is located in an established Water Management Area (WMA) in South Africa. The WMA is subdivided into numerous catchments and sub-catchments. The area is rich in geohydrological resources.

Water resources in the catchment are regulated by the national Department of Water Affairs (DWA) and managed by the provincial DWA; the water services are administered by the local water service provider.

Although managed at the administrative level (ie government and municipalities), separate parastatal institutions have been set up to manage and co-ordinate the environmental and ecological systems of the country.

You are the operational water manager at the mine.
You have reviewed the guide and are keen to test out the steps it proposes.

Hypothetical activities

- You begin by reviewing a recent hydrological assessment your mine commissioned. This clarifies the area that supplies water to the mine and gives you a clear indication of the downstream areas that receive mine-impacted water. You identify that a significant proportion of water originates from an aquifer over 50km away in a separate catchment.
- You review economic activities in the catchment and establish that a smelting operation and a number of light industrial sites are being built upstream. You note this potential impact on water demand and water quality.
- In addition to consulting with the DWA, you visit the local catchment management agency (CMA) to understand plans for industrial sites and clarify if the outlying aquifer is under their control. They tell you it is, and say that they are concerned about local biodiversity downstream of your operations and that water quality standards will be reviewed in the coming years.
- Armed with this information, you are able to clarify the functional boundary of the mine. You decide to include the outlying aquifer in this definition as although it is outside your immediate area of operation, its management has implications for water availability.
- You are also interested in the biodiversity issue raised by the CMA. You try to get a better understanding of this and other stakeholder and community water concerns. You decide to take note of all the concerns and issues that are raised, such as poor water quality, water shortages during the dry season and unemployment in the region. This is because you know that both real and perceived impacts will have implications for the mine, and you are aware that these need to be managed carefully. To obtain further information, you decide to contact the internal community liaison department, as well as participating in various stakeholder and community forums.

Tools and resources

- Consult regional hydrological maps
- Distil information from site EIAs
- Consult with relevant institutions and regulating bodies
- Review institutional studies
- Consult catchment management authority reviews and technical reports
- Consult internal community liaison department that has conducted its own research
- Engage in catchment stakeholder forums and local community forums

2.2 UNDERSTAND THE WATER ISSUES IN THE CATCHMENT

2.2.1 Assess the biophysical character of the catchment

Purpose of this step

To investigate how the the natural, climatic, hydrological and infrastructural aspects of the catchment interact to influence water quality and availability.

QUESTIONS	CONSIDERATIONS ON HOW TO DO THIS	RESOURCES
Is the water demand and availability in balance?	It is essential to understand whether current and future water availability meets demand of all water users and the sustainable function of ecosystems: • Is there a catchment, sub-catchment or quaternary catchment assessment, and does it indicate supply/demand imbalance? • Do users experience reduced availability during dry seasons? • Does a management plan indicate reliability concerns, and does it consider evolving user dynamics? • Has groundwater changed over time, and are you likely to face inundation from excess groundwater? • How might water surplus from dewatering activities affect the catchment, for example through discharge, transfer of water surplus out of the catchment or demand creation? • Are projected demands likely to exceed availability? • Do climate projections indicate a future supply challenge? • Have uncertainty and predictive limits of the water resource been considered in water studies, and hydrological modelling etc? • What is the potential error in water balance predictions, and do management plans and existing strategies reflect this potential error?	• Water resources management strategies and plans • Climate change projections • World Resources Institute's (WRI) Aqueduct tool • WWF's Water Risk Filter • Global Drought Information System • WBCSD's Global water tool • GEMI's Local Water Tool
Are there challenges associated with the catchment's hydrological characteristics?	The natural characteristics of the catchment determine the hydrological dynamics and the availability and quality of water. Changes to this environment have implications that need to be understood: • Do you have a clear baseline against which you can gauge changes in biodiversity, deforestation, desertification, land use and demography in the catchment? • Are you aware of major erosion or topographical changes in the catchment? • Have studies indicated deterioration in the hydrological characteristics of the catchment? • Do you understand the catchment's geochemistry and the impact this may have on water quality? • Are significant flooding/drought events taking place or expected to take place due to climate variability, deforestation, development etc? • Has an assessment of climate change impacts been performed for this specific area? • What is the primary hydrological or climatic parameter that could lead to uncertainty or error in water balance predictions.	• Natural resources strategies and plans • Local vegetative, soil and topographical surveys • Hydrological surveys from metrological bodies • Geochemical models • EIAs • WRI's Global Forest Watch
What is the quality of surface water and groundwater in the catchment?	The quality of surface water and groundwater in the catchment indicates the water management practices of current and previous water users in the system: • Do existing management plans indicate that water quality in the catchment is a concern? • Have you identified water quality problems related to your wastewater systems? • Does water quality deterioration have a negative impact on the fitness of water for use? • Does future climatic variability have implications for water quality?	• Water resources strategies and plans • WRI's Aqueduct tool • Global Drought Information System • EIAs

2.2 UNDERSTAND THE WATER ISSUES IN THE CATCHMENT

2.2.2 Clarify the regulatory and institutional framework

Purpose of this step

To investigate the ability of the catchment's regulating institution(s) to manage the catchment, as well as the ability of the water utility to provide water to the relevant users.

QUESTIONS	CONSIDERATIONS ON HOW TO DO THIS	RESOURCES
What is the national, regional and local institutional and regulatory environment?	It is essential to consider who manages water regulations at a national, regional and local level. The reliability and predictability of institutional governance should also be investigated: • Is it clear which institutions design and implement regulation at national, state and catchment level? • Is there clarity on the policy and legal requirements for both mining and metals operations and regulating bodies? • Is the regulatory environment stable and predictable? • Are regulations applied and enforced consistently and fairly? • Could the cost of water change in the short and medium term as a result of potential new regulation?	• National, regional and local government authorities • Catchment management institutions
What is the capacity of the regulator, management institutions and utilities to deliver effective services?	It is important to understand the institutional strength and capacity of the water regulator, management institutions and water infrastructure utilities. Operations should understand whether these institutions have adequate capacity to manage catchment challenges, planning, monitoring and enforcement responsibilities for normal, drought and flood periods: • Does the regulator or management authority have sufficient technical capacity and staff to enforce and police water regulation? • Is the regulator's decision-making process understood? • Does non-compliance have consequences? • Do utilities have the technical and financial capacity to operate the infrastructure systems effectively and to ensure appropriate maintenance for long-term sustainable supply? • Do utilities have adequate plans for infrastructure development to meet evolving demands? • Are the institutions' resources sustainable in the long term (or are there plans to become sustainable)?	• Development plans • Local government authorities • Catchment management institutions • Water resources management strategies and plans
Is the water allocation supported by adequate infrastructure?	The capacity and reliability of water supply infrastructure need to be understood, considering variations in water quantity and quality, as well as the impact of flood events on the system's ability to operate: • Is there adequate infrastructure to reliably supply water demand? • Are there periods when supply infrastructure fails? • Are there plans in place to increase infrastructure capacity to meet demand, and are they realistic? • Does the regulatory framework allow for water users to find/access water resources or do they have to purchase water or water rights? • Are there regional treatment works to ensure adequate water quality? • Is infrastructure for flood risk warning and management sufficient?	• Development plans • Water resources management strategies and plans

2.2 UNDERSTAND THE WATER ISSUES IN THE CATCHMENT

2.2.3 Evaluate the socioeconomic and ecological aspects of the catchment

Purpose of this step

To explore socioeconomic and ecological issues that influence water dynamics in the catchment. This analysis should flag the needs of water users and give an indication of where there may be competition for access to water of sufficient quality. Understanding these issues will provide insight into the water requirements of ecosystems and their dependent communities across the greater catchment.

QUESTIONS	CONSIDERATIONS ON HOW TO DO THIS	RESOURCES
What are the development objectives of the catchment?	It is essential to consider how economic and social development plans will influence water allocation in the catchment: • What are the regional development plans, and do they include water-dependent sectors? • Is there a clear prioritization of water users? • How will the water user patterns and demands for water change due to developmental changes? • How will development plans and changes in water users impact water allocation? • How will changes in climate impact development plans?	• Local economic development plans • Spatial development plans • Catchment institutions • ESIAs
Do all water users have access to adequate quality water?	Water users have water quantity requirements of a specific quality (eg for drinking water); upstream users should thus anticipate how their water use and discharge will impact on downstream users: • What are the quantity and quality requirements for upstream and downstream users? • Do local communities have access to water? • Where do local communities get their water? • How reliable are those sources to support local livelihoods? • Are local water resources adequate and safe? • Do local communities have access to sanitation services, or could water resources be contaminated by human waste?	• Local development plans • Catchment institutions • Spatial development plans • ESIAs • WaterAid's briefing note Universal access by 2030 • WBCSD's WASH pledge • CEO Water Mandate's Guidance on human rights to water
What are the economic activities, ecosystems and socially and culturally sensitive areas in the catchment?	Economic activities, as well as ecologically, socially and culturally sensitive areas in the catchment, are dependent on sufficient water of a specific quality. Mining and metals operations need to understand the sensitivity of the water resource and its dependent communities and ecosystems in order to ensure that management measures reflect the potential impacts of operations: • Have early warning triggers and thresholds or sustainability estimates been established for the water resource? • What are the water-dependent economic activities in the catchment, and what are their water quality requirements? • Are there sensitive ecosystems in the catchment, and are they under pressure or endangered? • What socially and culturally sensitive areas exist in the catchment? • Are any of the sensitive areas perceived as priority areas (or areas of high value) by relevant stakeholders? • How will flooding, drought or changes in water quantity and quality affect these sensitive areas?	• Climate change projections • Natural resources management plans • Local development plans • Catchment institutions • GDP statistics and local economic resources • ESIAs • Natural Capital Project's InVEST tool • ibat tool

HYPOTHETICAL EXAMPLE

Understanding water issues in the catchment

Background

The catchment from which you draw water is stressed and in deficit. As the region has variable seasonal rainfall, the catchment experiences significant rates of soil erosion as well as flooding during the summer rains. In addition, the water in the catchment is of a poor quality due to faecal contamination from poorly planned rural settlements and acid rock drainage from an abandoned mine shaft upstream from your operation. The water treatment infrastructure, as well as other water-related infrastructure, is able to meet the demands of the catchment. However, poor maintenance and skills shortages often result in failure during flood events.

The policy and regulatory environment is relatively stable although not necessarily well enforced. This is mainly due to resource shortages in key departments. There are regulatory changes on the horizon as water quality standards are expected to be updated shortly. In addition, current improvements to the water sector funding mechanisms and the water service provider's financial management structures will result in increased investment in infrastructure.

There is high competition for water in the catchment from a wide variety of water users and water quality concerns from domestic and agricultural users. There are, however, some strategic water users who receive priority for water access (as stipulated by the national regulatory framework).

Fishing is an important livelihood for communities situated downstream from your operations. A protected national park, containing endangered fish and amphibian species, is also located downstream along with the territory of the indigenous Bapedi people. Concerns have been expressed about the loss of their cultural heritage due to loss of land to industrial activities and poor water quality for the Bapedi population and their livestock.

Hypothetical activities

- You begin by reviewing recent natural resource management plans, and discover that although the catchment is in deficit, climate change predictions indicate that rainfall will increase. However, demand is also expected to increase, impacting the water availability in the catchment.
- You also discover that the Department of Environmental Affairs is initiating a program that will stabilize the slopes in the river basin, thus decreasing the erosion and limiting deforestation.
- After consultations with the local water service provider, you discover that there are plans to construct water treatment facilities in the next four years, thus improving the quality of water in the catchment. This is essential as the local economic development plan predicts an increase in water use in the catchment due to expanding coal mining activities.
- You also take note of the predicted changes in the water quality standards as this will likely impact your discharge licence conditions.
- You visit the local land-use planning, economic development and social services departments. You also engage with local NGOs, academics and community groups to form a better understanding about who the local water users are and what their water needs may look like in the near future.
- Through engaging with the rural communities in the area, you are able to better understand their various water needs and concerns over the loss of their cultural heritage. You learn that as they are currently not connected to the water service provider's distribution network, they use water directly from the river. The wide variety of water users and the predicted increases in future demand pose a concern for you as this will likely result in changes in water allocation.
- This fact-gathering process has provided a clear picture of the current and predicted water issues in the catchment area.

Tools and resources

- Consult with relevant institutions and regulating bodies
- Consult regional natural resource strategies and plans
- Distil information from site EIAs and ESIAs
- Consult with internal biophysical and social departments
- Conduct primary stakeholder engagement with local NGOs, community groups and academic experts
- Review biodiversity assessments
- Review local economic, spatial and social development plans

2.3 UNDERSTAND WATER ISSUES ACROSS THE MINE LIFE CYCLE

2.3.1 Understand how water supply requirements change over the mine life cycle

Purpose of this step

To understand water supply risk across the different phases of the operation's life cycle. Mining and metals operations may represent a large proportion of a catchment's water use, and even the most water-efficient operations may have significant impacts on a catchment in stress. Therefore, understanding the operational water balance and its impact on the catchment's water balance is critical.

QUESTIONS	CONSIDERATIONS ON HOW TO DO THIS	RESOURCES
What are the water quality and quantity requirements of the operation over its life cycle?	• Have you established a range of water balance scenarios/predictions that consider potential impacts to the operation's water supply – for example, geochemical changes affecting water quality, climatic projections affecting water quantity, changes over time in water availability if and when the mine progresses below the water table, etc? • Are operations vulnerable to supply shortages? • Do operations face particular quality constraints, and is there sufficient access to the water quality required? • How vulnerable are different parts of the operation's activities to flooding (considering both pluvial and fluvial forms of flooding) and groundwater intrusion? • Are water balance scenarios or predictions adequately resourced and integrated into the operation's mine plan? • Do you anticipate specific water supply risks to manifest as a result of particular production processes or closure activities? • Have you identified specific water challenges associated with closure?	• Operational plans and existing risk assessments • Existing water balance scenarios or models • Mine closure plans
What are the water supply costs for the operation over time?	The cost of water and the proportional contribution it makes to total operational expenditure will change over an operation's life cycle. While the unit price of water tends to be quite low, the value of water to the productive capacity of the operation is high (see Step 1.1.2). Understanding the role of water in creating value for the operation and anticipating the changing cost profile over time can support effective management action to minimize risks: • Have you estimated the costs of managing water over the entire life cycle of your operation, including supply limitation risks, water surplus (that may require dewatering), social water management risks and those costs associated with closure and in perpetuity liability? • Have you considered the potential need to obtain water from new or alternative sources and the costs associated with changing the operation's source of water supply? • How do you expect the operational costs of supplying and managing water to increase or decrease over the next 5, 10 and 15 years?	• Mine operational plans • Mine closure plans • Catchment management institutions/plans • Water service provider's strategic plan

2.3 UNDERSTAND WATER ISSUES ACROSS THE MINE LIFE CYCLE

2.3.2 Understand the management requirements of mine-impacted water

Purpose of this step

The quantity of mine-impacted water may vary as activities shift over the life cycle of the operation. Equally, the requirements for how operations treat surplus water, effluent and tailings will differ across the type of metal or mineral being mined or processed – for example, coal/platinum/iron ore or above ground/underground/below water table operations. The quality requirements and both the direct and indirect costs of managing effluent, water discharge and water associated with tailings over the operation's life cycle are critical to consider early in the planning stages. Consideration of the challenges around managing water at the point of closure is particularly important to ensure that the cash-flow model and net present value of the operation over its lifespan is accurate.

QUESTIONS	CONSIDERATIONS ON HOW TO DO THIS	RESOURCES
What are the management requirements for treating mine-impacted water?	• Have you estimated the quality of effluent that is likely to be discharged by your operation? • Is the capacity of your wastewater treatment facility adequate (in terms of regulation and operational needs) to process excess wastewater, for example from flooding due to climate variability? • Do climate events such as flooding of waste management facilities result in an increase of effluent from the operation (eg flooding of landfill site)? • Do you understand how effluent, dewatering and wastewater treatment needs may change over time as a result of changing activities within the mine? • For operations taking place below the water table, do you understand the dewatering volume profile of your operation over time? Is there a peak dewatering volume early in the establishment stages as water is removed from the aquifer? Will inflows progressively increase as the mine deepens? If you are transferring surplus water to meet third party demand, how will this need be addressed post closure? • Do you have a plan in place to respond to changing wastewater management requirements across the life cycle of the mine? • How are your operations planning for water management post closure?	• Mine operational plans • GEMI's Local Water Tool • Mine closure plans • ICMM's *Planning for Integrated Mine Closure: Toolkit*
What is the cost of managing mine-impacted water across the operation's life cycle?	The cost of managing water discharge or effluent will vary across the operation's life cycle. A holistic understanding and integration of these costs into the mine plan is essential from an operational, regulatory and reputational perspective: • For operations taking place below the water table, does your mine plan reflect the costs of intercepting groundwater, treating and returning the water to below ground, transferring it to a third party or controlling release of the water to the surrounding environment? What are the contingency costs associated with these practices in terms of infrastructure, permits, reputational risks, etc? • Have you estimated the potential cost of addressing wastewater issues over the full life cycle of the operation and particularly at the point of closure? • Have you made provision for post-closure water management costs, and is that reflected in the operation's cash-flow model? • What arrangements are in place to hand over or maintain infrastructure at the end of the operation's life?	• Mine operational plans • Mine closure plans • IFC's Financial Valuation Tool • Ceres Aqua Gauge • ICMM's *Planning for Integrated Mine Closure: Toolkit*

2.3 UNDERSTAND WATER ISSUES ACROSS THE MINE LIFE CYCLE

2.3.3 Consider regulatory, development and social aspects of operations

Purpose of this step

The regulatory (permit and licence) compliance requirements for operations are significant. As the operation progresses through the stages of its life cycle (including possible expansions), licensing and permits may need to be renewed. Social licence to operate is equally important to consider as a shift in local stakeholder perceptions can drive conflict and ultimately lead to changes in regulation over time.

QUESTIONS	CONSIDERATIONS ON HOW TO DO THIS	RESOURCES
Are your licences and permits adequate for the different needs of the operation over its life cycle?	Licensing and permits for water abstraction, wastewater treatment and water discharge are an essential prerequisite for a mine or metals operation. The requirements for obtaining them may change over the life cycle of the operation and should be carefully considered: • Are your licences up to date? • How critical are the licensed volumes or quality characteristics to achieving the mine's operational requirements? • Do you anticipate obtaining future licences easily, and are there specific criteria that you need to meet that may require you to take action (eg the installation of infrastructure)? • Do planned or existing licence conditions pose the potential to limit future operational plans?	• Mine operational plans • Water use licensing department • Perception surveys
Will you need additional or renewed licences and permits to meet future expansion requirements?	During the life cycle of the operation, there may be plans for expansions and regulatory requirements may shift. These developments may require additional or renewed licences. It is important to consider what the new licence requirements may be and understand the time/costs of obtaining them: • How stable is the regulatory institution that sets licensing/permit requirements? • How is water legislation expected to change in the future? • Have you considered the lead time for changing/updating licences? • Are existing operational licences limiting development or expansion, and was this a deliberate approval strategy that needs revision? • Have mine closure requirements been taken into account as part of your licence and permit planning?	• Mine operational plans • Local government authorities • Mine closure plans • Legislative monitoring tools or companies' government relations department
How might social issues affect your licence conditions?	Social issues, especially in instances where local communities are closely dependent on the operation, may drive conflict or lead to regulatory change. Establishing and maintaining a trusting relationship with the community through open and regular dialogue is key to understanding the concerns of local stakeholders and pre-empting potential operational and/or regulatory risks: • Do you understand the major social issues facing the local community? • Are you tracking the perception that relevant national and international stakeholder groups (such as NGO and investor communities) have of your role and responsibilities in addressing these issues?	• Local community • Multi-stakeholder advisory groups • Local network of mining associations • Local and international media • Legal journals and media specific to the water sector

HYPOTHETICAL EXAMPLE

Understanding water issues across the mine's life cycle

Background

As a coal mine, your operations require sizeable volumes of water across the production cycle. However, the water quantity and quality requirements vary across the different facilities within the mine. As the mine is projected to expand in seven years' time, the water requirements are projected to increase until two of the current mining sites are closed. The entire lifespan of the operations is 16 years, after which water requirements will drastically decrease, with only the rehabilitation staff remaining on-site.

Wastewater and waste treatment requirements are expected to follow a similar trend to that of water supply, with the exception being the post-closure management of wastewater. The mine has an on-site landfill, as well as a tailings dam, which often gets flooded during the high rainfall periods. High rainfall also results in flooded coal resources.

The mine has all the essential licences for its water and wastewater discharge requirements. However, the predicted expansion will require additional licences, and the local legislature requires licences to be renewed every five years.

The region has a high cost for basic services, and this is projected to increase steadily in the coming years. As the mine has an internal wastewater treatment facility, the costs of treating the water are internalized.

The region has also experienced high levels of social protest in recent months. The rural and informal urban communities do not have access to water and are dependent on the mine to provide basic services and employment opportunities.

Hypothetical activities

- To begin your assessment, you consult colleagues from across the mine's operational sites in order to investigate the water requirements across the various facilities, and over the lifespan of the mine. With the aid of the mine's recently updated operational plan, you are able to determine the approximate changes in water and wastewater requirements over the next five years.
- You discover that the administration and residential buildings require potable water, but the wastewater can be recycled and reused for other mine processes. This is because some mine processes (such as dust suppression) only require clean water (and not potable water), and this can be obtained from sources other than the municipal water network. Alternate sources available for the processing activities therefore include water emanating from the administrative and residential buildings, which can be recycled and reused.
- Through consultations with the finance department, who also review the cost forecasts from the water service provider, you discover that the cost of water is a huge concern for the mine. In addition, internal infrastructure (ie the wastewater treatment facility) has high maintenance and management costs.
- Through consultations with the legal department and water managers, as well as the social department, you discover that there are plans to increase water supply to local communities over the next two years. This has the potential to impact water allocation when you renew your licence in three years' time. As the settlements are located downstream, you are also concerned about your discharge permit.
- This assessment has provided a clear picture of both current and future water requirements for the mine, as well as estimating the total cost of water and wastewater treatment across the life cycle of the mine.

Tools and resources

- Review internal mine operational plans and closure plans
- consult with internal water resources and social departments
- consult with other internal departments
- review documentation from the water service provider
- review local infrastructure and social development plans
- consult with relevant institutions and regulating bodies
- consult with existing mining operations

2.4 UNDERSTAND THE OPERATION'S CATCHMENT RISKS

2.4.1 Identify water-related risks

Purpose of this step

While each operation's risks are different, there are a number of commonly encountered water risks. These can be direct operational risks or arise from the conjunction of operation and catchment vulnerability. Understanding these generic risks can help companies quickly screen a complex array of possible issues and identify those risks material to the operation.

Considerations

There are numerous risks that may impact operations and create risks for the trust and reputation of the company. The list in Figure 6 provides an overview of common water risks that may be relevant for operations to consider. It is important to acknowledge that this list is not exhaustive, but rather that it serves as a potential framework for companies to use as a quick prompt to identify their own material risks. Where a company has its own water-related risk categories, it is appropriate to use these. However, definition and identification of water risks should consider the interaction between the operation's vulnerability and catchment characteristics.

Figure 6: Commonly encountered water risks

GENERIC CATEGORIES OF WATER RISK	SUBCATEGORY
Water security in the catchment	Climate-change-induced variability
	Changing patterns of supply
Water supply system reliability	Infrastructure security
Flooding/dewatering	Water inundation
	Water surplus
Regulatory compliance	
Deterioration of receiving water from operational actions	Post-closure water treatment
Catchment and receiving water degradation from external issues	Water pollution incidents
Community issues and concerns	Community expectations
	Community perceptions
Institutional performance	Upstream infrastructure failure
Catchment governance (social, economic, environmental)	Political interference
Increasing cost of water	Cost of water treatment

2.4 UNDERSTAND THE OPERATION'S CATCHMENT RISKS

2.4.2 Assess the pathways associated with the key risks

Purpose of this step

Water-related risks manifest through direct impacts on operations', indirectly through reputational or regulatory influences where the operation's water use and activities impact other users and, more broadly, through regulatory changes due to catchment conditions not related to the operation. Understanding the risk pathway is important in prioritizing risks and identifying responses.

Assess the causes and consequences of water risks

Describing the pathway through which a risk will manifest enables more targeted and effective responses. It is important to distinguish the causes that are related to the catchment conditions and mining or metals operation, as well as assessing the way in which consequences relate to operational vulnerability or catchment characteristics.

This can be achieved through a cause–consequence analysis, which can provide a pictorial illustration of the risk assessment. The "bow-tie risk assessment" is an example of such an analysis as it allows for the identification of the cause and consequence for each water risk.

QUESTIONS	CONSIDERATIONS ON HOW TO DO THIS	RESOURCES
What are the direct risks that are likely to impact the operation?	Direct (primary) risks occur when water issues directly impact the operation, such as through physical constraints. It is essential to consider the importance of water on internal activities, how water issues will impact the costs associated with the operation over time (and possibly result in a decrease in the mine's net present value). These direct risks largely relate to water availability and supply, water discharge quality and wet weather flooding management.	• Internal risk assessment framework
What are the indirect risks associated with the operation's activities?	Indirect (secondary) risks arise as a result of the operation's impacts on "downstream" water resources that may result in social activism or regulatory changes affecting or disrupting operations. It is therefore essential to consider the importance of the operation's water use and discharge on other users and ecosystems in the catchment, whether this impact is real or perceived. Indirect risks largely relate to impacts of the operation's water demand (on water availability and allocation to other users) and waste discharge (on downstream water quality).	• Internal risk assessment framework • Media, NGO commentary • Surveys
What are the broader catchment risks that may affect mining or metals operations?	Catchment (tertiary) risks arise from conditions upstream, downstream and across the entire catchment and may have implications for operations in terms of regulation, management and governance of the catchment. Catchment risks may manifest through social or political tensions; ecological sensitivities; and planning, development and governance issues. Examples include disruption of water supply, changing water allocation mechanisms, upstream water pollution incidents or increased social activism over unmet developmental needs.	• Internal risk assessment framework • Catchment management institutions

2.4 UNDERSTAND THE OPERATION'S CATCHMENT RISKS

2.4.3 Prioritize and identify material risks

Purpose of this step

Internal risk assessment and risk management strategies should be used to rank risks and to identify materiality. This should incorporate the significance of impact on the operation and the likelihood of its occurrence in the catchment, as well as the ability of the operation to control or influence the specific risk.

Considerations

Where possible, operations should rank the magnitude of water risks through the use of their existing internal risk assessment processes. This will ensure that water risk is embedded in corporate risk assessment processes and is immediately recognizable to the business. It is also useful to ensure that risk assessments are included in financial risk management and attempts to consider how water will impact the net present value of the operation throughout the different stages of its life cycle. Figure 7 provides a stylized illustration of how this risk process works.

Figure 7: Example of a bow-tie risk assessment

CATCHMENT CHARACTER [STEP 2.2]		OPERATIONAL VULNERABILITY [STEP 2.3]		MATERIAL RISKS
Water balance	+	Water quality and quantity requirements across different facilities	=	Water security in the catchment
Hydrological characteristics		Water quality and quantity requirements throughout life cycle		Water supply system reliability
Water allocation and distribution		Cost of water throughout life cycle		Regulatory compliance
Quality of groundwater and surface water		Mine-impacted water discharge requirements across different facilities		Flooding/dewatering
Regulatory environment		Mine-impacted water discharge throughout life cycle		Deterioration of receiving water from operation's activities
Key catchment institutions		Waste treatment and management costs throughout life cycle		Catchment and receiving water degradation from external issues
Institutional capacity		Current licences and permit requirements throughout life cycle		Community issues and concerns
Infrastructure capacity		Future licences and permit requirements and renewals		Catchment governance (social, economic, environmental)
Catchment development plans		Social issues affecting operations		Increasing cost of water
Adequate access for all users				Institutional performance
Economic, social and cultural sensitivity				
Ecological Sensitivity				

RISK PATHWAY (DIRECT, INDIRECT OR CATCHMENT)

HYPOTHETICAL EXAMPLE

Understanding the operation's catchment risks

Background

After reading through the guide, you realize there are a range of catchment dynamics that, when combined with the operations's own vulnerabilities, have the potential to lead to material water risks that will need to be managed. You now seek to interrogate these issues in more detail.

Tools and resources

- Internal risk assessment framework
- ISO 31000 framework

Hypothetical activities

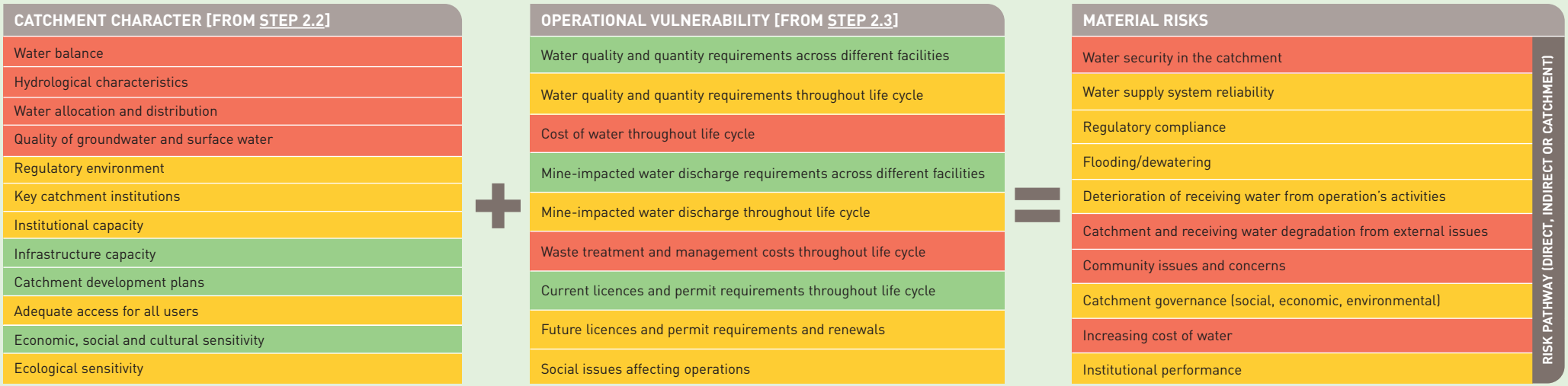
To begin the assessment, you consult the operation's internal risk assessment framework and the well-established ISO 31000 risk management framework. You then explore how catchment issues, identified in Step 2.2, have the potential to interact with operational vulnerability to create catchment-based risks for the operation. To help identify the materiality of these different risks, you undertake a qualitative "traffic light" scoring approach to represent the significance of the risk, as shown in Figure 8. For example, the catchment is in deficit (red colour in Column 1), and although the mine has adaptive water management approaches such as recycling and water treatment (green colour in Column 2), water security in the catchment is an area of concern (red colour in Column 3).

In identifying material risks, you recognize that you should consider both the significance of impact on the operation and the likelihood of its occurrence in the catchment. You also seek to understand the operation's ability to control or influence the risk. This allows you to filter out easily addressed issues and highlight the major material concerns that require a response (see Step 3).

Your assessment has allowed you to prioritize the risks, and you have identified the following material risks:

- water security in the catchment
- catchment and receiving water degradation from external issues
- community issues and concerns
- increasing cost of water.

Figure 8: **Identification of operational water risks through assessing catchment characteristics and operational vulnerabilities**



INTERNAL ACTION

Engage cross-functional teams

Purpose of this step

To engage cross-functional teams and build water stewardship into internal structures and processes to support the risk assessment phase. The steps here should be considered concurrently with the other steps associated with the assessment phase.

1. Engage cross-functional teams in risk and vulnerability assessment

a. Bring representatives from key parts of the organization together to participate in collective risk assessment process (community engagement; operations; health, safety and environment; risk management etc)

b. Use internal risk assessment procedures where relevant

2. Build water stewardship into internal structures and processes

a. Establish appropriate governance structures for water stewardship and water risk management

b. Incorporate water stewardship into all relevant strategies, plans and procedures

c. Incorporate water stewardship aspects into relevant roles and responsibilities

d. Consider incorporating water stewardship aspects into individual key performance indicators

EXTERNAL ENGAGEMENT

Clarify engagement objectives and initiate iterative consultation

Purpose of this step

To allow for proper identification of all stakeholder issues and concerns. The steps listed here should be considered concurrently with the other steps associated with the assessment phase.

1. Clarify objectives of the engagement process

a. Inform external stakeholder groups of your role as a mine or metals refinery operator and clarify your interests in engaging with them

b. Listen to their perspectives and understand their expectations of your role and the results of engagement

2. Define stakeholder participation process

a. Develop a clear plan for which stakeholders will be engaged and which forums will be used

b. Define the objectives for engagement and frequency of interaction

   i. Consult stakeholders to provide an opportunity for input

   ii. Define a stakeholder complaint and feedback mechanism

   iii. Involve stakeholders to provide an opportunity for dialogue and interaction

c. Define key indicators of progress or challenges

3. Consult stakeholders to execute an iterative participation process to identify issues and perceptions

a. Initiate consultation with stakeholders to understand their issues and perceptions

b. Several consultation sessions should be conducted to ensure that trust is built, various stakeholders are consulted and all issues are addressed

STEP 3
RESPONSE

ONCE IT HAS BEEN DETERMINED THAT AN EXTERNAL RESPONSE IS REQUIRED, COMPANIES SHOULD CRITICALLY CONSIDER THE RANGE OF POSSIBLE RESPONSE OPTIONS AVAILABLE.

Key content of this step

3.1 Understand response options to mitigate water risk

Outcome

Evaluation of potential response options to mitigate priority water risks

3.2 Evaluate potential responses

Outcome

Evaluation of potential interventions, including partners, risks and benefits

3.3 Develop a response strategy

Final outcome

Development of response strategy and water risk governance arrangements

Stakeholder engagement

3.1 UNDERSTAND RESPONSE OPTIONS TO MITIGATE WATER RISK

3.1.1 Determine if water risks can be mitigated by internal action

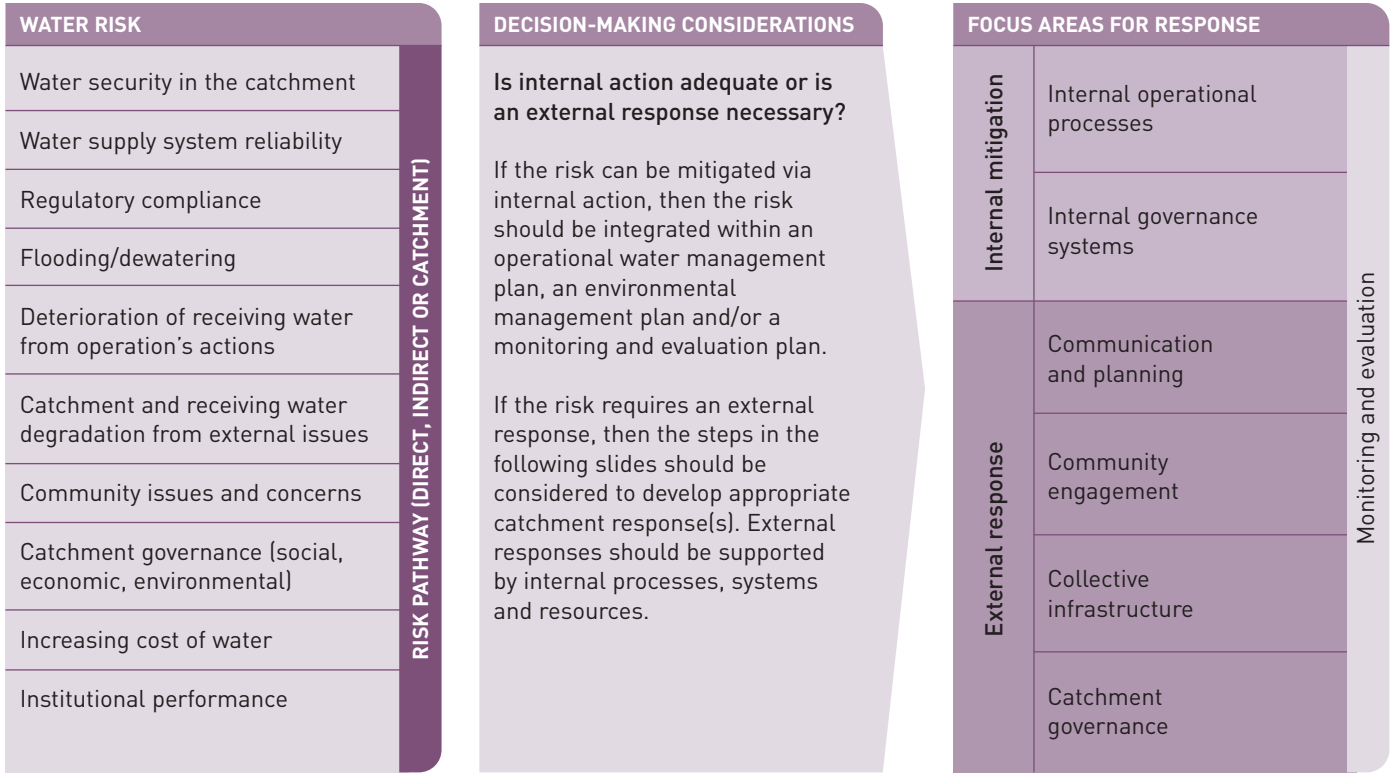
Purpose of this step

To determine whether the risk can be mitigated through internal action, or if it requires an external response (or a combination of the two). It should be recognized that external options need only be considered if internal action and appropriate risk monitoring systems are not adequate to mitigate these risks.

Before responding, companies should understand their risks and consider internal response options

Figure 9 illustrates a simple stylized approach for matching risks to response categories. Mining and metals operations should carefully consider the nature of their water risk (based on the insights developed in Step 2) and then assess whether the risk can be adequately managed and supported by the implementation of appropriate internal governance and monitoring systems (to monitor possible changes in catchment conditions or emergence of new risks). An assessment of the cause and consequence pathways provides the information to support this exercise. It is recognized that in reality many response options will require a mixture of internal and external activities, and the framework shown here merely serves as a model to help users explore the relative degree of focus.

Figure 9: Matching risks to response categories



3.1 UNDERSTAND RESPONSE OPTIONS TO MITIGATE WATER RISK

3.1.1 Determine if water risks can be mitigated by internal action (cont)

If internal action is identified as being the most appropriate response, it should be aligned with existing company risk management policies and procedures.

The risk should be:

- immediately shared with the individual or team who manages operational water risk
- managed via existing corporate risk management procedures using established principles such as the hierarchy of controls, illustrated in Figure 10, and with consideration of ISO 31000 – Risk Management
- managed with the support of internal resources such as finances, human resources and time.

Figure 10: Standard hierarchy of controls' hazard management procedure

HIERARCHY OF CONTROLS	EXPLANATION	EXAMPLES
Elimination	Eliminating the water hazard is the most effective hazard control for water risk management	Use of filtered tailings to avoid water-retaining tailings dams
Substitution	Substitution involves replacing something that produces a water hazard (similar to elimination) with something that does not	Replacing a constrained water supply with another source such as desalinated water
Engineering controls	While engineering controls do not eliminate water hazards, they isolate people from hazards and minimize the impact of the hazard	Adding variable speed drives to a pumping system to match water supply with demand; adding railings to pump barge and floating walkways
Administrative controls	Administrative controls are changes to the way people work and may involve education, water use efficiency, monitoring or changing work patterns to minimize exposure to a hazard	Regularly completing leak detection investigations on buried pipe systems to identify and reduce water losses
Personal protective equipment	Providing protective equipment reduces the impact of a water hazard on individuals	Use of personal flotation device when collecting water samples from deep or fast-moving water bodies

DECREASING EFFECTIVENESS

INCREASING EASE TO IMPLEMENT

3.1 UNDERSTAND RESPONSE OPTIONS TO MITIGATE WATER RISK

3.1.2 Identify potential external response options

Purpose of this step

To understand the range of response options available, and consider the situations in which different classes of response options are valuable, the costs and effort required to pursue them and the risks inherent in implementing them.

There are different types of response options available to companies that involve acting outside the operational boundary

Once it has been determined that an external response is required – requiring companies to act outside their direct operational sphere of control – companies should critically consider the range of possible response options available. Four generic categories of catchment responses are outlined in the diagram, delineated by the kind of risk encountered, as well as the site-specific context. There is no one-size-fits-all approach, but you should be aware of, and consider the suitability of, costs, capabilities and timeframes typically required to pursue each form of response. Identifying responses that address specific mining- and metals-related water risks should be based on the understanding gained in Step 2, including where along the cause and consequence pathway the response is focused.

RESPONSE EXAMPLES	SUITABILITY EXAMPLES	COST AND RESOURCES	CAPABILITIES TO DELIVER	DURATION
Communication and planning • Share collected water risk data • Include stakeholders in monitoring • Fund a catchment strategy • Jointly monitor water resources	Community concerns about the quality of local water as a result of mining or smelting activities	Ranking Low/moderate/high	• Technical expertise • Stakeholder capacity-building skills	Short to long term (across the life of the operation)
Community engagement • Conduct hygiene awareness • Consult community on mine water • Rehabilitate local water supply • Operate community water supply	Strong community concerns about mining/metal operation's impact on water or high expectations for the company's role in the community	Ranking Low/moderate/high	• Community and stakeholder engagement specialists	Short to long term (across the life of the operation)
Catchment governance • Promote farm water use efficiency • Participate in catchment forums • Build regulator capacity • Implement joint early warning	Limited regulatory capacity but complex hydrology requires a catchment management plan reflecting the interests of multiple stakeholders	Ranking Low/moderate/high	• Strong operational performance • Capacity to drive sustained and constructive engagement with policymakers and regulators	Long term only
Collective infrastructure • Advocate passive treatment • Plan coherent flood management • Contribute to infrastructure finance • Jointly treat regional mine water	Instances where water supply and quality may be limited due to insufficient infrastructure capacity or functioning	Ranking Low/moderate/high	• Construction capability • Ability to engage and negotiate with municipalities • A mandate to commission infrastructure	Long term only

3.2 EVALUATE POTENTIAL RESPONSES

3.2.1 Consider opportunities for engaging other partners

Purpose of this step

To understand the company's internal levels of commitment and capacity in terms of time, human and financial resources. Developing partnerships and engaging in productive multi-stakeholder collaboration may not be part of a mining or metals company's core competency. Before committing to a specific catchment-based response, companies should understand their own internal capacity and consider the ambition and capacity of other partners (ie communities, NGO groups, government or other mining and metals operations) to meaningfully engage.

The CEO Water Mandate's guide to water-related collective action

Opportunities, benefits and risks of partnerships

Successful partnerships create a space for mining and metals companies to build productive relationships with other companies, local communities, NGOs and regulators. These can help share the burden of mitigating risks, identifying opportunities, increasing stakeholder trust, building workforce satisfaction/retention and enhancing brand value. These opportunities are especially pertinent where water-related risks cannot be managed alone and the alternative to a productive partnership is increased operational challenges and costs. Clearly, successful partnerships deliver benefits to operations and help manage risk.

There are, however, risks and challenges in establishing partnerships. In some cases, private sector engagement may be construed as an attempt to unduly influence or "capture" a particular agenda and can be perceived as being purely self-interested. Engaging with partners has cost implications and requires resources via additional staff time to maintain frequent and adequate communication. The expectations arising from a partnership also require close and careful management. If the company's interests, objectives, role and exit strategy are not clear, misaligned expectations from partners may have negative consequences for building and maintaining trust with key stakeholders.

Understand partnership and collaboration models

In light of the opportunities, benefits and risks of engagement, there are a range of approaches companies may take to partnerships or collaboration. There are also a number of considerations that are important for managing external stakeholder interactions and supporting responses to catchment-related issues. There is a large body of literature on this topic, including the CEO Water Mandate's *Guide to water-related collective action*, which users may wish to consult in order to build further understanding.

The CEO Water Mandate's guide identifies four levels of collective action. Each level reflects an increasing degree of commitment and interdependency; understanding these can help companies assess the types of interventions suitable for them:

- Sharing information (informative) focuses on the co-ordination and sharing of information among interested parties.
- Seeking advice (consultative) includes the convening of specific interested parties to exchange ideas and expertise on the needs and challenges of the catchment.
- The pursuit of common objectives (collaborative) seeks to move interested partners together through the establishment of common objectives and shared implementation of responsibilities.
- Integrating decisions, resources and actions (integrative) is the result of alignment of interests, resources, decision making and co-ordinated action to meet the water-related challenges or opportunities in the basin.

3.2 EVALUATE POTENTIAL RESPONSES

3.2.1 Consider opportunities for engaging other partners (cont)

How to build partnerships

Partnerships/collective action will be most successful when tailored to and reflective of the motivation and capacity of all parties involved. For example:

- A mining or metals company may identify the potential for a certain form of partnership to add value – for instance, a community water quality monitoring program that allows the community to objectively measure and monitor water quality around a mine and build confidence that mine operations are not disturbing water quality.
- Before designing and initiating a program, the mine should consider the assumptions, ability and willingness of the community to participate in the program. In instances where formal education may be limited, a program may need to be designed very differentially. Similarly, designing a program that reflects a purely scientific paradigm for understanding water may not resonate with communities who have a spiritual/religious perspective on the importance of water.

Considering capacity and interest

Different levels of response are associated with different levels of internal company and external partner interest and capacity to engage. The requirements for capacity and interest (and typically costs) vary depending on the engagement level (ie informative, consultative, collaborative or integrative) and increase dramatically for collaborative and integrative responses (as shown in Figure 11). Therefore, the selection of response options and the associated engagement levels should involve an assessment of the external party dependence as well as the interest and capacity of both the internal and external party.

External party dependence is an important factor to consider as higher dependency on external parties will require a more engaged form of collective action, which is resource and management intensive.

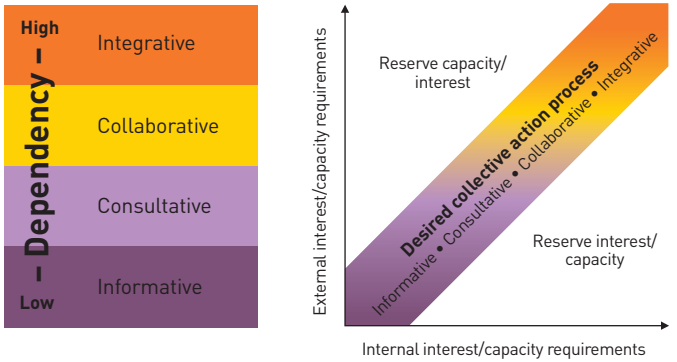
External party interest and capacity will enable or constrain the collective action engagement levels. If a more engaged level of collective action is desired, there will be a high demand on the interest and capacity of external parties. Low interest or low capacity should thus result in lower levels of collective action (eg informative).

Internal company interest and capacity will also enable or constrain the collective engagement options available to the company. Buy-in from senior executives and key staff members, and the securing of financial resources, will inevitably play a role in supporting or constraining engagement activities.

Skills and capabilities to establish and manage partnerships

The roles and capabilities needed to plan and run a successful partnership can be linked to the type and level of engagement that is being pursued. However, regardless of the level (informative to integrative), specialist skills may well be required and their availability carefully considered. Typical roles might include a partnership initiator, a convener, a process manager, a communications expert, technical specialists, third party funders and a recognized neutral party.

Figure 11: Mapping dependency, interest and capacity outcomes to collective action engagement levels



Source: CEO Water Mandate(2013). *Guide to water-related collective action.*

CASE STUDY OF A COLLECTIVE ACTION RESPONSE

Participatory water quality monitoring in the Athabasca Basin, Canada

Key issue

Community concerns regarding potential pollution of water resources

Collaborative solutions

- **Formation of a multi-stakeholder group including representatives from two mining companies and seven local communities**
- **Collective environmental monitoring program established**

Case study

The Athabasca Working Group (AWG) is a partnership established to implement an impact management agreement between local communities and uranium mining companies with operations in northern Saskatchewan, Canada. The AWG has a key role in addressing local concerns about potential environmental impacts of mining on the environment, including water quality, and ensures that the uranium mining industry maintains a positive working relationship with the local residents. The AWG comprises representatives from each of the seven communities within a 200km radius of the uranium mine sites and the two uranium mining companies (namely Areva and Cameco Corporation). The AWG programs are funded by the mining companies.

The AWG has established a community-based environmental monitoring program that assesses many parameters important to local residents, with a focus on local water quality and compares it to both reference locations and water quality guidelines. One of the most important elements of the program is that local residents take part in the sample collections each year, and it is independent of government and industry environmental monitoring. The program enables community members to collect their own environmental samples at the locations that are of most concern to them, which encourages data acceptance and promotes environmental protection, ensuring that water quality standards are maintained.

Quarterly meetings are held where AWG community representatives meet with personnel from the companies to review reports, discuss current community concerns and update the communities on exploration and mining activities and projects in the area. The AWG is part of a larger context of northern community relations undertaken by the uranium mining industry in northern Saskatchewan.

Local residents take part in the water sample collections each year, and it is independent of government and industry environmental monitoring

CASE STUDY OF A COLLECTIVE ACTION RESPONSE

Creating shared value for business and communities

Key issues

- Water scarcity
- Lack of municipal water treatment infrastructure

Collaborative solutions

A public–private partnership to address water shortages and deliver wastewater solutions and potable water to local communities

Case study

Freeport-McMoRan operates the Cerro Verde copper and molybdenum mining complex located in an arid region on the west side of the Andes Mountain Range, 30km southwest of Arequipa, Peru. The city is reliant on the Chili River as the main source of water for the population, and for all economic activities in the region including agriculture, mining, commerce and tourism. Access to clean water is a major challenge due to population growth and the arid desert environment. While several dams and reservoirs have been developed, water supply is almost fully allocated. In addition, wastewater treatment capacity in the Arequipa Province is insufficient and, as a result, the Chili River has become contaminated with untreated residential and industrial sewage discharges, which impact water-reliant economic activities in the region.

Water for Cerro Verde's current processing operations comes from the regulated Chili River system, and as this water source is shared with all industrial and domestic water users in the catchment, consistent access to clean water is a critical concern for all stakeholders. With Cerro Verde's plans to expand operations, increased water supply was required, which was not available from existing sources on a permanent basis. In order to address the supply deficit, an innovative public–private partnership was initiated between Cerro Verde, civil society representatives, the local water utility company, local authorities and the central government to ensure the sustainable delivery of potable water and the treatment of the city's wastewater.

Following engagement with local, regional and national stakeholders, Cerro Verde developed a potable water treatment plant, treating water from the Chili River, to deliver clean drinking water for the people of Arequipa.

The plant currently provides water to over 300,000 people in the region and is projected to expand to 750,000 people. In addition, the construction of a water storage and distribution network was undertaken to ensure water resources reach a greater proportion of households in the city.

Treating wastewater for use at the expanded Cerro Verde operations was found to be the best of several alternatives for a long-term source of water for the mine. In response, a wastewater treatment plant is currently being constructed by Cerro Verde to treat most of the city's wastewater. Cerro Verde will pay for the design, engineering, construction, operation and maintenance of the system for the first two years, as well as for the pumping of water for at least 29 years.

This much needed infrastructure will improve regional water quality, reduce waterborne illnesses and enhance the value of local agricultural products while providing water for an economically important operational expansion for the region. The wastewater treatment plant will supplement water supplies to Cerro Verde, and will deliver an annual average of 1 cubic meter per second of treated water to the mine. Any excess treated water will be returned to the river for the local water utility company to allocate.

Together, the two plants, along with the storage and distribution network, are supplying clean drinking water to the people of Arequipa and will allow wastewater generated by the population to be treated. This will reduce the environmental and human health impacts of discharging untreated water into the Chili River. Cerro Verde's support for the facilities is aligned with its efforts to assist with the social needs of communities near the mine, and to create shared value for local water users.

3.2 EVALUATE POTENTIAL RESPONSES

3.2.2 Assess risks and opportunities for potential responses

Purpose of this step

Every external catchment response involves other parties and will require the allocation of resources from the company, which could pose additional costs and possible risks. Careful consideration of the potential risks and opportunities of the response, along with the costs of its implementation, is necessary in order to ensure that catchment responses are proportional and productive and minimize total risk.

Define possible interventions from the response options

The type of intervention required will depend upon the chosen response option (from Step 3.1), levels of engagement, company capacity and the risks and opportunities posed by that particular response option. These risks and opportunities may also shift over time as trust, interest and capacity evolve along with the nature of the catchment.

An important step towards developing a catchment-based response strategy is to clearly define the intervention that may be adopted.

Appropriate prompts include:

- Is the response proactively addressing the catchment-related causes or contributors to the risk?
- What level of engagement and commitment is required by the company to deliver this response?
- What level of cost and operational support is likely to be required, not only at present, but over the lifespan of the response option? Is this reflected in the budget and resources allocated, as well as in the monitoring systems planned?
- Who will need to be involved/partnered with in order to deliver the response, and are they credible and interested in the type of intervention proposed?
- What additional risks may be introduced by adopting the intervention, and have internal mitigation actions been assessed?
- How can the company reduce involvement or exit the partnership as the intervention succeeds and/or mining and metals activities are terminated (at closure or beyond)?

HYPOTHETICAL EXAMPLE

Selecting a response option to manage material water risks

Background

During the water risk assessment phase, you prioritized the operation's water risks and identified the following four material risks:

- water security in the catchment – as the catchment is in deficit
- community issues and concerns – due to perceived impact on water resources
- catchment and receiving water degradation from external causes – due to legacy issues
- increasing cost of water – due to projected increases in the price of water.

As these four material risks fall under all three of the risk pathways identified in Step 2.4.2, numerous response options will need to be investigated:

- If the catchment is in deficit, this is a direct risk as future water shortages will affect the operation.
- Perceived impact on water resources is an indirect risk as it may affect the operation through social activism and/or stringent licensing conditions.
- Legacy issues and the projected increase in the price of water are catchment risks. These risks involve changes to the catchment's condition that are not attributed to the mine.

The management of these risks will thus require the input and collaboration of both internal and external parties.

Tools and resources

- Internal risk management framework
- Discussion with potential external partners
- Consulting with internal departments (eg finance, risk, water)

Hypothetical activities

You recognize that in order to select a response option, you should first determine whether the risk can be mitigated through internal action or whether it requires an external response (or a combination of the two). Together with the risk management team, the water champion and other internal members, you look at the "Standard hierarchy of hazard controls" to help you decide which risks can be managed internally. This assessment provides you with the following insights:

- Potential future water shortages may be minimized through internal action such as internal engineering controls; external action will, however, prevent long-term water shortages.
- Perceived impact on water resources can be partially reduced through internal action such as the rehabilitation of natural resources. However, establishing a high standard of transparency and two-way, frequent communication with the local community is crucial. Continuing to build relationships through trust, meaningful participation and dialogue will require ongoing external action.
- Pollution legacy issues and the projected increase in the price of water cannot be eliminated through internal action. Although the mine can investigate various internal actions, such as promoting water use efficiency and minimizing wastewater discharge to minimize the impact, external action will be required.

The management of the water risks identified will require engagement and collaboration with external parties. You therefore conduct an assessment of the appetite and resource capacity of the potential partners. Other mining operations in the catchment are facing similar risks and are therefore willing to collaborate to develop mutually beneficial solutions. Although willing to participate, the local water service providers and regulators have short-term resource limitations (medium- and long-term resources are healthy). Local community leaders are willing to engage on collaboration opportunities but are deeply suspicious of the mine's intentions. The currently fragile relationships with stakeholders limit the mine's appetite to invest heavily in external infrastructure, and the mine will therefore focus on managing water risks by building partnerships (and external skills) and working together with partners (instead of driving processes) for the immediate future. You are now ready to prepare the following response strategies for the four material risks.

MATERIAL WATER RISK	INTERNAL RESPONSE	EXTERNAL RESPONSE
Potential future water shortages	Water storage facilities	Contribute to infrastructure finance
Perceived impact on water resources	Rehabilitate natural resources	Ongoing engagement, participatory monitoring and co-management of water
Pollution legacy issues	Minimize waste water discharge	Collective action and joint monitoring
Increasing cost of water	Promote water use efficiency	Build regulator capacity

3.3 DEVELOP A RESPONSE STRATEGY

3.3.1 Develop a response strategy, plan and governance

Purpose of this step

To develop of a clear strategy for delivering the identified responses, together with an implementation plan and established set of governance and monitoring arrangements. This will ensure goals are clear, resources are effectively mobilized and responsibility for delivery is established.

ICMM's Community Development Toolkit provides support for those looking to formulate a clear goal and establish a process for delivery

Response interventions should inform the development of a clear strategy for pursuing catchment-based water risk management

Once an appropriate set of response interventions have been identified, companies should bring together key internal personnel to develop a strategy for delivering them. This is a collaborative process in which the involvement of multidisciplinary teams and key management is important.

Not all identified interventions will necessarily be implemented immediately, so the strategic planning process will often be required to differentiate between those actions that can and should be initiated at the outset and those with medium- and longer-term actions.

In developing a strategy, companies should consider:

- the company's risk appetite and the degree of leadership ambition expressed for water stewardship issues
- whether preventative interventions or mitigating interventions are deemed to be most appropriate
- internal company resources, financial and human
- maturity of the catchment water stewardship environment.

The final strategy should include;

- a clearly stated objective
- a set of strategic actions
- a clear timeline/deadline for achieving the strategy
- a monitoring and evaluation plan to ensure progress is on track and to identify when corrective action is required
- a plan for ensuring continuous improvement and learning from responses
- definition of key roles and responsibilities.

Tools and further guidance for developing a strategy

Those looking for further guidance on the logical and process steps required to support the development of a strategy should refer to ICMM's Strategic Planning Framework, which can be found on page 85 of ICMM's *Community Development Toolkit*. This provides support for those looking to formulate a clear goal and establish a process for delivery.

INTERNAL ACTION

Communicate strategy and promote champions

Purpose of this step

To ensure that response decisions are clearly communicated and endorsed and that appropriate resources can be mobilized. The steps listed here should be considered concurrently with the other steps in the response phase.

1. Communicate strategy and promote champions

a. Ensure the chosen response strategy is understood among key business champions

b. Assign roles and responsibilities for implementing response strategy

c. Ensure regular communication of the strategy and progress towards its delivery in appropriate corporate/operation communications

d. Ensure appropriate training is identified and undertaken to enable key staff to be involved in delivering the strategy

EXTERNAL ENGAGEMENT

Communicate intentions, evaluate progress, maintain engagement

Purpose of this step

To ensure stakeholders are properly engaged, communication is structured and partnerships are regularly evaluated. The steps listed here should be considered concurrently with the other steps associated with the response phase.

1. Communicate intentions for partnerships and critically evaluate progress

a. Support clear stakeholder communication regarding the company's role in partnerships in order to avoid misperceptions

b. Provide support to transparently and regularly evaluate partnership performance, and where necessary, establish an appropriate exit plan

To support Step 1.b, companies can refer to ICMM's existing advice in the Indicator Development for community engagement and the broader suite of monitoring and evaluation tools that can be found from page 185 onwards in ICMM's *Community Development Toolkit*.