

# Completion criteria: the tension between certainty and flexibility

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## Abstract

*Completion criteria have long been an important part of closure planning because they establish levels of performance against which the success of mine closure can be assessed. However, they are often criticised as being poorly defined, making the performance expectation ambiguous, and lacking clarity that is needed for the regulator, community and the mining sector. It is best for all stakeholders when completion criteria are clear and measurable, and they provide certainty of outcomes.*

*There has been considerable focus by the sector on improving the level of specificity in completion criteria. This is especially true in Queensland (Australia), where the progressive rehabilitation and closure plan framework requires criteria to be specified for each milestone in the rehabilitation process. However, when completion criteria become very specific and prescriptive, agility can be difficult to achieve in response to unforeseen circumstances, innovation can be stifled, and both an administrative and compliance burden can be created. Further, if the prescriptions are not correct, it is possible to achieve completion criteria and yet still have poor outcomes.*

*There has been a shift in many jurisdictions towards outcome-based environmental regulation, recognised by the Australian government as best practice (Commonwealth of Australia 2016). The cited reasoning behind the shift is that it is the outcome that matters as it better caters for innovation and can be adjusted over time as necessary.*

*Is it possible to adopt outcome-based completion criteria that still provide an enforceable, auditable regulatory tool? This paper explores ways that the mining sector can take the learnings from environmental regulation reform and apply those concepts to the formulation of closure completion criteria.*

**Keywords:** *outcome-based, prescriptive, completion criteria, closure planning*

## 1 Introduction

Completion criteria establish levels of performance against which the success of closure can be assessed. In order to be effective they should be well defined, realistic and achievable so that all stakeholders understand what success looks like prior to, during and after rehabilitation activities occur.

There has been considerable focus by the sector on improving the level of specificity in closure completion criteria. As specificity increases, there is a tendency towards drafting of criteria with a more prescription-based mindset. Prescription-based approaches to regulation of performance have been criticised as making it more difficult to be agile in response to unforeseen circumstances, stifling innovation and creating both an administrative and compliance burden. Further, if the prescriptions are not correct, it is possible to achieve completion criteria and yet still have poor outcomes.

There has been a shift in many jurisdictions towards outcome-based environmental regulation since this gives regulated companies more flexibility in the way they operate while achieving the required outcome. This paper explores the application of outcome-based regulation of performance to completion criteria for

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the mining sector. It draws on experiences from regulatory regimes outside of mining to explore how it can be most effectively incorporated into the mining sector for formulation of closure completion criteria.

## 2 Regulation of performance

The measurement and regulation of performance is all around us. It is in building codes, construction specifications, the transport sector and virtually all systems within which the world operates. Mine closure is just another aspect that requires measurement and evaluation of performance to assess whether it has been successful and met the agreed objectives.

There are two broad approaches to regulating performance (Coglianese 2015):

- prescription-based — where the way the regulated entity must act is exactly specified, presumably in order to achieve a desired level of performance
- outcome-based (also referred to performance-based) — where the required outcome is defined but leaves the means of achieving that outcome to the discretion of the regulated entity.

An example of an outcome-based requirement, provided by Coglianese (2015), is that the US Consumer Product Safety Commission (CPSC) does not specify how manufacturers must package medicines to make it hard for children to open the packages and poison themselves. Instead, it imposes a performance standard for child-resistant packaging. Packaging manufacturers must test any new designs with a sample of four-year-old children who are instructed to open the package. The basic standard is that 85% of the children must be unable to open the package within five minutes. The CPSC does not tell manufacturers how to construct bottle caps or other child-resistant features of packaging; it just says the packages have to resist opening by the vast majority of children in tests.

Outcome-based conditions are not prescriptive. They allow opportunities for proponents to be pragmatic and innovative about how to achieve the outcome set in the condition, and to adopt an adaptive management approach to ensure conditions are met and/or to demonstrate continuous improvement. They can also include a 'surrogate outcome', which is performance-based (Environmental Protection Authority 2021). A surrogate is a physical, chemical or biological characteristic that supports the outcome. An example of this is water quality, as habitat condition could be a surrogate for the condition of an aquatic species.

The approach of regulating entities such as government authorities leans towards either prescriptive- or outcome-based approaches, but this often changes over time through a process of continuous improvement to optimise regulation. Over the last decade there has been a general and widespread preference globally towards outcome-based regulation. There are a number of factors contributing to this shift but the three most important are (Coglianese 2015):

- The mandated means specified by prescriptive approaches may not prove as effective as other means.
- The mandated means may prove to be more costly than other equally effective means.
- By specifying how to act, prescription-based approaches can inhibit innovation in finding better or cheaper ways to achieve the same outcomes.

By giving firms flexibility to choose their own means to achieve the desired goals, performance standards theoretically allow firms to select the most effective or lowest-cost options.

In Australia, the Commonwealth government has endorsed outcome-based approaches for regulation under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Commonwealth of Australia 2016). Some other Australian jurisdictions have similarly provided guidance in a shift towards outcome-based approaches. For example, the Western Australian Environmental Protection Authority says that its ability to confirm that environmental objectives are met is improved when it is provided with information from the proponent about proposed environmental outcomes, rather than just measures to minimise or manage

impacts (Environmental Protection Authority 2021). Outcome-based conditions are the preferred condition type recommended by the Environmental Protection Authority (2021) because they can provide:

- clarity on the environmental values to be protected, enhanced, conserved and maintained
- transparency as to the required environmental outcomes to be achieved by proponents
- flexibility for proponents to identify how to achieve an environmental outcome consistent with adaptive environmental management and continuous improvement
- a best-practice regulatory approach
- alignment with the approach applied under the EPBC Act.

Performance standards provide flexibility that can allow for innovation because a regulated entity may be able to meet the mandated outcome in any number of ways, even if currently there might exist only one way to meet a performance standard.

### 3 The case for outcome-based completion criteria for mine rehabilitation

Completion criteria are agreed standards or levels of performance that indicate the success of closure (Australian Government 2016). Often completion criteria are used to determine when liability for an area can cease, but increasingly there is a realisation that relinquishment may never be achieved; hence the term ‘success criteria’ is becoming increasingly common. Completion criteria are critical in the context of mine closure because they define all the components that contribute to ‘successful’ closure.

It is in the interests of all stakeholders — mining companies, regulators, investors, Traditional Owners and the community — to have well-defined completion criteria that are clear and measurable so that the ‘goal posts’ are defined and agreed before planning, committing and implementing large investments in mine rehabilitation. Holmes et al. (2015) note that ambiguous and inconsistent completion criteria often lead to unclear standards for regulatory agencies and confused expectations among local communities.

One way to achieve this certainty for all stakeholders would be to adopt prescriptive closure completion criteria. This form of completion criteria is commonly specified for landform design. Landforms in mining operations are revisited regularly and adjusted based on short-, medium- and long-term mine planning, working within design parameters including maximum lift, slope length, slope angle and geometry. It is common to see completion criteria referencing maximum slope length and maximum slope angle. Criteria may include batters no greater than 15%, drainage features installed to break up long slopes so that no slope lengths exceed 100 m and limiting the height of landforms to 100 m above the natural surface. This type of completion criteria is easy to incorporate into landform designs and easy to measure once constructed, so may seem appealing. However, there are a number of shortcomings with this approach:

- The landform design parameters are essentially constraints that, if implemented, aim to achieve a different objective of ensuring a stable, non-eroding landform. Due to heterogeneity around individual mine sites and landforms there is a high likelihood of situations where these parameters would unnecessarily constrain the design, potentially creating greater environmental impacts in terms of the disturbance footprint. There are also likely to be situations where these parameters are not sufficiently constraining and the landform suffers from instability and erosion. Therefore compliance with the completion criteria does not necessarily mean that the overarching objective is met, and it may also be imposing unnecessary constraints on mining companies.
- There is limited ability to adjust these types of prescriptive approaches in light of other information and factors that affect achievement of the objective. For example, those parts of the landform that have blocky, durable, non-dispersive materials will be treated in the same way as those with erodible, dispersive materials unless very detailed, customised criteria are developed. This creates an administrative and compliance burden.

- Prescription arguably transfers greater risk to government, especially in situations where achievement of completion criteria does not translate into achievement of rehabilitation objectives. For this reason there is a tendency for prescriptive-based approaches to be overly conservative, which can impose unnecessary constraints.

For the same reasons that outcome-based regulatory approaches are experiencing widespread adoption throughout the world there are good reasons to apply this approach to completion criteria. It provides the ability for mining companies to innovate with different design approaches that are customised and locally appropriate while still maintaining the desired objectives. Examples include geomorphic design, where nonlinear slope and length combinations are used to replicate the geomorphological characteristics of the natural terrain, producing a design that achieves the desired outcomes (stability) without conforming to typical design guidance.

An example of a landform design completion criteria that is reframed as outcome-based may be that landforms are in keeping with the surrounding terrain and erosion rates are similar to surrounding undisturbed areas. This type of criteria offers much more flexibility to a mining company and likely results in better outcomes. For example, the designer has flexibility to design landforms that are less linear (e.g. avoiding uniform bench drain sequences), more undulating (e.g. avoiding large plateau-type landforms) and more similar to the natural terrain while also being able to cater for short- and medium-term mine planning changes.

While this may sound appealing it is not without its pitfalls. Most of the risk is transferred to the mining company, which is commonly risk-focused and driven by three main metrics: safety, volume and cost. When there is no regulatory focus on performance-tracking in a scenario where designed landforms are not performing as intended, it leaves the mining company exposed due to the underperformance and less likely to be able to fully resolve the underperforming landform. Similarly, outcome-based criteria need to be carefully worded in order to provide sufficient certainty: if the wording is vague and open to interpretation it does not achieve one of the key objectives, which is to provide certainty to all stakeholders. It could potentially result in disputes between the regulator and the regulated entity, leading to costs, rework and perhaps substandard outcomes.

## 4 Lessons from performance-based land use planning

There are many lessons that can be learned from other industries and sectors that have moved from prescriptive- towards outcome-based approaches. An example of particular relevance to mine closure planning is the roll out of performance-based planning (PBP) schemes in jurisdictions in the USA, Australia and New Zealand.

The *Integrated Planning Act 1997* (IPA) in Queensland was a major policy reform in the planning scheme in the late 1990s. The IPA abandoned prescriptive zoning in favour of a more performance-based approach (England & McInerney 2017). The IPA allowed for any development to be acceptable, including the removal of the concept of 'prohibited development', provided it met appropriate performance criteria. A fundamental tenet of PBP is that planning schemes should set performance criteria but not otherwise dictate what uses may be permitted in any particular zone or on any particular site. The IPA set very few prescriptions about the form or content of planning schemes but it did require that planning schemes, at a minimum, identify desired environmental outcomes and measures for achieving those outcomes.

Local councils were then tasked with developing and implementing planning schemes, in much the same way as mining companies are tasked with developing completion criteria to the satisfaction of the regulator and communities. The experience of local councils was that there was insufficient guidance on how to draft PBP schemes. The result was the formation of hybridised planning schemes that combined prescriptive- and performance-based components. The research of Frew et al. (2016) found that hybrid plans predominated and that, over time, a greater reliance on risk-adverse drafting approaches created a quasi-prohibition plan: the exact opposite of what was intended by the IPA. As a result, this created a perception of land use risk and uncertainty that caused a return to more prescriptive and inflexible plan-making methods.

England & McInerney (2017) argue that, more so than any of the procedural reforms to planning law, it is the evolution of PBP that has played into the hands of developers who wish to prioritise economic development over and above other planning goals.

So while conceptually outcome-based completion criteria for mine closure make sense and are aligned with a global shift towards outcome-based performance regulation, there needs to be strong guidance around how to formulate outcome-based criteria to achieve the agreed desired outcome.

## 5 Constructing outcome-based completion criteria

There is no agreed, consistent standard to define or measure completion criteria in mine closure (Blommerde et al. 2015), and hence no clear, universally accepted guidance on how to develop outcome-based completion criteria. In general, the process is no different to that required for development of prescription-based completion criteria but is instead made through the lens of outcome-based criteria during the drafting process.

In many mining jurisdictions, loose regulatory frameworks have given rise to a high level of company self-regulation and a varying quality of rehabilitation works (Erskine & Fletcher 2013). Mining proponents often resort to their own internal procedures or those of other similar mine sites to inform the definition of completion criteria (Young et al. 2019).

Manero et al. (2020) provide a logical framework for the development of completion criteria involving the following steps:

1. selection of post mine land uses
2. definition of aspects and closure objectives
3. selection of references
4. selection of indicators (referred to as attributes by Manero et al. 2020)
5. definition of completion criteria
6. evaluation of performance.

There is a feedback loop allowing new insights from the evaluation of performance to refine and revise completion criteria.

The selection of indicators directly affects how completion criteria are crafted so it is important that this selection is made carefully. Preference should be given to leading indicators over lagging indicators since these can be measured at early stages of rehabilitation and provide an indication of future rehabilitation outcomes. As rehabilitation deals with complex systems, and the relationships between indicators and objectives may not be well understood, there needs to be appropriate mechanisms for reviewing the indicators if improved information or more cost-effective rehabilitation techniques become available during the life of the mine. The properties of a good indicator (CSIRO 1998) are that it:

- has an agreed, scientifically sound meaning
- represents an environmental aspect of importance to society
- tells us something important and its meaning is readily understood
- has a practical measurement process
- helps focus information to answer important questions
- assists decision-making by being effective and cost-efficient.

The critical part of moving from Step 4 to 5 ultimately relies on the closure team (including at least the regulator and mining company) drawing on their combined experience, corporate knowledge, precedent or logic. This is the most difficult stage, and hence there are a wide range of outcomes. It is during this step that

the multidisciplinary closure team, with subject matter experts, should craft the completion criteria through an outcome-based lens. Coglianese (2015) usefully identifies six different dimensions against which outcome-based completion criteria can vary:

- specificity (loose versus tight)
- proximity between legal command and regulatory goal (close versus distant)
- how performance is determined (measured versus predicted)
- basis for the standard (ideal versus feasible)
- unit of regulation (individual versus aggregate)
- burden of proof (regulator versus regulated).

While all six dictate how outcome-based completion criteria could function, specificity is perhaps the most important to obtain alignment on between regulators, regulated entities and other stakeholders inputting to the process. Performance standards can be loose, such as a condition requiring a landform to erode at a rate similar to surrounding non-mined landforms, or these standards can be tightly specified, such as the erosion rate not exceeding X t/ha/yr average or Y t/ha/yr at any point on the landscape. Note that both these standards address the performance of the landform with respect to erosion, but neither are technology standards that specify the use of a certain technology or approach. Rather they define the outcomes the landform design is supposed to achieve, either in loose or tight terms.

Rehabilitated areas develop over a number of years and in specific growth stages, and associated completion criteria may need to change over time. This concept is built on the Queensland progressive rehabilitation and closure plan framework, whereby 'milestone criteria' are defined for various phases of rehabilitation. This allows them to be used in situations where rehabilitation is progressing (reached a particular mid-point/developmental stage) as well as at the ultimate end point, indicating achievement of the long-term rehabilitation objective. There should be no impediment to adopting outcome-based completion criteria at different stages along the rehabilitation journey.

## 6 Conclusion

There is a global push towards outcome-based regulation. The driver for this is to maximise flexibility and better cater for innovation. The benefits of outcome-based regulation also apply to completion criteria for mine closure, and outcome-based approaches should be adopted wherever possible.

Learning from the experience of the planning sector in the shift from prescriptive to PBP schemes it is important that practitioners are armed with strong guidance material on how to draft effective outcome-based completion criteria. While completion criteria need to be customised to specific sites there are themes common across many sites, so a repository of outcome-based completion criteria that can assist with a broad rollout across the industry is required.

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