

The Ok Tedi mine; applying good practice initiatives in planning for the closure of a large and complex mine

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Abstract

The Ok Tedi mine is located in the remote Western Province of Papua New Guinea (PNG) and is a world class producer of copper and gold. The mine is owned and operated by Ok Tedi Mining Limited (OTML). The structure of OTML is unique in that 82% is owned for the direct and indirect benefit of the people of PNG. Since mining commenced in 1984 OTML has been the foremost contributor to the economy of PNG and has delivered over US\$11.6 billion through taxes, royalty payments, dividends, compensation and wages.

Under the current mine plan ore reserves will be mined out by the end of 2013. Genuine opportunities are however being investigated to extend the mine life beyond 2013 to 2020. In December 2009 OTML submitted a Detailed Mine Closure Plan (2009 Plan) to the PNG Government. The 2009 Plan has been built on the knowledge acquired from over ten years of closure planning at Ok Tedi.

OTML aims to make the closure of Ok Tedi an example of 'good practice' and senior management have actively supported initiatives to enhance closure planning and ultimately the closure outcomes for Ok Tedi. Some of the good practice initiatives adopted in compiling the 2009 Plan include: detailed stakeholder engagement and community consultation; a benchmark study of closed mines from around the world; a detailed mine closure risk assessment; communication of closure messages to the broader community; a detailed estimation of closure costs; comprehensive closure criteria and relinquishment planning; and a detailed investigation into the social and economic impacts of closure. By implementing these initiatives OTML have set an example for others mining companies to follow.

1 Introduction

The Ok Tedi mine is located in the upper catchment of the Fly River System in the Western Province of Papua New Guinea (PNG) (Figure 1). The mine is a world class producer of copper and gold, and is owned and operated by Ok Tedi Mining Limited (OTML). In 2009 Ok Tedi produced 166,600 tonnes of copper and 515,000 ounces of gold in copper and gold concentrates. Mining commenced at Ok Tedi in 1984 and under the current mine plan ore reserves will be mined out by late 2013.

In December 2009 the 'Ok Tedi Detailed Mine Closure Plan' (2009 Plan) was submitted to the PNG National Government and superseded three previous draft mine closure plans. The 2009 Plan was prepared on the basis that there will be no other major sustainable industry in the area after the Ok Tedi mine closes. Genuine opportunities are however being investigated to (i) extend mine life beyond 2013 to 2020, and (ii) find viable alternative uses for OTML infrastructure, equipment and operational areas after closure.

Mine Life Extension (MLE) can be viewed as 'staged closure' because production and revenue are likely to be 50% less than current levels. MLE creates the opportunity for impacted communities and stakeholders to adjust to the reduced influence of OTML, and for interested stakeholders to play a role in the provision of town services.

The closure of Ok Tedi presents one of the largest and most complex closure projects in the world to date. It is OTML's aim to make the closure of Ok Tedi an example of good practice and senior management have actively supported initiatives to enhance closure planning and ultimately the closure outcomes for the Ok Tedi mine.

1.1 Ownership structure

The structure of OTML is such that through its shareholders the wealth generated by OTML mainly benefits the people of PNG and the people of the Western Province. The shareholders of OTML include:

- The Independent State of PNG (State) 30%
- Inmet Mining Corporation 18%
- PNG Sustainable Development Program Limited (PNGSDP) 52%

On 25 November 2009 the acting Prime Minister Sir Puka Temu, announced that the State had approved a proposal for Inmet to exchange its 18% shareholding for a 5% net smelter return royalty. It is expected that terms and conditions will be formally completed by mid 2010.

PNGSDP were established as a trust fund to support sustainable development in PNG, particularly in the Western Province. PNGSDP acquired 52% of OTML as part of BHP Billiton's exit strategy in 2002. While the State holds equity in the Ok Tedi mine, it has agreed to allocate half of the dividends it receives (or 15% of total dividends) into trust funds for the following stakeholders:

- Fly River Provincial Government 2.5%
- Mine Area Landowners 2.5%
- The People of Western Province 10%

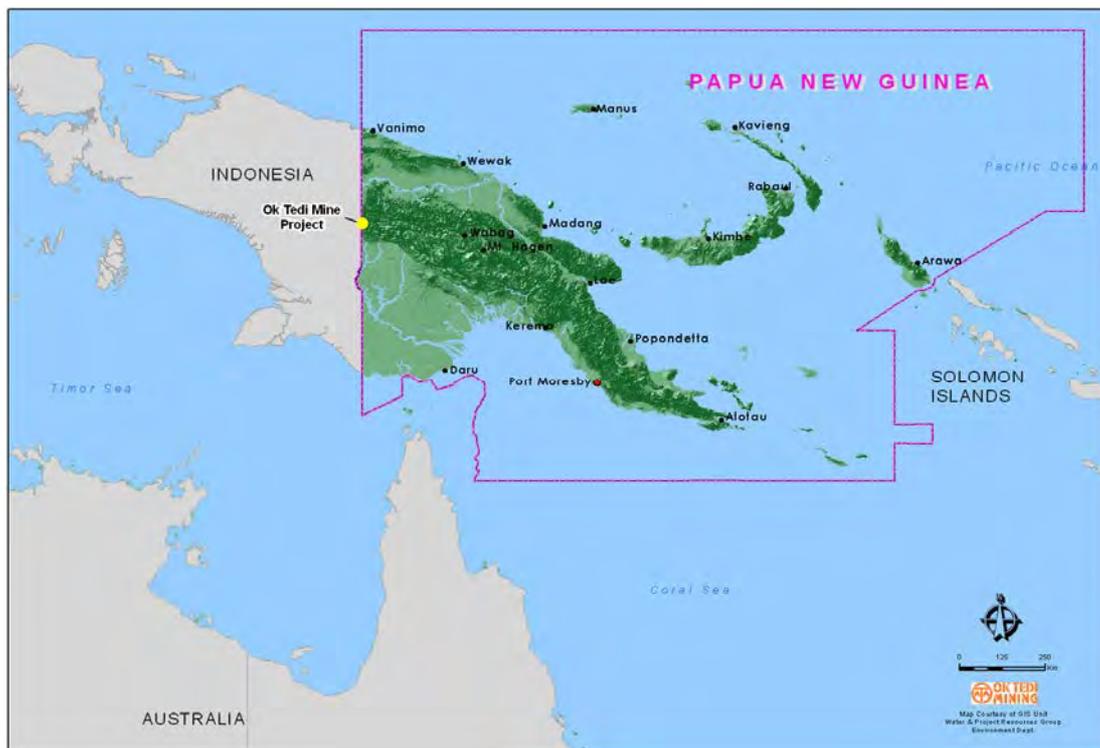


Figure 1 The Ok Tedi mine is located in the Western Province of PNG.

1.2 Production and benefits

OTML commenced gold production in 1984. Subsequent large-scale open pit copper mining and processing commenced in 1986. From 1984 to 2009 the mine produced 12,778,820 tonnes of copper concentrate. Metal contained in concentrates include 3,925,311 tonnes of copper, 10,300,032 ounces of gold and 23,830,031 ounces of silver. OTML also produced 1,712,953 ounces of gold bullion in the early years of mining.

OTML has been the foremost contributor to the economy of PNG. In 2009 OTML paid US\$350 million in dividends to shareholders, 82% of which will ultimately benefit the people of PNG through shareholders

PNGSDP (52%) and the State (30%). In 2009 net revenue from the sale of concentrates accounted for over 30% of PNG's export earnings and 17% of GDP. In 2009 total taxes and dividends of US\$187.6 million were received by the State, with a further US\$131.3 million distributed to the Fly River Provincial Government, communities and employees.

Since 1984 OTML has contributed over US\$11.6 billion to PNG through taxes, royalty payments, dividends, compensation payments and wages. The National Government have received over US\$5 billion in taxes, royalty payments, dividends and levies. The Fly River Provincial Government has received around US\$1.5 billion in royalty payments, tax credit scheme expenditure and dividends. Impacted communities have received nearly US\$1.1 billion in royalty payments, lease payments and compensation payments. Over US\$2.9 billion has been paid in dividends to PNGSDP and over US\$1.1 billion has been paid to National employees as wages and benefits.

OTML employs 2,000 employees and 1,500 contractor company employees. Approximately 95% of employees are PNG Nationals.

1.3 Summary of operations

The Ok Tedi project site consists of a number of operational areas including the Mine, the Mill, Tabubil, Bige and Kiunga (Figure 2). Ore is mined from the open pit and transferred to the mill for processing. Waste rock from the mine and tailings from the mill are discharged into the Ok Tedi river.

Copper concentrate is piped from the mill to Kiunga where it is dried and loaded onto barges for transport down the Fly River. Concentrate is transferred from the barges onto a transshipment vessel which is anchored either in the Gulf of Papua or in Port Moresby harbour depending on weather conditions. Concentrate is off-loaded from the transshipment vessel to export vessels for transport to markets around the world.

A dredge operates in the Ok Tedi River at Bige (Figure 2) to extract mine derived sediment from the river. These sediments are deposited on both the east and west banks of the Ok Tedi and are reworked into stable stockpiles. Pyrite concentrate that is separated from tailings at the mill, are piped to Bige for subaqueous storage under the West Bank Stockpile.

The majority of the Ok Tedi workforce lives in the township of Tabubil (Figure 2) which has a population of approximately 7,500. OTML also have offices in Port Moresby, Kiunga and Brisbane, Australia.

1.4 Project Setting

1.4.1 Location and climate

The Ok Tedi mine is located close to the headwaters of the Ok Tedi, approximately 1,000 river kilometres from the coast. Regional elevations range up to 3,500 m above sea level. The Fly River system has a catchment area of about 75,000 km² and comprises three main tributaries: the Ok Tedi; the Upper Fly; and the Strickland (Pickup, 2009). The Ok Tedi receives waste rock and tailings from the Ok Tedi mine and the Strickland receives sediment from mining operations at Porgera.

The Fly basin has a humid tropical climate and average rainfall varies with elevation (Moi et al, 2001). Falls in excess of 10,000 mm/year occur at the Ok Tedi mine site (1,500-2,000 m asl) and decline to about 8,000 mm/year along the upper and middle Ok Tedi.

1.4.2 Mine affected geomorphology

Up To 80 million tonnes of waste rock and tailings have been discharged annually from the Ok Tedi mine into the Ok Tedi / Fly River system. The original mine design incorporated a tailings dam, but its foundations collapsed in a landslide during construction in 1984 (Swales et al, 2000; Storey et al, 2009). Subsequent State approval was granted for tailings to be discharged directly to the river system.

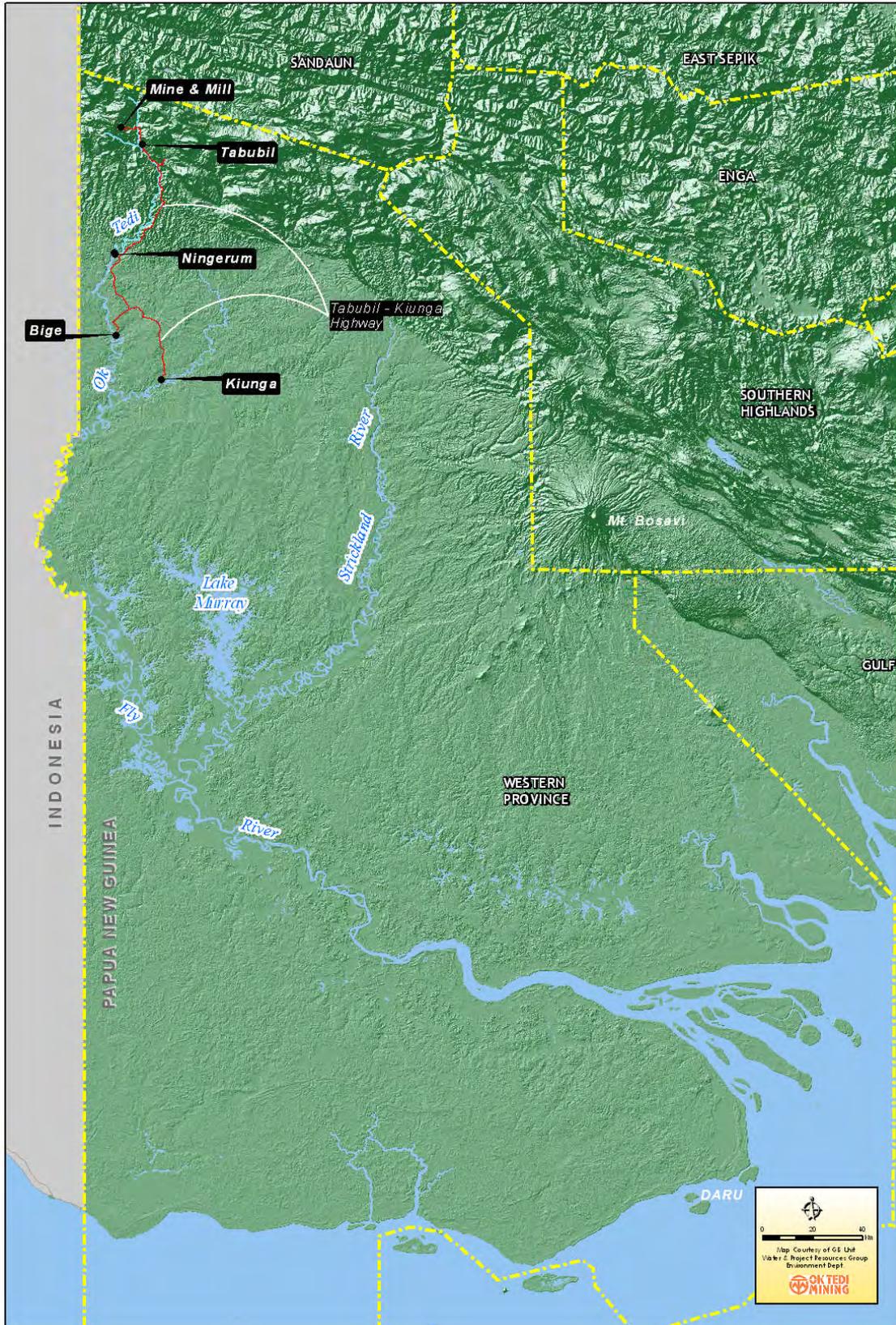


Figure 2 The Ok Tedi project site in relation to the Western Province of PNG.

The impacts to the river system from mine waste disposal are mostly physical impacts. Following regular monitoring by OTML and a comprehensive three year Community Health Survey conducted from 2003 to 2006 (Bentley, 2007a & 2007b) it was found that there are no mine-related human health issues regarding

the edibility of foodstuffs throughout the system. This includes drinking and recreational waters, air quality, and all aquatic and terrestrial flora and fauna.

Prior to mining the natural load of the Ok Tedi was 3-5 Mt/year with a similar amount coming from the Upper Fly (Higgins et al, 1987). Over the period 1985-2000 and as a result of waste rock and tailings deposition, the load in the Ok Tedi increased to an average 45 Mt/year (Pickup, 2009). Some reaches of the river have experienced extensive deposition, raising the riverbed, adding material to levees and flood plains, and increasing the duration and frequency of flood plain inundation.

The dredging operation at Bige will continue to the end of mine life and will assist in minimising future physical impacts.

1.5 Legal framework

The Mining (Ok Tedi Agreement) Act 1976, otherwise known as the Principal Agreement, applies to OTML and its operations. There have been amendments to the Act and to the Principal Agreement on nine occasions.

The Mining (Ok Tedi Mine Continuation (Ninth Supplemental) Agreement) Act 2001 (Ninth Supplemental) was enacted by the National Parliament on 20 December 2001, to allow BHP Billiton to exit from the Ok Tedi project in February 2002. The Ok Tedi Mine Closure and Decommissioning Code 2001 (Code) was included as a schedule to the Ninth Supplemental and is the principal guide for closure planning at Ok Tedi.

The Code provides a statutory regime to plan for closure. In accordance with the Code OTML have submitted draft mine closure plans in 2002, 2004 and 2006, and a detailed mine closure plan in 2009 four years prior to mine closure. The 2009 Plan has met and in many instances exceeded the requirements of the Code.

2 Mine Closure Planning at Ok Tedi

The 2009 Detailed Mine Closure Plan was built on the knowledge acquired from over ten years of closure planning at Ok Tedi. By implementing 'good practice' initiatives in planning for closure, OTML have set an example for others mining companies to follow. The key initiatives adopted in compiling the 2009 Plan include:

1. Open and ongoing engagement of stakeholders in the closure planning process.
2. Ongoing consultation with communities who will be impacted by closure.
3. A benchmark study of mines from around the world and visits to three closed mines by OTML and stakeholder representatives.
4. A detailed mine closure risk assessment undertaken with stakeholders to define and quantify closure risks.
5. Implementation of a strategy to communicate closure messages to the broader community.
6. Detailed closure cost estimations to the satisfaction of independent auditors.
7. Robust closure criteria tied to a lease relinquishment framework and supported by;
 - o Post closure monitoring for up to thirty years after mine closure.
 - o Post closure maintenance plans, including a strategy to provide for basic security and maintenance beyond relinquishment.
8. Detailed review of predicted social and economic impacts on various target groups and stakeholder strategies to mitigate these impacts.

Each of the above is described in more detail below.

2.1 Stakeholder Engagement

Stakeholders play an important role in mine closure planning. Ok Tedi has had both positive and negative impacts on stakeholders, and some of these impacts will continue after mine closure; many stakeholders will also be around long after the mine closes. The 2009 Plan was compiled through close and ongoing consultation with stakeholders, and with a high level of transparency.

In January 2008 OTML and their stakeholders agreed on an approach to enable stakeholders to be engaged in all levels of the closure planning process. This agreement was reached in a workshop attended by representatives from a diverse range of stakeholder groups (Figure 3). A three tier planning and engagement structure, including stakeholder representation, was defined and endorsed by all attendees; it comprised a high level 'Steering Committee', a 'Planning Committee' and three 'Working Groups' (Figure 4). The terms-of-reference for each tier of the engagement structure were drafted and endorsed by the Planning Committee.



Figure 3 The Mine Closure Planning Committee, January 2008.

OTML successfully implemented the agreed structure which involved monthly and later quarterly meetings for the Planning Committee and Working Groups, and six-monthly meetings for the Steering Committee. The stakeholders represented within the engagement structure include:

- Various National Government departments
- The Provincial Government
- The Local Level Government
- Landowners and impacted communities
- PNGSDP
- Landowner business associations
- The Ok Tedi Mining and Allied Workers Union (OTMAWU)

The aim of engaging stakeholders was to provide an avenue for their direct involvement in the closure planning process, and to ensure that the mine closure plan was compiled taking stakeholder concerns and issues into account. Stakeholders participated and had the opportunity to have input into each aspect of the closure planning process. The process of engaging stakeholders is ongoing.



Figure 5 Mine closure community consultation patrol, June 2009.

2.3 Benchmark Study

A benchmark study of relevant mine closure examples from around the world was undertaken to gain knowledge to enhance closure planning and ultimately enhance the closure outcomes for the Ok Tedi mine. The aim of the benchmark study was to target and visit mines with comparable environmental and social conditions to Ok Tedi. A literature review was undertaken to identify relevant mines to visit, the following sites were considered in the review:

- Kelian Mine, Indonesia
- Minahasa Raya, Indonesia
- Misima Mine, PNG
- Coldelco Salvador Division, Chile
- Porgera, PNG
- Freeport Mine, Indonesia
- Marcopper Mine, Philippines
- Mamut Copper Mine, Malaysia
- Mt Muro Gold Project, Indonesia

Site visits were arranged to the three most relevant mines identified from the literature review: Kelian, Minahasa Raya and Misima mines. Site visits to each were made possible by the generous hospitality of the host companies and their willingness to encourage others to learn from their experience. OTML compiled a study team to visit each site, the team comprised: OTML closure planning and environmental staff; an OTML independent Board member and; stakeholder representatives from the National Government and PNGSDP. Stakeholder representatives were invited so they could broaden their knowledge base and contribute more effectively to closure planning for Ok Tedi.

The study team spent an average of two days at each mine; each visit included an inspection of key mine areas as well as surrounding areas including local communities. The host companies gave the study group access to those people who had been directly involved in the mine closure process; and the study team had the opportunity to ask questions and review relevant documents.

After the site visits the study team developed recommendations on how Ok Tedi could apply the successes and avoid the failures of other closure projects. The findings of the benchmark study were presented to the OTML Board who subsequently endorsed a number of recommendations.

2.4 Risk Assessment Process

A detailed mine closure risk assessment was initiated by OTML in 2008. The risk assessment commenced with a two day risk identification workshop held in Port Moresby in October 2008. The workshop was attended by a large group of internal and external stakeholders and its aim was to allow all stakeholders to contribute directly to the risk identification process.

Workshop outcomes were consolidated into a risk register; the register divided risks into 'OTML' and 'residual' risks. OTML risks are those that are clearly the responsibility of OTML, residual risks are those that are the responsibility of others and may remain after closure. OTML embarked on a process of quantifying OTML risks in order to: develop a risk profile to rank closure risks; develop an exposure profile and determine the costs associated with risk events; assess the cost-effectiveness of risk mitigation actions and develop a preferred mitigation strategy; and provide a risk-based contingency for inclusion in the detailed closure cost estimate.

From the quantification process the model determined that the pre-mitigation risk profile was dominated by four risk events:

1. Prolonged dry spell during the decommissioning works
2. Safety during the transition from mining to closure operations
3. Kiunga to Finalbin Highway failure.
4. OTML personnel repatriation interruptions

The risk quotients for the four highest-risk events were greater than the cut-off value adopted for the 'threshold method' of calculating the risk cost. The pre-mitigation exposure profile also demonstrated that the top four highest-risk events have relatively low to moderate occurrence costs. The risk model determined that without implementing any risk mitigation actions the pre-mitigation risk cost was US\$24.6 million.

The cost of implementing combinations of mitigation actions was assessed against the impact on the pre-mitigation risk cost, to develop the optimal mitigation strategy. The optimal strategy involves the implementation of mitigation for the four highest risk events, which in priority of reducing effectiveness are:

1. Prolonged dry spell during the decommissioning works
2. Safety during the transition from mining to closure operations
3. OTML personnel repatriation interruptions
4. Kiunga to Finalbin Highway failures

The implementation of mitigation actions for these four risk events, reduces the risk cost from US\$24.6 million to US\$4.7 million. The cost to mitigate these risks is estimated to be US\$4.1 million. As a result of the mine closure risk assessment both the recommended risk mitigation strategy and the recommended risk-based contingency allowance were endorsed by the OTML Board.

In an effort to assist stakeholders to prepare for closure, OTML coordinated a 'residual risk' workshop in May 2009. The aim of the workshop was to review the residual risks in the context of assigning responsibility and potential mitigation strategies. It is the Planning Committee's aim that all residual risks have an 'owner' and corresponding 'mitigation strategy'. OTML will continue to work with stakeholders and regularly update the risk profile in this regard.

2.5 Communication

In 2008 a strategy was designed to enable mine closure messages to be communicated to a broad range of stakeholders, using a host of communication tools. The strategy targeted: employees, contractors and their

dependants; mine impacted communities; the National and Provincial Government; settlers in the mine area villages; NGO's; and the general public.

During 2008 and 2009 the communication strategy was implemented, and various communication tools were used including presentations, workshops, conferences, local radio, intranet, email, community consultation patrols, and national media including news print and television.

2.6 Detailed Closure Cost Estimation

The Mine Closure and Decommissioning Code 2001 requires that OTML specify the amount of 'financial assurance' necessary for the performance of the mine closure plan and provide a copy of a statement of an independent person approved by the State and qualified to make it, that the estimate of the cost of completing the mine closure plan is reasonable.

The Code also requires that OTML establish a reserve account in the joint names of the Company and the State to be known as the Ok Tedi Financial Assurance Fund (FAF) to which monies are contributed by way of financial assurance. The size of the biannual contributions to the FAF are such that, when taken together with interest accruing on those contributions, by the estimated date of closure there will be adequate amounts in the fund to implement the mine closure plan

In 2008 a dedicated project team was established to compile a detailed closure cost estimate for inclusion in the 2009 Plan. Expert consultants were also engaged to assist in estimating asset realisation, deconstruction and logistics costs.

In accordance with the Code, the 2009 closure cost estimate captures all costs that will be incurred after cessation of commercial production, including but not limited to: deconstruction and logistics; earthworks and remediation; revegetation; repatriation of the workforce; severance entitlements; and post closure monitoring. The 2009 cost estimate was US\$227.5 million. This figure was endorsed by independent auditors appointed on behalf of the State. A summary of the cost estimate is provided in Table 1.

Table 1 Closure cost estimate summary

Description	US\$ million
Deconstruction, remediation and earthworks	182.7
Revegetation	11.4
Employee retrenchment	38.0
Asset sale recovery costs	
o Net asset realisation value	Zero
o Less deconstruct and logistics including contingency	(45.7)
o Less OTML support for deconstruction	(26.7)
o Less fixed costs for program extension	(22.9)
Project contingency and escalation	
o Project contingency	30.7
o Risk based contingency	4.7
o Escalation to mine closure	16.1
Post closure monitoring	
o Environmental	34.1
o Social	5.0
Total	227.5

The 2009 cost estimate relies on the assumption that the sale of company assets will cover the costs of: deconstruction of these assets and logistics required for their transport; support for the deconstruction program; and extending the closure program to facilitate deconstruction. The 'zero net asset realisation value' approach was considered conservative by the independent auditors and by expert consultants.

An overall contingency of more than 20% was included in the 2009 estimate; this level is considered appropriate for an estimate at feasibility level. Escalation was also included. The 2009 estimate included a risk-based contingency allowance as per the recommendations of the mine closure risk assessment. The risk-based contingency relied on a number of mitigation strategies being implemented, and provision for these has been included in the 2009 estimate.

2.7 Relinquishment Planning

OTML have developed robust and defensible closure criteria for each operational area as a tool to demonstrate closure performance. These closure criteria have been tied to the lease relinquishment process. OTML established a dedicated project team comprising OTML staff and expert consultants, to debate and develop closure criteria for Ok Tedi.

The OTML closure criteria framework consists of aspects, objectives, criteria and standards. These relate to each other as follows (Table 2):

- Aspects; are elements that need to be considered for closure of every area, and that together will ensure the overall closure objective is addressed.
- Objectives; describe the intent of the mine closure programme, in relation to each aspect.
- Criteria; describe specific elements that can be measured or certified to have occurred, and that are considered to be critical to achieving the objective. Each objective may have more than one criterion, and a criterion may apply for more than one objective.
- Standards; may be either an agreed value that is measurable and is regarded as the minimum that must be achieved, or a certification that specific closure activities comply with an agreed plan for those activities.

In line with ANZMEC & MCA (2000) Ok Tedi closure criteria are site specific and cover a range of aspects. Ten aspects were considered for each operational area, these aspects and their related objectives are outlined in Table 2. Once OTML have met the agreed closure criteria, the State will accept that closure risks have been sufficiently minimised and allow OTML to relinquish their leases.

Table 2 Aspects and objectives to be applied to each area

Aspects	Objectives
Residual assets to be retained	Assets to be retained will be left with the capacity to function
Suitability for agreed post-closure land use	Land will be suitable for use consistent with that of surrounding land, at lower intensity
Deconstruction of assets to be removed	Above-ground infrastructure of assets that are not to be retained will be removed, and below-ground infrastructure removed where practicable
Geotechnical stability	Geotechnical stability will be appropriate for post-closure purpose
Contaminated sites	Contaminated sites will be treated
Potentially-hostile mine wastes	Mine wastes will be managed sufficient to minimize off-site impacts
Surface water	Uncontrolled flows and resultant accelerated erosion will

Aspects	Objectives
management	be minimized
Surface preparation and growth medium	Opportunities for plant establishment will be maximised
Soil surface stability / erosion	Accelerated erosion will be minimised
Vegetation community	The area will support self-sustaining, perennial vegetation that is dominated by native species

One of the key objectives for rehabilitated areas is ‘self-sustaining perennial vegetation dominated by native species’. Achieving a self-sustaining vegetation community in the Mine, the Mill and Tabubil areas (etc) will be simpler than for the Bige stockpiles. For this reason OTML aims to relinquish all mining tenements (except those at Bige) five (5) years after mine closure; OTML aims to relinquish Bige mining tenements fifteen (15) years after mine closure.

2.7.1 Post closure monitoring

OTML will undertake post closure monitoring to measure performance against closure objectives and measure the long-term impacts to the river system. OTML have made provision for US\$39.1 million in the 2009 detailed closure cost estimate to fund post closure environmental and social monitoring for up to thirty (30) years after mine closure.

OTML will demonstrate performance against closure objectives in operational areas using both auditing and monitoring measures. ‘Auditing’ will be used to demonstrate performance against criteria that can be measured at a fixed point in time. The State (or a third party) will audit OTML’s compliance against given criteria. ‘Monitoring’ will be used to demonstrate performance against criteria that will be measured overtime, with the aim of demonstrating compliance at the end of the nominated monitoring period. A monitoring program has been structured to measure each of the ‘aspects’ listed in Table 2 in each operational area after closure.

The long-term impacts to the river system will be measured for up to thirty years after mine closure via a detailed program to monitor a range of parameters including: water quality; acid-rock drainage; biological indicators; and river hydrography.

2.7.2 Post closure maintenance

After closure and rehabilitation works are complete, rehabilitated areas will be maintained by OTML until machinery are demobilised from site. Where required, post closure maintenance may involve reinstating surface water controls and repairing erosion gullies. The requirement for active maintenance of rehabilitated areas will diminish with time, as vegetation establishes and helps to minimise erosion.

Two endowment funds will be established to provide for basic security and maintenance of key areas beyond the OTML maintenance period and beyond lease relinquishment. The endowment funds will be held in perpetuity and their aim will be to provide:

- Basic long term security so that;
 - Unauthorised access to these areas is minimised
 - Unauthorised excavations in these areas are minimised
 - Unauthorised clearing of vegetation in these areas is minimised
- Basic long term maintenance in each area including;
 - Surface water control structures
 - Erosion gullies
 - Revegetation

Provision has been made for both endowment funds within the 2009 detailed closure cost estimate. One fund will be for the mine area clans and the second will be for the Bige area clans. The size of each fund has been calculated so that a number of members from each clan are paid a wage in return for providing basic security and maintenance of each area.

The procedure for disbursements from these funds will involve annual checks to ensure that the clans have been managing the land in accordance with the purpose of the funds. If the land has not been managed appropriately disbursements will not be made. It is proposed that the clan members to be involved in this scheme will also be involved in closure and rehabilitation planning and implementation. The participants will therefore have the skills and knowledge to enable the concept to be effective. A similar program has been successfully implemented at the Kelian Mine.

2.8 Social and Economic Reporting

In 2008 a stand alone project team comprising OTML staff, expert consultants and external stakeholders, was established to develop a social and economic report (SER) on the social and economic impacts of mine closure, and the status of social and economic programs being undertaken by OTML and other stakeholders in Western Province to mitigate these impacts. The aim of the SER was to help key stakeholders identify opportunities to enhance long term development outcomes and minimise negative impacts from mine closure.

Prior to development of the 2009 SER a literature review was undertaken to assess existing mine closure guidelines and draw on recent mine closure experience, in particular those aspects relating to the compilation of social and economic data. It was found however that environmental factors continue to dominate mine closure planning efforts in developed countries such as Australia and the USA. Relatively few large-scale mines have closed in recent years, and even fewer provide lessons that can be applied to the closure of Ok Tedi.

The 2009 SER was compiled in open consultation with stakeholders, and large parts of the report were developed in workshops attended by the Planning Committee. The format of the SER, as agreed by the Planning Committee, included:

- Identify target / impacted groups and key stakeholders.
- Describe the current status of target groups.
- Predict the impact of mine closure on target groups.
- Include stakeholder concepts for alternative economic activities in the Western Province after mine closure.
- Summarise the development strategies of key stakeholders aimed at minimising closure impacts on target groups.
- Develop recommendations to minimise the social and economic impacts from mine closure on target groups.

Two substantial bodies of work were completed to assist in the development of the 2009 SER, particularly in the description of the current status of target groups. The first was the 'impact area profiles' (IAP) which presents social and economic data for those communities directly impacted by the Ok Tedi mine. The primary source of data for the IAP was a population and housing census conducted by OTML in late 2007, which surveyed 138 villages and 12,351 households with a population of 88,806 people. The IAP also utilise a wide range of other current and historical data sources, to provide comparisons over time to the Western Province or to PNG as a whole. The IAP provides useful information to development partners, to assist them in planning and implementing programs to mitigate closure impacts on the communities.

The second body of work was a 'benefit stream analysis' (BSA) which provides: an estimate of mine benefits and their distribution since mining commenced; an estimate of future benefits and their distribution until mine closure and; an estimate of the mine-related benefits available after mine closure.

The recommendations of the SER are currently being implemented by OTML and their stakeholders; the SER was designed to be accessible to and used by all relevant stakeholders. One of the key SER recommendations was for the Provincial Government to draft robust development plans for the province; these would assist the Provincial Government in coordinating the distribution of development funds that flow from various sources into the province. Development funds are currently distributed according to the priorities set by the donor organisation.

3 Conclusion

Since 1984 OTML has been the foremost contributor to the economy of PNG, and 82% of the company is owned for the direct and indirect benefit of the people of PNG. Under the current mine plan ore reserves will be mined out by late 2013 however, genuine opportunities are being investigated to extend the mine life beyond 2013 to 2020. Ok Tedi mine closure will be one of the largest and most complex closure projects in the world to date, and will have significant impacts on stakeholders and PNG as a whole.

For over ten years OTML have been actively planning for closure, and in December 2009 OTML submitted their Detailed Mine Closure Plan to the PNG Government. OTML aims to make the closure of Ok Tedi an example of 'good practice', and senior management have actively supported initiatives to enhance closure planning and ultimately the closure outcomes for Ok Tedi. By implementing good practice initiatives in planning for closure, OTML have set an example for others mining companies to follow.

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