

PLATE 29. - Mining operations at Queenstown.

Landscape and Man

THE FUTURE OF THE MINING INDUSTRY IN THE PIEMAN-GORDON REGION OF
WESTERN TASMANIA

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ABSTRACT

The development of the region is predominantly attributable to the mineral industry which has been an integral part of the region for over a hundred years. The region has proved to be exceptionally rich in a variety of mineral deposits and has made a considerable contribution to the State's development and economy.

This paper briefly examines the basis of the industry and some of the main factors that will influence its future. On the basis of published mine statistics and given favourable operating conditions, the established mines of the region have operating lives spanning the next 13 to 30 years. The longer term future of the industry initially depends on the discovery of "new" ore deposits in a region considered to offer good probabilities for the discovery of further volcanogenic base metal sulphide deposits and tin deposits related to granite intrusives. Despite this, the future of the mineral industry in the region cannot be guaranteed. However, careful planning by, and co-operation between, the industry and Government can improve the probability of its continued existence and/or expansion.

INTRODUCTION

The initial step towards the development of the mining industry in the region commenced in 1854 when a party of prospectors conducted an unsuccessful search for gold in the area northeast of Kelly Basin (on Macquarie Harbour) towards Frenchmans Cap. During the last 120 years or so, the region has been extensively explored by the pioneering prospectors, and, more recently by exploration teams using more sophisticated techniques. The culmination of these efforts is now recorded on our maps, which are dotted with prospects and mines, including three major producing mines at Mt. Lyell, Rosebery and Renison Bell, while our historical records frequently refer to dead corporations which were unable to develop adequate ore reserves and/or capital to maintain their operations or individuality. This clearly illustrates a basic feature of the industry, in that, although mineral showings (prospects) may be numerous, significant deposits are not frequent, and profitable mineral deposits (orebodies) are relatively few.

Despite this exploration effort, particularly during the last two decades, involving tens of millions of dollars of expenditure, no new major ore deposits have been discovered outside the established mining fields of Mt. Lyell (discovered 1883), Rosebery (1893) and Renison Bell (1900). However, successful exploration within these mining fields has permitted continued production to the present day, and has provided a base for production during the next decade or so.

On a global scale mineral deposits characteristically occur in provinces, and while some provinces are highly rewarding, others yield few profitable mines. This relatively small region has proved to be exceptionally rich in mineral deposits, providing the raw materials for the mining industry over a period of some 90 years, (Solomon *et al.* 1976). The approximate proportions of contained metal production from the region, relative to the total Australian mine production for 1975 were as follows: tin 38.3%, copper 12.4%, zinc 12.3%, gold 10.3%, silver 9.6%, lead 4.3%.

The answer to the question "What is the future of the mining industry in the region?" largely depends on who you ask, what time span is considered, what technological advances are anticipated, what political/legislative changes are envisaged and

what future metal demands and processes are predicted. Even a cursory examination of all possibilities is beyond the scope of this presentation. Consequently, the discussion will be confined to brief considerations of some of the main aspects of the question.

Table 18 presents data on the estimated ore reserves and current production rates for the main producing mines in the region, and on this basis an approximate estimate of the respective mine operating lives is made. The latter estimate can only be regarded as a guide as it does not take into account factors such as extensions to reserves, variations in production rates and the existence of favourable operating conditions.

The main aspect of interest arising from these figures is that due to the long lead time between the initial indication of a new ore deposit and the commencement of production (approximately 6-8 years for an underground operation), new ore deposits must be located and development commenced within the next 10 to 12 years, if the industry is to survive at current production rates. Furthermore, new ore deposits must be discovered and developed beyond the boundaries of the established mining tenements for the industry to survive in the longer term, i.e. beyond 20-30 years hence, or to significantly expand operations.

EXPLORATION

The most critical stages in the mining industry are the exploration stage (of discovery and definition) and the subsequent financing and development of an ore deposit. Exploration is a high risk venture (perhaps best described as one of the world's biggest gambling businesses) in which the risk and costs increase rapidly in response to increasing technical difficulties. Successful exploration is initially dependant on the probability of occurrence of an ore deposit and subsequently on the probability of discovery.

Probability of Occurrence

The proliferation of exploration, prospecting and mining tenements that cover much of the region indicate that the industry considers that there is ample scope for the discovery of new exploitable ore deposits. The distribution of these tenements also broadly reflects those areas currently considered to offer higher potential for discoveries. This in turn reflects the broad regional geological features of the region, which for the purpose of this discussion can be subdivided into 5 main zones, notably:

1. The older Precambrian rocks (fig. 1) which form the western margin of the central highlands. These rocks are predominantly quartzites, phyllites and mica schists and contain relatively few mineral occurrences. They are generally considered to be of low potential for future significant mineral discoveries.
2. The central belt of Cambrian Mt. Read volcanics, comprising the host rocks to the base metal sulphide ores of Rosebery, Hercules, Mt. Lyell and many other prospects. These rocks extend the vicinity of Mt. Darwin, north to Mt. Murchison and beyond. It is not too optimistic to forecast that other similar ore deposits will be found in this belt. However, the best promise for additional production in the medium-long term future is possibly from mixed base metal sulphide deposits, i.e. the lead-zinc-copper ores of the Rosebery type.
3. The sedimentary succession to the west, which is in part older than (Precambrian) and laterally equivalent to the Mt. Read volcanics. This sedimentary succession includes the host rocks to the pyrrhotite-cassiterite vein and replacement deposits (e.g. Renison Bell) which are developed in the vicinity of granitic intrusions. Prospects of finding additional deposits of this type are also considered to be quite good.
4. The younger Ordovician and Siluro-Devonian rocks contain many poly-metallic fissure veins, most probably of granitoid origin. (in the Dundas-Zeehan-Trial Harbour areas).

Table 18

ORE RESERVE ESTIMATES AND APPROXIMATE PRODUCTION RATES - 1976

MINES	APPROXIMATE ORE RESERVES 1976		APPROXIMATE ANNUAL PRODUCTION 1976		ESTIMATED MINE LIFE.	POSSIBLE ORE	POSSIBLE MINE LIFE
	TONNES	GRADE	TONNES	GRADE	YEARS	TONNES	YEARS
Renison Bell	9,895,000	1.34%Sn	494,000	1.24%Sn	10	8,200,000	30
Rosebery	8,300,000	16.9%Zn 5.0%Pb 1.02%Cu 142g/t Ag 2.9g/t Au	588,000	12.6%Zn 4.0%Pb 0.7%Cu 149g/t Ag 2.8g/t Au	13	1,000,000?	15
Mt. Lyell	37,281,000	1.45% Cu	2,215,000		13	5,000,000?	15

The Future of Mining

The potential to develop a mine with sufficient reserves for a medium term operation on such deposits is considered to be low.

5. The altered granitic rocks such as those of the Heemskirk Granite offer promise for the future development of bulk low grade tin deposits.

While the principal discovery goals for exploration in the region are considered to be massive lead-zinc-copper sulphide deposits and replacement tin-sulphide deposits, the possibility of locating and developing bulk low grade deposits of these and other metals should not be neglected as a longer term production source. Otherwise, ample scope still exists for the prospector, and for the smaller companies to develop and mine the small high grade ore deposits, such as those of the Dundas-Zeehan district.

Probability of Discovery

It is well known that the region contains favourable geological environments for the location of a variety of economically significant mineral deposits, but as yet we have little appreciation of the extent of our mineral resources. The probability of discovery is primarily dependent on geological skill, the depth and nature of post mineral cover, the size and shape of the deposit and the response of the target to geochemical and geophysical techniques.

Mineral exploration in this region is slow and relatively expensive by comparison with the Australian mainland and the easily discoverable ore deposits. Discrete higher grade concentrations which outcrop or have some positive surface indication of their presence have already been found, and are in production. Exploration has progressed to a stage where various sophisticated geological, geochemical and geophysical techniques have replaced the simple tools of the early prospector. Individually, or in combination, these techniques may provide indications of favourable conditions for ore location. Given such favourable indications the exploration phase moves into one of positive assessment (usually by diamond drilling), initially to confirm the presence of an ore deposit, and subsequently to establish dimensions, metal content, treatment feasibility, potential mining problems and potential value. If subsequent detailed feasibility studies indicate that the deposit can be mined and that the metals can be extracted and sold economically, there is an orebody but not necessarily a mine.

TECHNOLOGY

The aspect of technology needs only passing mention at this stage as the benefits to the industry from advances in improved exploration techniques, with greater sensitivity, depth penetration, and versatility, which could open up a new era of ore discovery in the region; techniques capable of overcoming increasingly difficult mining problems; improvements in the mine operator working environment and safety; improvements in productivity and efficiency; treatment of lower grade ores; improvements in waste disposal.

The role of luck in mineral exploration is often emphasised. However, because of the continuing development of technology, its role has diminished rapidly and it is no longer a dominating factor in mineral discovery.

METAL PRICES

The factors which influence the price of a metal are many and varied. They include confidence in plans for economic expansion, proposals for environmental protection, political stability, strike action, possibility of substitutes, volume of recirculating scrap metal, confidence in world currencies and warfare. Consequently the accurate forecasting of metal prices is a delicate and difficult task.

During the last two years the depressed state of the world economy has resulted in a severe imbalance between world metal supply and demand, particularly for copper, lead and zinc. As the metal stocks have risen to record levels, there has been a corresponding drop in the price of these metals, while at the same time there has been a rapid escalation in costs in all areas of the industry (including labour, materials, energy sources and interest on loans). This has led to the reduction or suspension of expenditure on some major capital items and on exploration in the region. The full repercussions of these measures may not be witnessed until some years from now.

The price trends for the principal metals produced in the region during the period 1957-1976 are illustrated in fig. 25. It should be noted that graphs do not take into account effects of currency realignments and inflation.

The copper price is still well below the production costs of many mines around the world and unless the price improves significantly in the immediate future, many more marginal operations, such as Mt. Lyell, will inevitably face closure. The outlook is for the copper price to recover very slowly during the next few years as demand is met by world surplus stocks (currently approximately 1.7 million tonnes) and production levels return to normal.

Lead and zinc can be conveniently considered together, as they are usually mined together, and until 1974 maintained similar price levels (fig. 25). In 1974 zinc established itself as the higher priced metal as the relative demand for lead fell. In general the outlook for the zinc price appears to be similar to that for copper, that is for a slow recovery as the world economy improves. However, due to lead's toxic properties the price recovery will probably lag behind that for zinc.

The longer term outlook for copper, lead and zinc on the world scene is not clear. However, there is a real possibility that supply will fall considerably short of demand during the next 10-15 years, largely due to the prevailing economic climate which offers little, if any, encouragement for major investment in new project development which could maintain existing operations and production levels, or increase production capacity. For example a copper price of at least \$1,800 (1,400) per tonne would probably be required to encourage major capital development projects on existing operations, and still higher prices would be necessary to justify the enormous capital outlay required to develop a "new" ore deposit.

The recent imbalance between supply and demand for tin arose from the short-fall in consumer demand occasioned by the world economic recession. Consequently, the immediate outlook for tin is much brighter than that for copper, lead and zinc. Tin prices are expected to remain high in line with inadequate production levels.

POLITICAL ACTIONS

While we have no influence on world metal prices, one important area where some influence on the future of the industry should be possible is that of the political arena. It is in the interests of both the State and Federal governments to develop and maintain conditions in which the industry can work towards ascertaining the extent and nature of the mineral reserves and potential mineral resources of the region, and hence provide a basis for the planning of future mine developments and developments in related industries. Alternatively, if further significant mineral resources are not found, the government can commence the early planning, development and establishment of the State's future economic base.

The 1976 Federal budget proposals moved towards the re-establishment of such a favourable climate with the control of inflation being the primary target, with the reduction of mine life from 25 to 5 years for the calculation of depreciation of

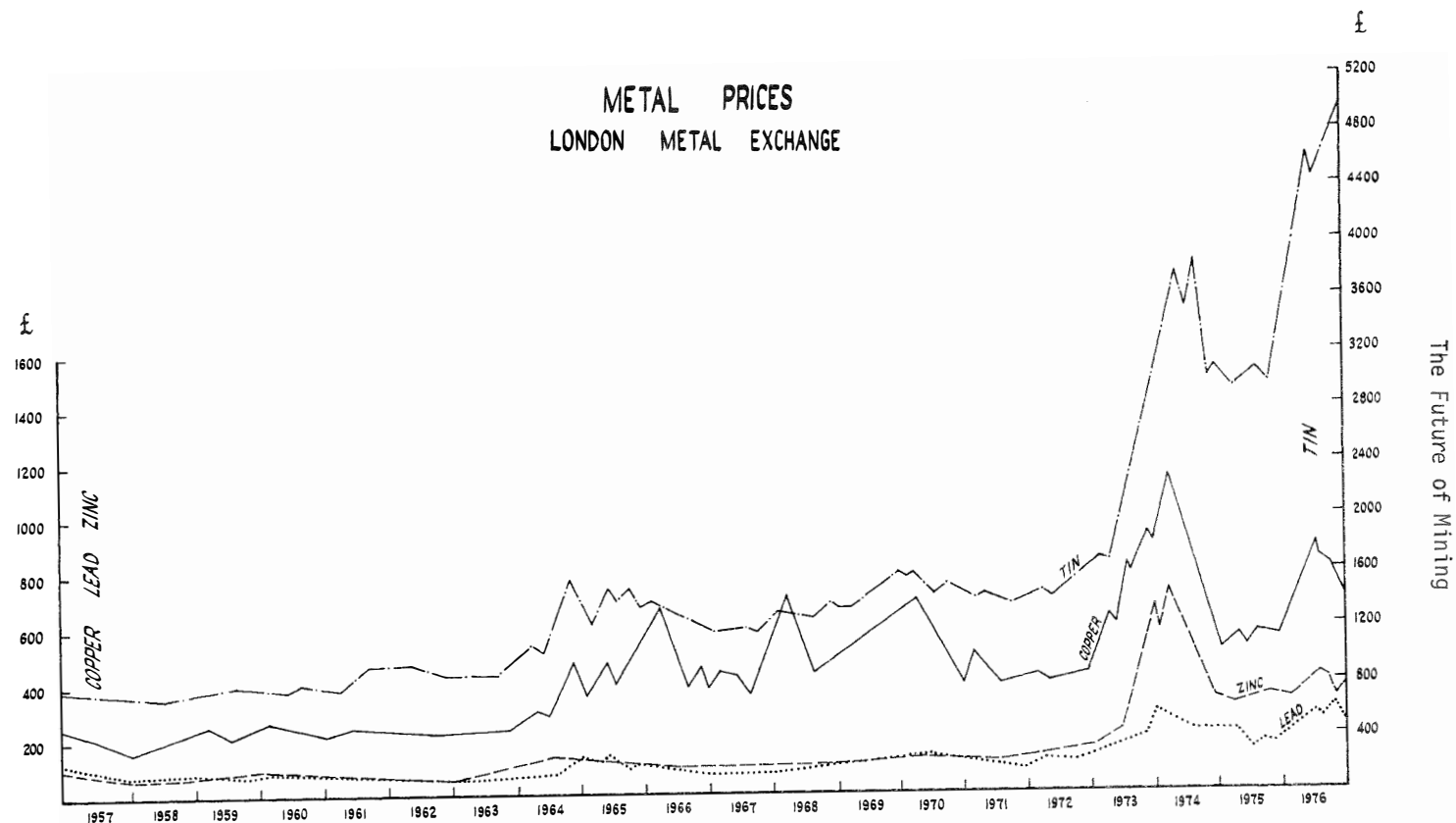


Fig. 25 - Base metal price at the London Metal Exchange 1957-76.

capital expenditure which will help to attract loan funds for the development of new mining projects, and with the easing of the foreign investment policy.

As mentioned earlier, the exploration is a high risk venture and this risk flows on into the subsequent mine development and production phases. The only sure way of avoiding this risk is to have enough capital to survive the inevitable runs of bad luck and to maintain belief in long term profitability. But despite this, even the strongest companies in this region may not have the necessary capital to explore at the desired scale. Hence joint operations will be of increasing importance as a means of extending available capital resources, and reducing risk. As mineral resources of increasingly lower grades are sought, and exploration and development of ore deposits at increasingly greater depths are justified, the need for multinational capital and expertise will become increasingly great.

Particularly during periods of high metal prices, increasing pressures are directed at governments to introduce new or higher levels of taxation on the industry. While for various reasons these measures may be considered desirable, unless the implications and implementation of such reforms are carefully thought out, they can quickly undermine investment confidence and give rise to adverse effects in the longer term.

The final aspect to be briefly considered is that of legislation imposing land use controls, which are predominantly manifested in the growing concern with the preservation and conservation of the natural environment. While accepting the concern and the desire to reduce man's impact on the environment to an "acceptable" level, the following points need to be evaluated and resolved:

1. The increased costs incurred by more stringent environmental protection measures will ultimately be passed on to the consumer. How much will the public be prepared to pay for minimising the environmental impact of man? Environment protection legislation must balance the need to adequately protect the environment while permitting industrial development to service the community.
2. Controlling legislation and rules must be established against an adequate background of scientific knowledge. The environmental impact of proposed developments must be evaluated realistically as almost any action of man will have some effect. In this regard the length of time involved is often overlooked, as we tend to over-emphasise short-term environmental impacts and underestimate long term future needs.
3. Similarly, a realistic timetable for rehabilitation and pollution control measures should be established. Future mine development in the region will generally be able to cope with most environmental protection demands, but any gaps in our available technology cannot be solved overnight. Undesirable operations could be phased out as the technology and/or capital resources are available to replace or modify them.
4. The multiple land use concept may offer a means of avoiding the possibility of natural resources being unnecessarily locked away. However, an accurate assessment of the land's potential should be obtained.

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PLATE 30. - The open cut mine at Queenstown.