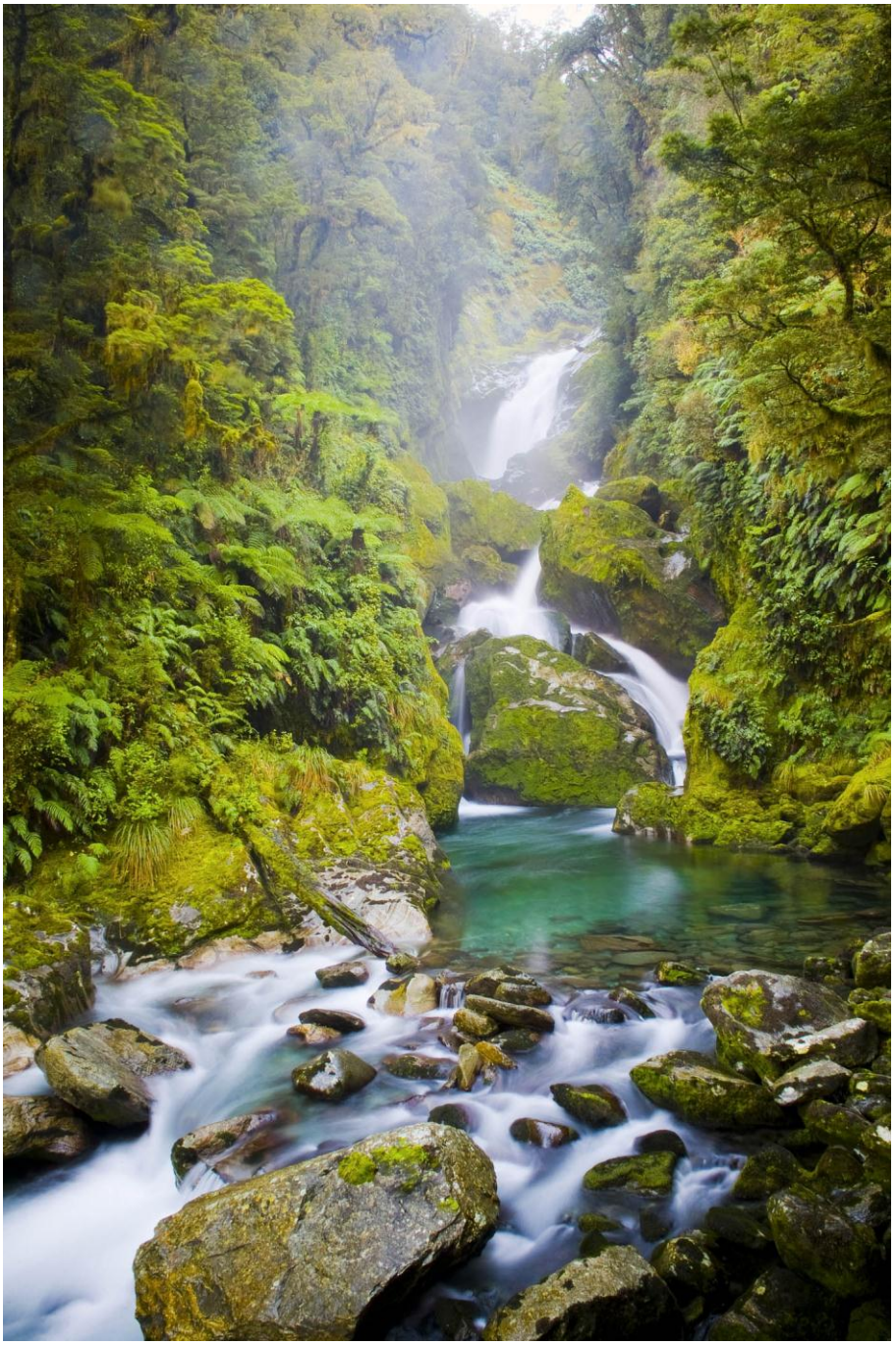
Mining Economics

and the

Conservation Estate



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1. Introduction

- Carried out in an economically efficient manner, mining can contribute to human welfare. Undertaken in the wrong place, the wrong way, or without a proper legal and regulatory framework, mining can have a negative impact on the economy.

- There are two sets of negative externalities (spillovers) that must be taken account of in cost-benefit analyses of mining projects.

- Most obvious are the difficult-to-quantify effects on the 'existence values' of landscapes and ecosystems, which impact on non-consumptive uses such as recreation, tourism, photography and film, and the vicarious enjoyment of the New Zealand outdoor environment by people who may never visit the relevant places in person. Existence values are no less real than commercial values even though they are not normally recorded or recognised in markets.

- The second set of spillovers are the potential negative impacts on other sectors of the economy – especially tourism, but also agricultural exports – that may flow from loss of iconic sites or views, and more general possible damage to the nation's brand image as "clean and green" or "100% pure". Because of tourism's large weight in the nation's GDP, the impact on GDP resulting from loss of brand image could easily outweigh the narrowly-measured gains from a mining project.

- This document brings together a series of papers addressing issues that arise both in forming policy relevant to mining, and in evaluating particular mining projects, especially those in the conservation estate.

2. Valuing New Zealand's Mineral Resource

- The Government has put forward a figure of $194 billion as the "value of New Zealand's onshore minerals excluding hydrocarbons". This figure is not actually a valuation in the usual sense. It is an estimate of the gross revenue from sale of all the output that could hypothetically be secured by mining the entire mineral estate immediately. It takes no account of the costs of exploration, development, extraction, decommissioning, and land rehabilitation, nor of environmental and other external costs of mining. The $194 billion number is large but has no economic meaning.

- A more meaningful way to value the nation's mineral resources is to calculate the present value of the resource rents that could flow to New Zealand, after all costs of mining (including the cost of capital) have been covered. The best estimate of this value, by Statistics New Zealand, is of the order of $1 billion -

less than 1% of the MED's figure. This represents the price which the entire mineral estate would be expected to fetch on sale to the highest bidder.

- Areas that were proposed for deletion from Schedule 4 of the Crown Minerals Act, in order to open them to mining, are reported to contain 10% of the nation's mineral resources, implying an economic value of roughly $100 million before taking account of adverse effects that are not currently monetised.

- $100 million is equivalent to a one-off payment of $36 per voter in the New Zealand electorate. There are strong indications that a single $36 cash payment per adult person would be inadequate compensation for giving mining companies access to the proposed areas of high-value landscapes and ecosystems. According to a recent public-opinion survey, a large segment of the public would require royalties thirty times the current rate that is applied to mineral resources. Insofar as this is an accurate reflection of the existence value of Schedule 4 land in the eyes of the public, it immediately rules out any possibility that mining in Schedule 4 areas could pass a cost-benefit test.

3. Mining Access to Different Categories of Land

- A review of the legislation shows that mining enjoys a uniquely privileged position in securing access to Crown-owned conservation lands. While all other sectors must seek concessions under the Conservation Act 1987, mining companies can secure much less stringent "access arrangements" under the Crown Minerals Act 1991.

- The 1997 amendments to the Crown Minerals Act established Schedule 4 to protect high-value landscapes and ecosystems from any mining development, but gave the Ministers of Energy and Conservation the power to delete any areas they wish by Order in Council. Public consultation was required, but with no judicial or parliamentary checks on the final decision. The public was obliged to trust ministers to act in good faith.

- Once the principle of protection ceases to be absolute (subject only to the will of Parliament) and instead becomes contingent on the goodwill of two ministers, the potential must always be there for an unravelling of the social compact around national parks, nature reserves, and other iconic areas of the country.

- The essence of protected status lies in the obstacles to its revocation. Deletions from Schedule 4 are completely different from additions and must not be confused with them or treated as some sort of tradeoff. Additions to the schedule carry no implication that the status of already-protected areas is being changed. Deletions, on the contrary, carry precisely that implication.

- The practice of placing a legal/administrative ring-fence around a nation's highest-valued conservation areas is a common international response to the impossibility of conclusively balancing quantifiable economic gains from development against difficult-to-value environment costs. Providing absolute

protection for key areas is an economically efficient way to resolve what would otherwise become bitter and costly disputes over 'development' proposals.

- The original legislative proposal to ban mining in parts of the conservation estate was put forward by the then Labour Government in 1990. The primary aim was to provide regulatory certainty that mining would not be permitted in these areas. When finally legislated in 1997, albeit in watered-down form, the Schedule 4 arrangement had multi-party support and was effectively a social covenant to provide durable protection.

4. Mining's Impact on Tourism

- The sector most threatened by allowing mining to encroach into Schedule 4 lands is tourism, which is enormously more important to the New Zealand economy than mining, with export earnings roughly twenty times those of all non-petroleum mining.

- The risks to tourism arise both from degradation of key landscapes and from damage to the nation's "clean green" and "100% pure" branding in overseas markets.

- Studies carried out by the Ministry for the Environment in 2000-2003 found that an important segment of the international tourism market would simply switch to alternative destinations in response to adoption by the New Zealand Government of policies which downgraded the country's brand image. The resulting projected damage would be of the order of 1% of GDP (similar to the total current contribution of all mining and quarrying).

- Even if expansion of mining activity in protected areas did not impact monetarily on tourism, it would not represent an economic net gain for the nation unless it could compensate also for non-monetised losses of existence, option, bequest and recreational values.

- Where mining can be expanded with no spillover costs to the tourist industry or any other sector, and without sacrificing important values held by the public, it should result in a net gain in GDP and in the balance of payments. But wherever mining expansion comes at a cost to tourism or other sectors, any cost-benefit assessment must take full account of that spillover.

5. Statistical Overview of the Mining Sector

- Mining is not a major sector of the New Zealand economy. With oil and gas included it has accounted for around 1% of annual GDP over the past four decades. With oil and gas excluded, the remaining mining activities - collectively labelled "mining and quarrying" - account for around 0.4% of GDP.

- Mining generates far fewer jobs, and less wages and salaries, per dollar of final output, than other sectors. While contributing around 1% of GDP, mining provides less than 0.3% of total employment – between 5,000 and 6,000 jobs.

- The growth of the aggregate mining sector's value added has not outpaced GDP growth for the economy as a whole in the past three decades. Mining has not been a growth-leading sector. Mining's economic contribution is far more unstable (volatile) than national output, consistent with the sector being more boom-and-bust than the average.

- Excluding oil and gas, mining accounts for between 1% and 1.5% of New Zealand's total exports – about $0.4 billion in 2007.

- With oil and gas excluded, the dominant mining activities (over 70% of total output by value) are quarrying and coal mining. Both stand out as locally-owned sectors which between them account for the great bulk of mining employment.

- Overseas investment accounts for 35-40% of the net capital stock of mining (including petroleum). Disaggregated figures are not available.

- Mining companies pay relatively little tax. Royalty revenues run well below 1% of total output by value, and company tax is minimised by generous depreciation and the ability to carry tax losses forward. Solid Energy stands out as paying 33% of its profits in tax, whereas Oceana Gold and New Zealand Steel Mining both overseas owned) paid no company tax at all 2004-2009, while Newmont Waihi reportedly paid 22% tax on its net profit.

- Direct Government expenditure on administering the Crown mineral estate and undertaking geotechnical research is estimated at less than $20 million annually. Revenue from royalties and levies has ranged from $120 million to $211 million over the past five years, mostly from oil and gas. Excluding petroleum, other mining and quarrying pays around $13 million annually in royalties and levies, and around $35 million in company income tax (mostly from state-owned Solid Energy).

6. Distribution of Income Generated by Mining

- National-accounts data for the mining sector including oil and gas show that mining is far more capital-intensive than the New Zealand economy average. Gross operating surplus (returns on and of capital invested) accounts for around 35-40% of mining output compared with only about 20% of national output.

- For the economy as a whole, "compensation of employees" makes up around 20% of total output whereas in mining the labour share is below 10%, having fallen dramatically since the 1970s.

- The ratio of gross value added to total output in mining has fluctuated, reaching a peak of 65% in 1992, since when it has dropped to 45%, roughly the economy-wide average ratio. The trend in the ratio for mining has been downward in the past two decades.

- The appearance of a relatively high value-added to-output ratio in mining is misleading because of the way the conventional national accounts statistics treat consumption of capital (depreciation). The economy-wide figure for depreciation is 7% of gross output whereas for mining it has ranged between 12% and 20% over the past two decades. Using gross rather than net value added as the measure of "contribution to the economy" makes mining appear more productive than it actually is in adding value to the intermediate inputs used.

- The great bulk of gross value added goes to capital rather than labour. As the mining sector is far more capital-intensive than the economy-wide average, the incomes generated in mining are heavily skewed towards operating surplus.

- Gross operating surplus takes just under half of gross value added across the whole economy, but between 70% and 80% in mining. Compensation of employees takes 47% of gross value added across the economy, but only 20% in mining.

- Within gross operating surplus, the mining sector has a conspicuously higher depreciation claim on revenues than the economy as a whole and also a higher claim for net surplus. Depreciation is not a cash cost but simply an accounting entry, used mainly to reduce the amount of income tax payable on operating surplus.

- From 1988 on, published national-accounts data is available showing the GDP contribution of mining and quarrying separately from oil and gas, though with no breakdown between operating surplus and compensation of employees. Mining and quarrying contributes around 0.4-0.5% of GDP and oil and gas around 0.7-0.8%.

- A decomposition into compensation of employees, operating surplus, and taxes on production separately for "mining and quarrying" and "oil and gas" for the 2007 year shows oil and gas to be more capital-intensive than other mining, with gross operating surplus taking 41% of gross revenue and 83% of gross value added, while wages and salaries account for only 6% and 13%.

- Mining and quarrying, with oil and gas excluded, has operating surplus taking 26% of revenue and 64% of value added, still high relative to the national average figures of 20% and 50%. Wages and salaries in mining and quarrying capture 32% of gross value added compared with 47% for the economy as a whole

- Statistics New Zealand does not release data at any more disaggregated levels for reasons of "confidentiality". Available information has been gathered from other sources to assemble 2007 March-year estimates for gold and silver, ironsands, quarrying, and coal, as separate sub-sectors.

- The wage share in both output and value added is highest for ironsands: 25% of output and 57 of value added. Then comes quarrying with 15% and 35%, followed by coal with 11% and 35%. The wage share is lowest for gold and silver mining: 11% of output and 22% of value added.

- Gold and silver mining has over 75% of its gross value added going to gross profit, with a spectacularly high share for depreciation (which represents cash income accruing to overseas owners). Quarrying and coal have gross operating surplus around two-thirds of value added. Ironsands records 43%.

7. Foreign Exchange Contribution

- 'Retained value' is the share of each dollar of sales revenue that is retained in the New Zealand economy, at least over the first two rounds of expenditure. The figure for mining and quarrying is 82% if "services to mining" are assumed to be entirely New Zealand-owned, or 76% if that sector is entirely overseas-owned. Excluding services, the figure is 77%.

- Coal stands out as having the highest proportion (83% in 2007) of gross income spent within the New Zealand economy. Quarrying is similar, with 82 retained vaue, followed by ironsands with 70%. Gold and silver mining comes at the bottom (55%).

- Turning to net direct foreign-exchange contribution (export earnings minus payments for imports and gross profit to overseas owners), the figure for gold and silver mining was an estimated 49% of gross income, followed by coal with 38% and ironsands with 13%. Quarrying made a negative direct contribution to the balance of payments, incurring more balance of payments outflows to pay for imported requirements and profits repatriation than it earned from exports.

- The direct contribution is not, however, the whole story for balance of payments impact, because of the indirect contribution of each sector via import substitution. Allowing for the import saving when mining output is sold as inputs to other sectors, displacing (hypothetical) competing imports, reverses the ranking. Quarrying comes top with well over 100% of output as its balance of payments impact (due to the very high cost of replacing local quarry supplies with imports), followed by coal (about 90%) and ironsands (80%). Gold and silver comes last with 55%.

- From the standpoint of development of the national economy, quarrying and coal are the standout performers – the former because of its fundamental

forward-linkage infrastructural role in providing construction materials without which other key economic inputs (roads, buildings) could not be supplied at current cost; and coal because of its local ownership, high company tax payments, and substantial contribution to foreign exchange earnings.

- Ironsands, like quarrying, supports a substantial forward-linked downstream activity – iron and steel smelting at Glenbrook - but returned relatively little of its export earnings to the economy, because of low tax payments and foreign ownership.

- Gold and silver turned in an undistinguished performance on all fronts, with no forward linkages, low taxes, and almost all surplus accruing to offshore owners.

8. Contingent Liabilities

- There are significant costs associated with closing-down a mining operation. Provisioning during a mine's lifetime for those long-term future costs is important, but severe uncertainties make it difficult to know whether financial provisions set aside today will be adequate to cover future potential damages.

- Unusually high environmental risks are associated with large-scale mining in geologically unstable terrain. Of four major mining projects in the Coromandel region since 1970 (Tui, Golden Cross, Martha Hill, and Favona) two projects have had major environmental problems associated with tailings storage while a third (Martha Hill) was implicated in serious subsidence of areas within Waihi township, requiring evacuation of residents.

- Lax environmental regulation in the past has left New Zealand a legacy of 'orphaned sites' polluted by mine tailings, agricultural chemicals, and timber processing residues. The cost to taxpayers of cleaning up just the Tui mine tailings dump at Te Aroha is likely to exceed $20 million.

- The Parliamentary Commissioner for the Environment has drawn attention to over 100 remaining mining licenses issued under old legislation, for which the party or parties liable to cover the full costs of environmental damage is unclear.

- The Golden Cross mine at Waitekauri was required to post a $12.5 million bond as a condition of its consent. Costs of remediation when the mine's tailings dam failed due to ground movement were somewhere between $30 million and $60 million.

- The prevailing legal requirements relating to bonds and mandatory insurance appear to rely heavily upon both corporate good citizenship and the exercise of judgment by the relevant consent-granting authorities. There has too often been inadequate provisioning for remedying the consequences of serious ecological damage resulting from mining.

1. Introduction

The papers in this collection were commissioned in 2010 by the Royal Forest and Bird Protection Society of New Zealand, to provide background information for the ongoing policy debate over Government proposals to expand the amount of mining being undertaken in the nation's conservation estate. The statistics used have been drawn from official sources and from company annual financial statements[1]. Three of the papers – reproduced here (with some revisions) as Chapters 2, 3 and 4 – were appended to Forest and Bird's submission on the Government discussion paper circulated in March 2010 (which proposed deletion of several areas from Schedule 4 of the Crown Minerals Act). The remaining chapters have not previously been published.

Three features of mining as an economic activity have come to the fore in the course of the 2010 policy debate:

- First is the limited size of most onshore mineral deposits in New Zealand, compared with the enormous scale of, say, Australian ore bodies. This means a relatively short life-span for a typical New Zealand mine. Few large-scale metal mines last more than a decade or so before going into decline and closure as the resource is depleted[2]; and most coal deposits are affected by difficult geology (especially widespread faulting) which raises extraction costs and limits mine size.

- Second is the potential conflict between the depletable nature of mining and the sustainable nature of other, potentially competing, commercial activities in the conservation estate such as tourism, which rely upon the preservation of landscapes and ecosystems for non-consumptive use by visitors, and for purposes of national branding in overseas markets. New Zealand's small geographical extent (compared in particular with Australia) makes it relatively difficult to find locations where large-scale extractive activity can proceed with no detrimental environmental spillovers.

- Third, following from the second, is the political sensitivity of mining. Recent history has shown mining development on conservation lands to be highly contentious, in the sense of dividing popular opinion into sharply-opposed camps. This means that there is a clear risk that a partisan policy decision in favour of a heavily-contested mining project may be overturned by a future

[1] Appendix A describes the main official sources and the classification systems used.

[2] The ironsands of the North island west coast are the most notable exception, because of the very large scale of the resource. No metals deposits of comparable size appear to be located in conservation land.

> government. Without a political consensus underpinning the rules for mining development, the resulting uncertainty can be expected to have a chilling effect not only on mining projects in contentious areas of the conservation estate, but on mining activities more generally. There is a high premium attached to access rules that have the sanction of a united Parliament and general popular acceptance.

Carried out in an economically efficient manner, mining can contribute to human welfare. Efficiency requires that mining be done where the relevant resources are relatively abundant and where economic costs (in the widest sense) are lowest. Mining will not increase economic welfare - on the contrary, it will reduce it - if done in the wrong place, or in the wrong way, or without a proper legal and regulatory framework. Mining therefore presents industry-specific problems for regulators and policymakers, which cannot be finessed by overgeneralized rhetoric or glamorous photography.

Economic efficiency requires that account be taken of spillovers (externalities) from mining. In relation to the conservation estate, spillovers come in two sets. The most obvious are the largely-unquantifiable detriments to the existence values of landscapes and ecosystems, which impact negatively on non-consumptive uses such as recreation, tourism, photography and film, and the vicarious enjoyment of the New Zealand outdoor environment by people who may never visit the relevant places in person. Existence values are no less real than commercial values, and it is not helpful to dismiss them as "emotion", since human welfare is ultimately experienced as happiness by individuals and it is this that economics seeks to maximize.

The second set of spillovers are more susceptible of quantification: negative impacts on other sectors of the economy – especially tourism, but also agricultural export products – that may flow from loss of iconic sites or views, and more general possible damage to the nation's brand image as "clean and green" or "100% pure". Because of tourism's large weight in GDP, the negative GDP impact of a loss of brand image could easily outweigh the narrowly-measured gains from a mining project undertaken without adequate concern for spillovers.

The extensive public debate of 2010 points to the need to review both legislation and the nation's political culture surrounding "development" projects. This report seeks to shed some light on the regulatory and economic context for mining in New Zealand. It first looks at general valuation issues, the legislative and policy framework, and the potential tension between mining and tourism as contributors to the New Zealand economy. It then turns to a detailed review of the available statistics to explore the mining sector's role in the economy, the distribution of incomes generated by mining, and the extent to which the sector's earnings remain in the economy. Finally it looks at the costs of making good the environmental damage resulting from mining activity, and the allocation of liability for such damage.

2. Valuing New Zealand's Mineral Resource

2.1 The Issue

In August 2009, the New Zealand Government signaled its intention to review the status of parts of the conservation estate listed in Schedule 4 of the Crown Minerals Act 1991.[3] A discussion document published by the Ministers of Energy and Conservation in March 2010 subsequently claimed that that the nation's endowment of on-shore minerals (excluding petroleum) had a "value" of $194 billion[4] and that "about 40 percent of New Zealand's known [excluding hydro-carbons[5]] mineral potential is estimated to be in Schedule 4 areas"[6] or some $80 billion.[7]

The discussion document proposed the removal from Schedule 4 of a number of particular areas in Great Barrier Island, the Coromandel, and Paparoa National Park. The Government's estimated "value of minerals" within those targeted areas, according to the MED website[8], comprised:

Coromandel (including Great Barrier):	$18 billion
Inangahua (Paparoa National Park):	$1-2 billion[9]
Total (approximate):	$20 billion

The areas that the Government was proposing to remove from Schedule 4 therefore included one quarter of its estimate of the "value" of minerals within all Schedule 4 lands ($20/$80 billion), and about 10% of the national total ($20/$194 billion)[10].

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3 As amended in 1997.

4 Ministry of Economic Development, *Maximising our Mineral Potential: Stocktake of Schedule 4 of the Crown Minerals Act and Beyond*, March 2010, http://www.med.govt.nz/templates/MultipageDocumentTOC____42792.aspx, p.2.

5 Strictly speaking, hydrocarbons comprise oil and gas but not coal, which would imply that the $194 million figure includes coal reserves. However, the context of the MED document suggests that coal had been excluded in estimating the $194 billion figure.

6 *Maximising our Mineral Potential*, p.2.

7 Put the other way round, this means that 60% of the total is accessible without encroaching on those parts of the conservation estate with the highest landscape and ecosystem values - at least, as indicated by their inclusion in Schedule 4 after a bruising political debate in 1997.

8 http://www.med.govt.nz/templates/Page____42795.aspx . **10. What is the value of minerals in the areas proposed for removal from Schedule 4?** Answer: The Coromandel is one of the most mineral rich areas of New Zealand with production value of gold and silver alone in excess of $17 billion to date. The potential in-ground value of remaining metallic and non-metallic resources in the Coromandel area has been estimated at $54 billion based on current prices. About a third of that is estimated to be in the less than four percent of the area proposed for removal from Schedule 4. The Inangahua sector in the Paparoa National Park is moderately to highly prospective for coal, worth at least $1-2 billion. The sector is the subject of considerable permit interest and has been the subject of mining activity in the past.

9 Mostly coal.

In considering the proposition that the nation's non-petroleum mineral resources have a "value" of around $200 billion, the immediate question to ask is what valuation methodology (if any) was used to derive this figure and what it means. The discussion document stated[11] that the figure was derived from a 2008 consultancy report and two studies by GNS scientists. The 2008 report by mining industry consultant Richard Barker stated that:

> New Zealand's potential mineral resources were assessed by GNS Science in a study in 1999. It identified potential for 16 metals in 32 different types of mineral deposit. These potential metallic mineral resources were valued at $86 billion using 1999 values, based on conventional resource modeling techniques. Real prices of most metals and minerals were at historical lows in 1999. Since then further investigations and price rises have increased the potential value of the assessed resources [including non-metallic minerals] to more than $200 billion.[12]

Both in that 2008 report, and in his 2010 paper on the "value" of precious metals on Great Barrier[13], Barker's figures are actually for gross sales revenue, which he calculates by taking an estimate of the volume of recoverable metals or other products, multiplying this by the current market price of each, and adding up the results, with no allowance for costs of exploration, development, extraction, decommissioning, and rehabilitation, nor for environmental and other external costs of mining. The result is a number which is large but economically meaningless, because it does not represent the real value of the resource as an asset of the nation. The same criticism applies to the figures in the two GNS scientific studies relied on by MED.

Gross output or revenue without regard to cost is not an indicator of economic benefit. An economic analysis would focus on four areas: the value added

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10 These percentages will be overstated insofar as coal may be missing from the $194 billion total, as noted earlier.

11 Ministry of Economic Development, *Maximising our Mineral Potential: Stocktake of Schedule 4 of the Crown Minerals Act and Beyond*, March 2010, p.2 footnote 2.

12 Richard Barker, *The Natural Resource Potential of New Zealand*, March 2008, http://www.minerals.co.nz/pdf/Natural_Resource_NZ_web.pdf , p.7. Of the $200 billion, $139 billion was metals; the increase from $86 billion to $139 billion in metals was attributable entirely to Barker's use of (high) 2008 prices in place of the (low) 1999 prices used in his main source, Christie, A.B. and Braithwaite, R.L., *The mineral potential of New Zealand*, Institute of Geological and Nuclear Sciences science report 99/4, 1999.

13 Richard Barker, *An assessment of the value of Crown minerals in the Te Ahumata area, Great Barrier Island* , report prepared for Ministry of Economic Development, January 2010, http://www.med.govt.nz/upload/71519/Assessment-of-the-Te-Ahumata-area.pdf .

(contribution to GDP) of mining, the distribution of returns between the New Zealand economy and overseas interests, the extent of spillovers onto third parties (externalities, both quantifiable and non-quantifiable), and the asset valuation of the depletable resource itself. Confusion of potential sales revenue with the value of the underlying resource explains why Barker's number, relied on by the Government in its discussion paper, is so much higher than any credible economic valuation of New Zealand's mineral resource endowment, and greatly overstates the benefits to be secured from extraction of the total mineral resource.

2.2 Economic Value: Statistics New Zealand's Method

The casual and economically uninformative treatment of mineral valuation in the 2010 MED discussion document is in striking contrast to systematic work carried out by Statistics New Zealand in 2000-2003 to construct a "Mineral Monetary and Physical Stock Account", based on the United Nations System of Environmental and Economic Accounting (SEEA)[14]. That exercise (see Appendix K) yielded a valuation of New Zealand's non-petroleum mineral resources in the vicinity of $1 billion[15] – roughly 0.5% of the figure used by the Government. Under the Statistics New Zealand valuation, the mineral resources in the areas targeted for removal from Schedule 4, estimated as 10% of the total, would be $100 million, not the Ministry of Economic Development's $20 billion.

The SEEA valuation methodology estimates the market value of a mineral resource as the total sale price that the owner could hypothetically receive by selling it to the highest bidder. In the case of mineral resources owned by the Crown on behalf of the nation's people, this market value is estimated as the discounted present value of the resource rents that the owner could collect from a developer of the resource without

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14 United Nations, European Commission, International Monetary Fund, Organisation for Economic Cooperation and Development, and World Bank *Handbook of National Accounting: Integrated Environmental and Economic Accounting*, final draft 2003http://unstats.un.org/unsd/envaccounting/seea.asp

15 Statistics New Zealand, *Environmental Accounts Series: Mineral Monetary and Physical Stock Account 1994-2000*, available at http://www.stats.govt.nz/publications/nationalaccounts/minerals/interpretation-of-the-mineral-stock-account.aspx , p.6 and Table 4.4 p.16; and (for coal) *Energy Monetary Stock Account 1987-2001*, Table 5.4 p.21. The valuations fluctuated widely from year to year because of the volatility of the commodity prices used to estimate them.

rendering development commercially unattractive.[16] That is, the value of the resource itself is the present value of the residual (rental) income that would be available from development of the resource after paying for all the costs of exploration, development, extraction, processing, marketing, decommissioning, and site rehabilitation. Statistics New Zealand designed its study to be consistent with the international standard methodology, and with the national accounts. It drew its physical estimates of the total mineral stock from the same source that Barker and the Government's discussion paper have used - the 1999 Christie/Braithwaite mineral resource inventory.[17]

Statistics New Zealand's estimate of around $1 billion corresponds reasonably closely with the observed rate of royalties received by the New Zealand Government from the non-petroleum mining industry. Royalties on non-oil minerals are notionally set in the vicinity of 1% of gross revenue, with actual receipts often less than this, and $1/196 billion is the same order of magnitude.

Even the implied estimate of $100 million as the value of the minerals that would have been made available for exploitation by removing from Schedule 4 the areas listed in the 2010 discussion document is likely to be a considerable over-estimate of the actual recoverable value[18]. As Barker notes, his gross-revenue figures "are not predictions of what is achievable in the near future"[19], given the uncertainties and likely difficulties to be overcome in developing the resource. A simple reality check on the geology and topography of the Coromandel suggests that the likely actual recovery of minerals in the event of mining companies being granted access would fall well below the gross total estimate, given that much of the resource would require open-pit mining and very large tailings containment structures in country that presents well-known engineering problems. Similarly, the costs of securing adequate power supplies on Great Barrier Island would be high as it would require a new dedicated plant, probably fired on barged coal.

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16 For detailed discussion of the methodological and conceptual issues surrounding valuation of minerals see UN et al 2003, *Integrated Environmental and Economic Accounting*, Chapters 7 and 8, especially pp.275-290 and 318-323.

17 Christie and Braithwaite (1999) *The Mineral Potential of New Zealand*, Institute of Geological and Nuclear Sciences, Wellington, 1999.

18 The estimation procedure used by Statistics New Zealand does not appear to have imputed any cost representing charges imposed on the notional mining industry to internalize any externalities such as loss of existence value or tourism and recreational values. To the extent that these are relevant, the resulting valuation figure will be an overestimate.

19 Barker 2008, p.8.

2.3 What Price to Forego Conservation Values and Allow Mining?

Only a small fraction, if any, of the mineral deposits in the Schedule 4 areas being targeted by the Government would be recoverable by underground mining with minimal footprints for the portals, and even such "surgical" underground mining would still require large tailings dams in the close vicinity.[20] Tailings have been the most common source of environmental problems with mining in New Zealand to date. Mining in Schedule 4 would inevitably have required the sacrifice of some ecological and landscape values, at least for the period of mining and rehabilitation, and potentially for far longer in cases of irreversible environmental impacts. If these environmental costs were to be internalised by means of charges on developers to compensate for the loss of landscape and ecological values[21], it is highly unlikely that more than a small fraction of the potential, if any, would actually have been profitable to mine.

The extreme difficulty of using any "expert" procedure to determine in monetary terms the existence value of landscapes and ecosystems points to the wisdom of relying upon regulatory and political signals. To convert the economic valuation into laypersons' terms, one could think of the Crown-owned mineral resources of New Zealand as being the property of the electorate. The March 2010 proposal to grant mining access to parts of Schedule 4 can then be framed as a hypothetical purchase offer by a developer to pay the voters of New Zealand a sum of at most $100 million, in exchange for an unrestricted right to mine the entire stock of minerals in those lands. There are 2.8 million registered voters in the New Zealand electorate, which means that the gain from granting access would have been $36 or less per voter. Whether a one-off payment of $36 each would be sufficient to persuade a majority of the electorate to support the mining proposal would then be the litmus test to be passed by the Government.

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[20] The Tui mine at Te Aroha, whose tailings continue to present a massive environmental problem, was entirely underground with portals occupying only small areas of the site.

[21] As has been proposed in September 2010 by the Parliamentary Commissioner for the Environment in her report *Making Difficult Decisions: Mining the Conservation Estate.*

One could think of this $36 per adult person as either a "willingness to accept" payment for handing over a slice of the nation's mineral estate; or as a "willingness to pay" to prevent mining companies from having access to Schedule 4. Either way, the suggested deal does not appear particularly attractive, and it is not surprising that following public consultation, the Government decided not to proceed with the Schedule 4 deletions.

Note that this decision can be the economically correct one even when there are positive "benefits to the economy" in terms of gains to employment or GDP. There has been a tendency among some economic consultants and industry lobbyists to claim that positive effects on GDP are conclusive evidence of net economic benefits, but in fact this involves a failure to recognize the shortcomings of GDP as the sole measure of economic and social welfare. Non-market values are no less relevant to welfare than the quantifiable market values emphasized by the industry. They are, though, difficult to bring into any precise monetary balance. The threshold approach outline above (is $36 per voter a sufficient compensation for handing over 7,000 ha of Schedule 4 land to miners?) is one way to get a yes/no answer to the cost-benefit question. A more calibrated approach tries to tease out non-market values by varying the offered compensation.

In May 2010 a public-opinion survey of 2,215 people was commissioned by the Business Council for Sustainable Development. It found that "while a majority of New Zealanders acknowledge mining on Schedule 4 land's royalty revenue, jobs and economic growth and wealth benefits the majority still oppose it".[22] Generally the survey found that existing royalty rates on mining were considered too low to compensate for the loss of conservation values, often by a very wide margin. "Royalties for mining Schedule 4 land would need to be above 30% for a majority of New Zealanders to feel satisfied the economic benefits and effects on the environment are balanced."[23]

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22 Shape NZ, *New Zealanders' views on the mining industry, royalties and tax: A ShapeNZ nationwide survey of 2,215 New Zealanders*, May 13-18, 2010, Part 2, p.5.

23 "New Zealanders want mining firms to pay higher royalties and new super tax on profits", Business Council for Sustainable Development media release 23 May 2010, p.2, summarizing answers to the question "To achieve a balance between economic benefit and the environment, what level of royalty should the Government receive from those mining Schedule 4 conservation land?"- see ShapeNZ 2010 p.8

If it is true that, to compensate for the environmental damage caused by mining activities in sensitive areas, a large segment of the public would require royalties thirty times the current rental value that is applied to mineral resources, this immediately rules out any possibility that mining in Schedule 4 could have passed a cost-benefit test.

While Schedule 4 lands are now off the agenda, the Government has signaled its intention to encourage the expansion of mining activities in other areas of the conservation estate. The consenting procedures for granting access to these lands, and the reasons for treating Schedule 4 lands differently from the rest, are the subject of the next chapter. The economic issues to be resolved in cost-benefit assessment of projects in the conservation estate are covered in later chapters.

3. Mining access to different categories of lands

3.1 Legislation

The Conservation Act 1987 created the Department of Conservation, which has the following functions:

6 Functions of Department

The functions of the Department are to administer this Act and the enactments specified in Schedule 1 to this Act, and, subject to this Act and those enactments and to the directions (if any) of the Minister,—

(a) To manage for conservation purposes, all land, and all other natural and historic resources, for the time being held under this Act, and all other land and natural and historic resources whose owner agrees with the Minister that they should be managed by the Department:

(ab) To preserve so far as is practicable all indigenous freshwater fisheries, and protect recreational freshwater fisheries and freshwater fish habitats:

(b) To advocate the conservation of natural and historic resources generally:

(c) To promote the benefits to present and future generations of—

  (i) The conservation of natural and historic resources generally and the natural and historic resources of New Zealand in particular; and

  (ii) The conservation of the natural and historic resources of New Zealand's subantarctic islands and, consistently with all relevant international agreements, of the Ross Dependency and Antarctica generally; and

  (iii) International cooperation on matters relating to conservation:

(d) To prepare, provide, disseminate, promote, and publicise educational and promotional material relating to conservation:

(e) To the extent that the use of any natural or historic resource for recreation or tourism is not inconsistent with its conservation, to foster the use of natural and historic resources for recreation, and to allow their use for tourism:

(f) To advise the Minister on matters relating to any of those functions or to conservation generally:

(g) Every other function conferred on it by any other enactment.

Under section 6(a) the Department currently manages about one-third of the land area of New Zealand and 0.3% of the marine area, with a presumption that the primary use for that land is to be conservation.

The Minister of Conservation has power under section 17Q of the Conservation Act to grant "concessions" for commercial activities other than mining to locate within the conservation estate, subject to tests set out in section 17U.

First, under s.17U(1),

> In considering any application for a concession, the Minister shall have regard to the following matters:
> (a) The nature of the activity and the type of structure or facility (if any) proposed to be constructed:
> (b) The effects of the activity, structure, or facility:
> (c) Any measures that can reasonably and practicably be undertaken to avoid, remedy, or mitigate any adverse effects of the activity:
> (d) Any information received by the Minister under section 17S or section 17T of this Act:
> (e) Any relevant environmental impact assessment, including any audit or review:
> (f) Any relevant oral or written submissions received as a result of any relevant public notice issued under section 49 of this Act:
> (g) Any relevant information which may be withheld from any person in accordance with the Official Information Act 1982 or the Privacy Act 1993.

Then there is a clear instruction to the Minister in section 17U(3)):

> The Minister shall not grant an application for a concession if the proposed activity is contrary to the provisions of this Act or the purposes for which the land concerned is held.

Various other tests and limitations are spelled out in the remainder of s.17U, the combined effect of which it to ensure that the special status of conservation land is fully protected when private commercial activities are granted concessions.

Section 17O(3) of the Conservation Act, however, exempts mining from these provisions of the Conservation Act:

> (3) A concession is not required in respect of—
>
> (a) Any mining activity authorised under the Crown Minerals Act 1991 (including the transitional provisions of that Act)

Section 61(1) of the Crown Minerals Act 1991 instead provides for much looser "access arrangements" under which use of Crown land for mining purposes can be granted by "the appropriate Minister" to any areas other than those listed in Schedule 4 to the Act.

Section 61(2) of the Crown Minerals Act sets out the relevant matters to be considered in granting access arrangements for mining in non-Schedule-4 conservation lands:

> 61(2) In considering whether to agree to an access arrangement in respect of Crown land, the appropriate Minister shall have regard to—
>
> (a) The objectives of any Act under which the land is administered; and
>
> (b) Any purpose for which the land is held by the Crown; and
>
> (c) Any policy statement or management plan of the Crown in relation to the land; and
>
> (d) The safeguards against any potential adverse effects of carrying out the proposed programme of work; and
>
> (e) Such other matters as the appropriate Minister considers relevant.

These are conspicuously less demanding tests than those to be met by activities seeking concessions under the Conservation Act (reproduced earlier). No mention is made of public notice and submissions, environmental impact statements, the effects of the activity, or "measures that can reasonably and practicably be undertaken to

avoid, remedy, or mitigate any adverse effects". There is no provision to parallel s.17(U)(3) of the Conservation Act, strictly preventing the Minister from granting an application for a concession if the activity is "contrary … to the purposes for which the land concerned is held"[24].

The distinction between concessions and access arrangements is important. "Concessions" under the Conservation Act include leases, licences, permits or easements, all requiring documentation. "Access" under the Crown Minerals Act is a far looser and more informal concept:

> **Access arrangement** and **arrangement** means an arrangement between a person desiring access to land for the purpose of carrying out mineral related activities and the owner and occupier of the land, permitting such access, either entered into by way of agreement or determined by an arbitrator in accordance with this Act

Mining, therefore, has a uniquely privileged legislative status among activities seeking access to the conservation estate.[25]

3.2 Economic Efficiency and Regulatory Certainty

The existing legislative framework presents mining companies with a three-tier classification of the country:

- two-thirds outside the conservation estate requiring approval from the Minister of Energy (with some further restrictions in the case of Maori land);
- 20% in conservation lands requiring approval from the Minister of Conservation; and
- 13% in Schedule 4 within the conservation estate, barred from mining.

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[24] The Parliamentary Commissioner for the Environment makes similar arguments in her September 2010 report *Making Difficult Decisions: Mining the Conservation Estate*

[25] Tourism, as a non-consumptive use that is compatible with preservation of wilderness values, is explicitly allowed under the Conservation Act 1987. All other activities must seek special access, and it is relative to these that mining's privileges are "unique".

This three-fold classification may seem rough-and-ready, but is an effective way of dealing with the difficult issues that arise when attempting to assess the economic gains from mining development versus the environmental losses. The gains from mining are relatively straightforward to quantify, whereas losses to environmental values are inherently difficult to measure and are usually treated in qualitative terms. An important part of the evaluation of environmental values is expressed through the democratic political process since many of the existence and other values of natural systems and landscapes are subjectively experienced by the population as a source of well-being, separately from their monetary income and expenditures, and find clear expression through political actions, rather than through market mechanisms.

Mining *per se* is in the first instance just another economic activity that stands alongside other components of the country's GDP. In some parts of the country, mining does not compete with other value-creating activities and does not encroach on landscapes or natural systems to which a high value is attributed by the public. In those areas it is reasonable for mining projects to face only the land-use regulatory procedures faced by other sectors. At the other end of the spectrum of natural values, however, there will be areas which the public values so highly for their natural characteristics that environmentally destructive activities, including mining, can be ruled out without engaging in time-consuming and expensive procedures of inquiry and adjudication between competing claims.

Economic efficiency requires, among other things, the minimisation of transaction costs so far as possible. In the case of areas of very high natural value, it is not efficient to allow continual battles between the competing interests, both because the issue of "development" versus "conservation" is inherently impossible to resolve except by exercise of judgment (usually with an arbitrary component[26]); and because such battles have negative spillover effects. Extractive industries as a whole face the chilling effect of aroused public hostility, while the threat of major impacts on high-value landscapes and ecosystems has an equally chilling effect on tourism and aggrieves affected communities.

[26] That there is an inescapably arbitrary element in most environmental valuation is well understood in the economics literature; see for example Nick Hanley, Bengt Kristrom, and Jason F. Shogren, "Coherent Arbitrariness: On Value Uncertainty for Environmental Goods", *Land Economics* 85(1): 41-50, February 2009.

In most western democracies, legislation has been enacted to enable low-value areas to be developed by extractive industries, while removing the highest-valued areas from all developments[27] and then providing some intermediate areas in which commercial and non-commercial values must be balanced by a formal process. This administrative solution to the dilemma of how to proceed in the situation where, because of missing markets, standard cost-benefit techniques fail, is an efficient (transaction-cost-minimising) approach. Its viability hinges, however, on the integrity of landscape and ecosystem protection at the high-value end of the spectrum. Any perception that the boundaries of Schedule 4 are open to "gaming" by industry lobbyists directly damages the integrity of the entire system of classification of land according to its inherent environmental values.

The key "missing markets" whose absence can distort land allocation decisions guided only by market forces are those for the inherent values which the population at large places upon natural systems and landscapes. As a classic paper by Krutilla puts it, [28]

> The central issue seems to be the problem of providing for the present and future the amenities associated with unspoiled natural environments, for which the market fails to make adequate provision….
>
> When the existence of a grand scenic wonder or a unique and fragile ecosystem is involved, its preservation and continued availability are a significant part of the real income of many individuals….. One may ask why no market has developed where option value exists for the preservation of natural environments.

Krutilla's answer was that the environment is a public good whose value to the community cannot be captured by the market mechanism, but must be protected by administrative means. Of these the simplest and most reliable is the reservation of

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[27] That is, uses which gain value from the natural environment without degrading or depleting it. Tourism, recreation and observational science are examples of non-consumptive use.

[28] John V. Krutilla, "Conservation Reconsidered", *American Economic Review* Volume 57, Issue 4 (Sep., *1967*), 777-786, pp.778, 779, 780.

certain landscapes and ecosystems to place them outside the reach of those types of economic activity that would diminish their inherent value. This idea lay behind passage in 1964 of the US Wilderness Act, which set aside 9.1 million acres (3.68 million hectares) of federal lands as wilderness, defined as follows:

> A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and community of life are untrammeled by man, where man himself is a visitor who does not remain.

Clearly, outside the highest-value areas reserved as wilderness there remained vast area of US federal lands in which a balance has had to be struck between development and conservation, and there has developed a large economic literature on the estimation of non-market values attached to undeveloped lands and natural systems[29]. An important conclusion from that literature is that, generally speaking, the limited methods available (contingent valuation, hedonic valuation, travel-cost and so on) are able to capture only a part of the existence and option values of natural systems, providing lower-bound figures rather than accurate estimates. Even those lower-bound estimates are expensive to produce. Hence a straightforward cost-minimising policy approach in the most obviously difficult and contentious cases is to use administrative decisions to bar "development" from areas where it is clear that the inherent non-market values of the unaltered environment are very large, even if a precise numerical value cannot be assigned to them.

From an economic point of view, the point of the social compact embodied in Schedule 4 of the Crown Minerals Act is to forestall wasteful expenditure of scarce resources on disputes and hearings in parts of the country where especially large non-quantifiable existence, option and bequest values are at stake. Ring-fencing highly

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[29] See, for example, Vernon L. Smith, "Economics of Wilderness Resources", California Institute of Technology Social Science Working Paper 84, May 1975; Richard G. Walsh, John B. Loomis and Richard A. Gillman, "Valuing Option, Existence and Bequest Demands for Wilderness", *Land Economics* 60(1): 14-29, February 1984; John B. Loomis and Robert Richardson, "Economic Values of the US Wilerness System: Research Evidence to Date and Questions for the Future", *International Journal of Wilderness*7(1): 31-34, April 2001; Ray Rasker, "An Exploration into the Economic Impact of Industrial Development versus Conservation in Western Public Lands", *Society and Natural Resources* 19(3): 191-207, 2006

valued areas is an efficient way to short-circuit the difficult process of balancing gains against losses.

Because the issue is inherently and inescapably political, resting upon values held subjectively by the public at large, there always remains a reserve power for the public (as represented by Parliament) to revisit the protected status of a national park, or nature reserve, or other protected area. It follows that once an area of outstanding natural beauty or high ecological importance has been identified as such, and given protected status, there is a strong argument for that status to remain inviolate unless Parliament determines otherwise. If the protection accorded is of a lower standard than this – for example, able to be overturned by executive decision of the Government of the day - the benefits of avoiding the transaction costs associated with previous bitter political battles over mining in the conservation estate are inevitably sacrificed to some extent.

This highlights a major potential deficiency in the provisions for "amending" Schedule 4 of the Crown Minerals Act 1991. Section 61(4) of the Act empowers the Ministers of Conservation and Energy to amend the schedule by Order in Council, following a process of public consultation "to the extent that is reasonably practical" and with no criteria stated against which proposed amendments are to be evaluated, nor any provision for judicial review of the ministers' decisions.

Amendments may comprise additions to the schedule, deletions from it, or both. The legislation recognizes no distinction between additions and deletions. But from the standpoint of economic efficiency, and the sustainability of the legislation itself, it is deletions that are the critical amendments.

Additions to the schedule carry no implication that the status of already-protected areas is being changed. Deletions, on the contrary, carry precisely that implication, since they involve breaching the sacrosanct status of protected areas. The Crown Minerals Act places very few checks and balances around the power of the two ministers unilaterally to delete areas from protected status in response to pressures from, e.g., mining interests. With few formal checks on the exercise of executive power, public trust is an essential component in sustaining protected status.

Public trust in the government of the day to act fairly and in good faith in resisting requests from mining companies to be given access to Schedule 4 lands is important as part of the general framework of property rights and contracts within which the economy operates. Perceived breaches of trust have potentially chilling effects on economic activities in various related sectors of the economy – including tourism and New Zealand's branding in export markets.

The existence of the power to delete areas from Schedule 4 at the discretion of ministers, without explicit parliamentary oversight, potentially opens the way to rent seeking and regulatory capture by mining interests while raising difficult issues about the sanctity and status of national parks as a category. National parks, once established, are presumptively of sufficient conservation value to be included in Schedule 4 as a matter of course (though in 2008 the addition of Kahurangi and Rakiura National Parks to Schedule 4 was done by explicit Order in Council, because the wording of the statute did not make it automatic). The Crown Minerals Act provisions, however, leave open the way to piecemeal dismemberment of national parks if mining activities are allowed.

Any such encroachment at the margin, however small, tends to act as a signal that "nothing is sacred", and thereby to reignite the social and political tensions (and associated wasteful diversion of scarce resources into lobbying) that establishment of Schedule 4 was intended to calm. Once the principle of protection ceases to be absolute (subject only to the will of Parliament) and instead becomes contingent on the goodwill of two ministers, the potential must always be there for an unraveling of the social covenant around national parks, nature reserves, and other iconic areas of the country.

This suggests that an amendment to the Crown Minerals Act may be called for to toughen the criteria for deletions from Schedule 4, preferably by requiring clear public justification and parliamentary sanction for any deletions.

The next section reviews the legislative history.

3.3 History of the legislation

The context in which the conservation estate was established was the decision by the Government in 1985 to break up the Crown lands managed since 1914 by the New Zealand Forest Service. The goal was to separate the management of the Crown's large areas of commercial production forests from the remainder, which were to be withdrawn from commercial use for timber production and similar extractive pursuits and placed under Department of Conservation's management. The view at the time was that the criteria that should guide conservation management were sufficiently different from those applicable to commercial land use to warrant the establishment of a separate government department, with an explicit mandate to protect land rich in non-market values.

In New Zealand as in the USA, lands held by the government include some areas of outstanding natural value alongside large areas where some economic uses can coexist with the inherent values. Striking a balance between the measurable economic gains from commercial development and the unmeasurable (non-quantifiable) loss of natural values in the process of development is time-consuming and difficult, placing heavy cost burdens upon all parties (as the history of the RMA, and the debates over mining in the Coromandel during the 1980 and 1990s, make clear). Those costs inevitably increase with the scale of the natural values at stake, as public concern (expressed through submissions, litigation, and political activity) increases.

Taking account of the uncertainties involved, and given the benefits of regulatory certainty, an economically efficient (least-cost) administrative solution is to classify the conservation estate into areas of progressively higher inherent value, to place a boundary around the highest-value category, and to ban extractive economic activities within that boundary. This in essence is the origin of Schedule 4 of the Crown Minerals Act.

In November 1990 the then Minister of Conservation, Philip Woollaston, introduced the Protected Areas (Prohibition on Mining) Bill to[30]

[30] *Hansard* Vol.510, 4 September 1990, p.4226.

> "prohibit mining in certain categories of protected areas of land managed by the Crown. Those areas are national parks…, national reserves and nature reserves under the Reserves Act, wilderness areas under either the Reserves Act or the Conservation Act, and sanctuary areas and ecological areas under the Conservation Act. There is also provision for additional areas to be brought under the legislation by Order in Council, made on the joint advice of the Minister of Conservation and the Minister of Energy.

The stated aim was to remove any previous presumption that mining would be permitted in these areas, and thus to provide certainty for all parties. As Christine Fletcher later summarized the original motivation,[31]

> The idea was to try to bring some certainty into a very difficult situation of tension between … warring parties, by closing certain protected areas within New Zealand to mining activities so that everyone knew where they were, so that everyone knew where the boundaries were, and so that a great deal of time was not spent on dealing with mineral applications that were not only very costly to all concerned, but also divided communities and, in some cases, families.

An important feature of Woollaston's PAPOM Bill (as it became known) was the asymmetry in its approach to changing the listed areas from which mining was to be banned. The two responsible Ministers were to be able to add land to the list, but not to remove any, by Order in Council. This meant that removal of any area from the list would require a decision by Parliament itself, reflecting the fact that the system of prohibition was explicitly intended to reflect public sentiment.

Under the PAPOM Bill, therefore, an incumbent government would not have been able to reopen any area that had been closed to mining without going back to Parliament for approval. This was consistent with the intent to provide certainty for all parties, and in particular to provide security to local and national communities

[31] *Hansard* Vol.564, 13 November 1997 p.5398.

favouring conservation, who would be relieved of the cost and trouble of maintaining continuous political action to countervail lobbying by mining interests.

The 1990 Bill went to the Planning and Development Select Committee, where it languished for seven years until 1995, when Judith Tizard, with support from National's Christine Fletcher, successfully introduced the Coromandel Hauraki Gulf (Prohibition on Mining) Bill to protect key areas on the Coromandel peninsula.[32] The Planning and Development Select Committee, chaired by Fletcher, reported back to the House in early 1997, recommending that the Coromandel Hauraki Gulf Bill should not proceed but that the 1990 PAPOM Bill should be taken up and enacted as an amendment to the Crown Minerals Act 1991[33]. The Government did so in March 1997 and the resulting Crown Minerals Amendment Bill (No 3) was passed in November 1997 with National, Labour and Alliance support (but strongly opposed by the ACT Party on the basis of arguments closely parallel to those advanced in 2010 by the Government for reopening some of Schedule 4 to mining).[34]

In the course of deliberations, Jeanette Fitzsimons of the Alliance successfully moved an amendment regarding the mechanism by which the Government Bill proposed to allow Schedule 4 to be changed. In the 1990 PAPOM bill there had been provision for land to be added, but not for land to be deleted, by Order in Council. The 1997 Crown Minerals Amendment (No 3) Bill provided that land could be either added to or deleted from (the word used in section 61(4) is "amend") the new Schedule 4 by Order in Council on the recommendation of the two responsible ministers, without any reference to Parliament. Jeanette Fitzsimons stated her preference for any deletions from the schedule to be treated separately from additions, and to require parliamentary approval, but was forced to settle for a softer alternative negotiated with Max Bradford (then Minister of Energy) which required only that the ministers "must consult to the extent that is reasonably practicable, having regard to all the circumstances of the particular case, those persons the Ministers have reason to believe are representative of interests likely to be substantially affected by the Order in Council or

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32 "Mining Bill Likely to be Backed by Nat MPs", *The Dominion* 4 April 1995 p.2; "Coromandel Mining Bill Under Way", *National Business Review* 23 June 1995 p.3.

33 *Hansard* Vol.559 12 March 1997 pp.850-859.

34 *Hansard* Vol.564 13 November 1997 pp.5391-5406 and Vol.565 19 November 1997 pp.5499-5530.

representative of some aspect of the public interest."[35] The amended section places no obligation on the ministers other than to consult; there is no requirement on them to take fully into consideration the matters raised during consultation.

3.4 Conclusion

The social covenant under which Schedule 4 lands are off-limits to mining companies under the 1997 legislation is less stringent than had apparently been intended in 1990 by the Labour Government that created the Department of Conservation. The promised "certainty" about the security of protected land was transformed in the 1997 legislation into the provision that Schedule 4 could not be opened to mining without public consultation and a decision by the Ministers of Conservation and Energy. This is a much lower legal threshold than the usual bans on mining in wilderness areas in other jurisdictions, and places a considerable onus on the relevant Ministers to act in good faith when exercising their powers.

The essence of protected status, after all, lies in the obstacles to its revocation. The existence of procedures for adding to Schedule 4 (as was done in, e.g., the Crown Minerals Act (Schedule 4) Order 2008) should be seen as entirely separate and separable from the procedures for deleting land from the schedule; the second is far more contentious and has far greater social and economic ramifications than the first. This means that the two sets of proposals in the official discussion paper of March 2010 – one to add several areas to Schedule 4, and the other to remove some – have to be treated as separate matters. The proposed additions extend the scope of protected areas, but the deletions would have radically reduced certainty about the protected status of areas listed under the (imperfect) social covenant.

With no recourse to the courts to enforce protection, those wishing to preserve Schedule 4 from mining encroachment had only the political arena in which to act. This means that decisions on where and whether to allow mining were shifted from a situation of certainty to one of uncertainty – an uncertainty that inevitably increased once actual deletions from Schedule 4 become proposed as government policy. The

[35] Crown Minerals Act 1991 s.61(5).

intense political battles that the 1990 PAPOM Bill and the 1997 Crown Minerals Amendment (No 3) Bill were aimed to stop, returned in 2010.

Following the July 2010 decision to leave Schedule 4 untouched, the spotlight of public debate can be expected to shift to the wider issues raised by the privileged status of mining in terms of access to the conservation estate. In reconciling commercial and environmental considerations when considering particular future projects, the responsible Minister(s) will need to take account not only of readily-quantifiable aspects such as value added, net rental value, and balance of payments impact, but also of the difficult-to-quantify economic effects including impact on publicly-held existence values and option values of landscapes and ecosystems, and spillovers from mining onto other sectors of the economy.

Spillovers are important for an economic evaluation of the contribution that mining projects may make to the national economy because of the importance of many parts of the conservation estate as a component of New Zealand's brand image as a tourism destination. This area of potential conflict is tackled in the next chapter.

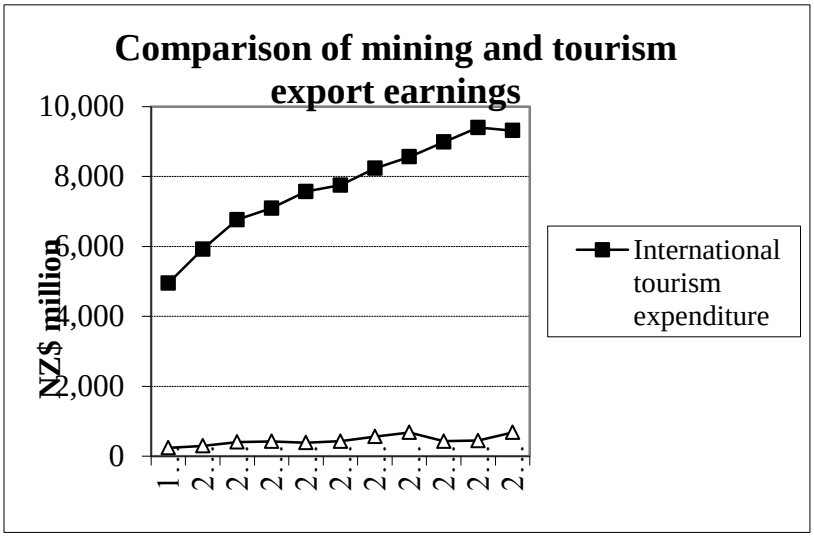
4. Mining's Potential Impact on Tourism

4.1 Introduction

The sector of the market economy most directly at risk from allowing mining projects in sensitive areas of the conservation estate is tourism. The mechanism through which large-scale expansion of mining could most obviously lead to a reduction in tourism revenues is the brand image of New Zealand as a destination.

While it is possible that in certain particular cases a mine might directly eliminate an existing or potential tourism opportunity by eliminating a valued landscape feature or blocking access to a high-value area, such micro-level impacts are not further considered in this chapter.[36] Far more important is the impact on overseas perceptions of New Zealand's environmental protection policies. Tourism is a far more important contributor to the economy than mining and has been growing much faster as an export sector, with earnings now twenty times those of non-petroleum mining (Figure 4.1)

Figure 4.1



4.2 Is the tourism brand image sensitive to environmental issues?

[36] An example of economic analysis applied in a comparable case – the conflict between indigenous timber logging and tourism in the Punakaiki area which subsequently became the Paparoa National Park – is the 1983 paper by Stephens which estimated that logging could sustain only 25 jobs compared with 60 jobs that would be created through creation of the National Park.[36] As the two uses were mutually incompatible, the economic analysis favoured conservation plus tourism development. Robert J. Stephens, "Forestry or a National Park: a New Zealand Case Study", *International Journal of Social Economics* 11(3/4): 29-45, 1984. See also R.J.Stephens and C. Wells, *The Regional Economic and Social Impact of a Punakaiki National Park*, mimeo, Victoria University of Wellington, 1983. Stephens' estimate of tourism development potential has subsequently proved to have been much too conservative.

The relationship between New Zealand's international brand image and the performance of key export sectors including tourism has been the subject of economic analysis in two studies commissioned by the Ministry for the Environment in the early 2000s.[37] In the first of these, PA Consulting evaluated three issues[38]:

- the relationship between the value obtained in emerging markets for New Zealand's added value dairy products and the impacts poor farm management might have on the rural environment;
- the relationship between environmental quality generally and the inbound tourism sector; and
- the relationship between various policy positions with respect to the release of genetically modified organisms and the value obtained from the exports of organic produce.

The second of these is the relevant scenario for our purposes. The consultants used a contingent valuation methodology (based on interview surveys of market participants) to assess what change in tourism earnings would follow from a significant degradation of New Zealand's environmental image in the eyes of overseas tourism customers. The elements of environmental quality considered were land, freshwater, coastal marine and waste. Particularly relevant to tourism were erosion, contaminated sites, drinking water quality, non-biodegradable litter, waste volumes, landfill quality, and management of the hazardous waste stream.[39] Mining activities clearly fall into several of these categories.

The report's value-chain analysis of tourism concluded that[40]

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37 PA Consulting Group, *Valuing New Zealand's Clean Green Image*, report to Ministry for the Environment, August 2001, http://www.mfe.govt.nz/publications/sus-dev/clean-green-image-value-aug01/index.html; Kel Sanderson, Carolyn Saunders, Ganesh Nana, Adolf Stroombergen, Hugh Campbell, John Fairweather and Andy Heinemann, *Report to Ministry for the Environment and Treasury on Economic Risks and Opportunities from the Release of Genetically Modified Organisms in New Zealand*, April 2003, http://www.mfe.govt.nz/publications/organisms/economic-impact-apr03/ .

38 PA Consultants, *Valuing New Zealand's Clean Green Image*, report to Ministry for the Environment, August 2001, http://www.mfe.govt.nz/publications/sus-dev/clean-green-image-value-aug01/index.html p.1-2.

39 PA Consultants 2001, p.3-10.

40 PA Consultants 2000 p.4-16.

> In the case of inbound tourism, environmental value appears to be largely driven by the end user. While travel agencies can influence a potential tourist's decision to travel to New Zealand to a certain extent, the final decision on whether or not to undertake the journey depends on the tourist. Thus, in the case of inbound tourism, the role of the gatekeeper (in this case the travel agent) is less significant than in, for example, the European markets for farm produce.
>
> Thus, to gain an understanding of the value of New Zealand's clean green image in the tourism sector, it is necessary to target the end user (i.e. the tourist) for survey purposes. It was decided to target tourists from all of our major tourism markets, namely; Australia, USA, Japan, UK and Korea.

Contingent valuation surveys were carried out for a sample of 50 departing tourists from each of these major markets as they passed through Auckland International Airport. Respondents were shown two sets of images: one set of "images that are typically used to promote New Zealand in our key overseas markets" and one "depicting an alternative environmental scenario, in which New Zealand's environment has been degraded"[41].

The responses turned out to be bi-modal, in that the tourists interviewed fell into two strongly contrasting groups. One group were unaffected by the hypothetical change in environmental quality; the other group would not select New Zealand at all as a destination in the environmental-degradation case. Except for Australians, the dominant group in each market were the environmentally-sensitive, with the result that when converted to average "percentage decrease in length of stay" by adding up the number of tourism-days lost, the falls in tourism volume were between 63% and 78% for all surveyed markets other than Australia; for Australia the fall was 48%.[42]

The overall reduction in inbound tourism spending, calculated as the fall in tourist days multiplied by average expenditure per tourist day, was $2.1 billion out of estimated 2001 total expenditure of $3.2 billion. The consultants then used the

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41 PA Consultants 2001 p.5-19.

42 PA Consultants 2001 Appendix F, and p.5-20 Table 30. Note that the surveys did not ask whether the decision to stay away would change if the price of New Zealand holidays were reduced to reflect the fall in perceived environmental quality. This issue was, however, addressed in the survey methodology of Sanderson et al 2003.

Tourism Satellite Account to estimate the corresponding loss in the sector's contribution to GDP; the result was a reduction of between $530 million and $938 million depending on the treatment of GST and induced spending by labour employed in the tourism sector.[43] As GDP in 2001 was $117 billion, this represented a loss of between 0.5% and 1% of annual GDP.

Scaling the figures up to 2009 international tourism expenditure of $9.3 billion, the comparable loss of tourism export earnings would be $6.1 billion, with a loss of value-added of between $1.7 billion and $2.7 billion, or between 0.9% and 1.5% of 2009 GDP ($185 billion).

The second study, by a consortium of consultants headed by BERL, focused on the question of whether release of genetically modified organisms would have a positive or negative impact on the economy as a result of the offsetting effects of possibly diminished perceptions of New Zealand's environmental quality, versus possible gains in agricultural productivity. Questionnaire surveys were administered to 444 individuals in Australia, the USA and the UK, and to 93 inbound tourists in Christchurch. Respondents were asked to describe their response, in terms of decisions to purchase New Zealand fruit, dairy products, and tourist holidays, under two scenarios: one in which New Zealand released GMOs and one in which it publicly refrained from using them.

A majority of respondents stated that their purchasing decisions would be unaffected, but one-third of the overseas respondents and one-quarter to one-third of the inbound tourist sample stated that their demand for New Zealand goods and services would fall in the first scenario, and rise in the second. The estimated impact on international tourism demand from release of GMOs was a drop in tourism by 5.7% if prices remained unchanged[44]. A fairly high price elasticity of demand of 4 was estimated, implying that to sustain tourism volumes unchanged in the face of GMO release, the average price charged to visitors to New Zealand would have to fall by about 1.4%.

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43 PA Consultants 2001 p.5-24.

44 Sanderson et al 2003 pp.17-18. Release of human-health-related GMOs produced a smaller shift of 2.9%.

If these results are translated to current tourism earnings (in the vicinity of $9 billion per year), the resulting drop in annual total tourism exports would be between $125 million (if all the adjustment came through price) and $513 million (if all adjustment were in volume).

The economy-wide modeling undertaken for the 2003 study unfortunately did not include any experiment in which tourism receipts were reduced without simultaneous larger falls in agricultural export earnings. The BERL general-equilibrium model estimated a 2.4% drop in GDP and a 2.6% drop in economy-wide employment following release of plant GMOs[45], but the economy-wide effect of an equivalent loss of brand image affecting tourism alone would have been less than this.

In summary, the two most serious efforts at estimating the tourism impacts of a negative shock to New Zealand's clean green image seem to converge towards finding that the damage would be of the order of a 1% fall in GDP, sustained for as long as the negative image persists.

It should be noted that both these studies occurred prior to the phenomenal success of the Lord of the Rings movies and during the early stages of what is now the decade long "100% Pure New Zealand" branding and advertising campaign by Tourism New Zealand. Since the studies were completed, several other sectors of the economy have also been aggressive in promoting their products internationally using "clean – green – pure" branding. This suggests that were the studies to be repeated, the level of potential negative economic impact from perceptions of a degradation of New Zealand's environmental image would be greater.

The authors of the 2001 PA Consulting report clearly identified the distinction that has to be made between the actual and the perceived quality of the environment (and of environmental protection). In their risk assessment section they noted that[46]

> the relationship between environmental quality and export value is somewhat indirect in nature. In particular, it is the environmental image that creates the value, not environmental quality per se.

[45] Sanderson et al 2003 Table 5.1 p.35.
[46] PA Consultants 2001 p.6-5.

> … [E]nvironmental image and environmental quality may move independently of one another. For example, it is quite possible that the efforts of marketers could maintain an image of environmental quality in spite of a deterioration in environmental quality – particularly in the dairy sector where the consumer has no direct experience of environmental quality. Similarly, it is possible that New Zealand's environmental image could deteriorate without any change in environmental quality – the concern over the misreporting of the incidence of scrapie in New Zealand in Germany in early 2001 is a good example.

Thus it is quite possible that, in the short term at least, New Zealand may be able to maintain at least some of the contribution to environmental value in the face of declining environmental quality. However, it seems unlikely that this could be sustained over the long term. In the long term, one can expect environmental image and environmental quality to track one another.

4.3 Conclusion

There has been no comparable survey research undertaken since the 2003 study, which makes it a matter of speculation whether large mining developments in the conservation estate would have impacts of the same order of magnitude. It is the high political visibility of the conservation estate that makes tourism earnings vulnerable to large mining developments in it. Effects on the country's tourism brand are likely to be driven more by perceptions of policy, and policymakers' attitudes, than by actual physical impacts of mining - at least in the short run.

To bring mining up to comparability with tourism as an export earner would require a lot of new, very large mines. Gold exports under high-price conditions are $400-500 million annually. (Total exports for the 2008 calendar year were $541.6 million.) To bring mining up to tourism's $9.3 billion of overseas earnings would require adding 30 new mines on the scale of Martha Hill.

The point of this comparison is not to deny that expanded mining activity could have a role to play in lifting New Zealand's export earnings, but rather to put the sector's role into perspective. Where mining can be expanded with no spillover costs to the tourist industry or any other sector, and without sacrificing important values held by the public, it should result in a net gain in GDP and in the balance of payments. But

wherever mining expansion comes at a cost to tourism or other sectors, a cost-benefit assessment must take full account of that spillover.

Suppose that a 20% expansion of mining exports caused tourism earnings to drop by 1%, then the net outcome would be negative for total exports and GDP. The sheer weight of tourism in the balance of payments and the national accounts means that even apparently small negative spillovers to tourism earnings from expansion of smaller sectors can have major macroeconomic consequences.

The spillovers discussed in this chapter are only one of the relevant elements in cost-benefit assessment of mining developments. Even if a very large expansion of mining activity in protected areas were to eventuate that did not impact monetarily on tourism (or at least not to an extent that outweighed the financial gains from the mining), it would not represent an economic net gain for the nation unless it could compensate also for negative externalities that are not currently monetised. For example, any diminution in the local population's enjoyment of places that they would gain less enjoyment from visiting (recreation benefits), and any fall in subjective well-being amongst the wider population whether or not they visit the areas themselves (existence values), and foregone future tourism earning potentials from modes not currently exploited (option value) would need to be taken account of.

5. Statistical Overview of the mining sector

This chapter and the next two explore the statistical record, in order to evaluate the various impacts on the New Zealand economy of mining as a whole, and to compare the differing records of the main sub-sectors – coal, gold and silver, ironsands, and quarrying.

5.1 The broadly-defined mining sector's economic contribution

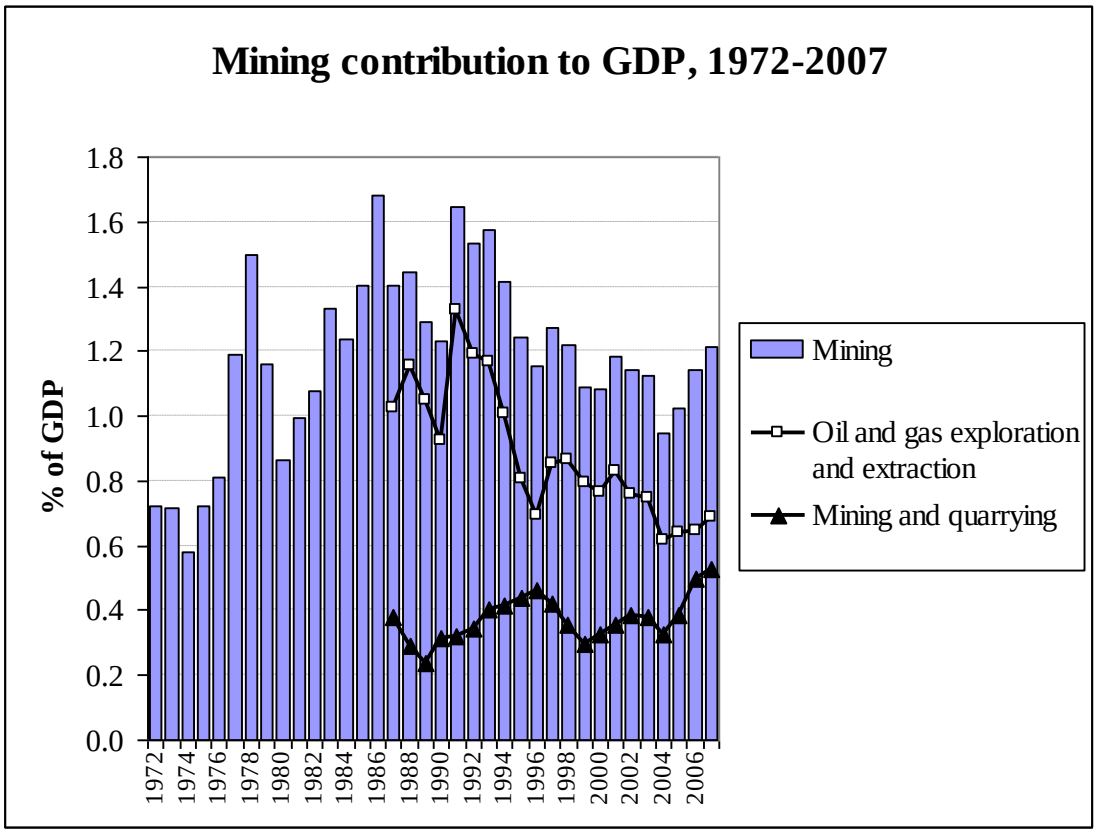
Mining, broadly defined, is not a particularly important sector of the New Zealand economy. It has accounted for only around 1% of GDP over the past four decades even with oil and gas included, with no tendency to increase (Figures 1 and 2). Once "mining and quarrying" is separated from "oil and gas exploration and extraction", it sits at around 0.4% of GDP, fluctuating over the range 0.2% - 0.6% due mainly to swings in the prices of mined commodities. Even the very large-scale (by New Zealand standards, in terms of impact on the landscape and volumes of material moved in open-pit operations) new mining developments of the past two decades, such as Stockton, Macraes, Martha Hill and Globe Progress, have collectively changed the sector's weight in the national economy by no more than 0.1% of GDP. The total mining sector contribution to GDP (heavy line in Figure 2 below) has been relatively steady at constant prices over the past two decades, with a downward trend since the late 1990s.

As a recent study for the Ministry of Economic Development notes[47],

> Internationally, the relative contribution of New Zealand's oil, gas and mining sector to national wealth, as measured by its contribution to GDP, lies in the bottom half of the OECD
> …
> Direct employment in the mining sector is low; only 5,900 people were recorded as employed in the industry at March 2009, of a total workforce of 2.2 million. This makes mining New Zealand's smallest employing industry…

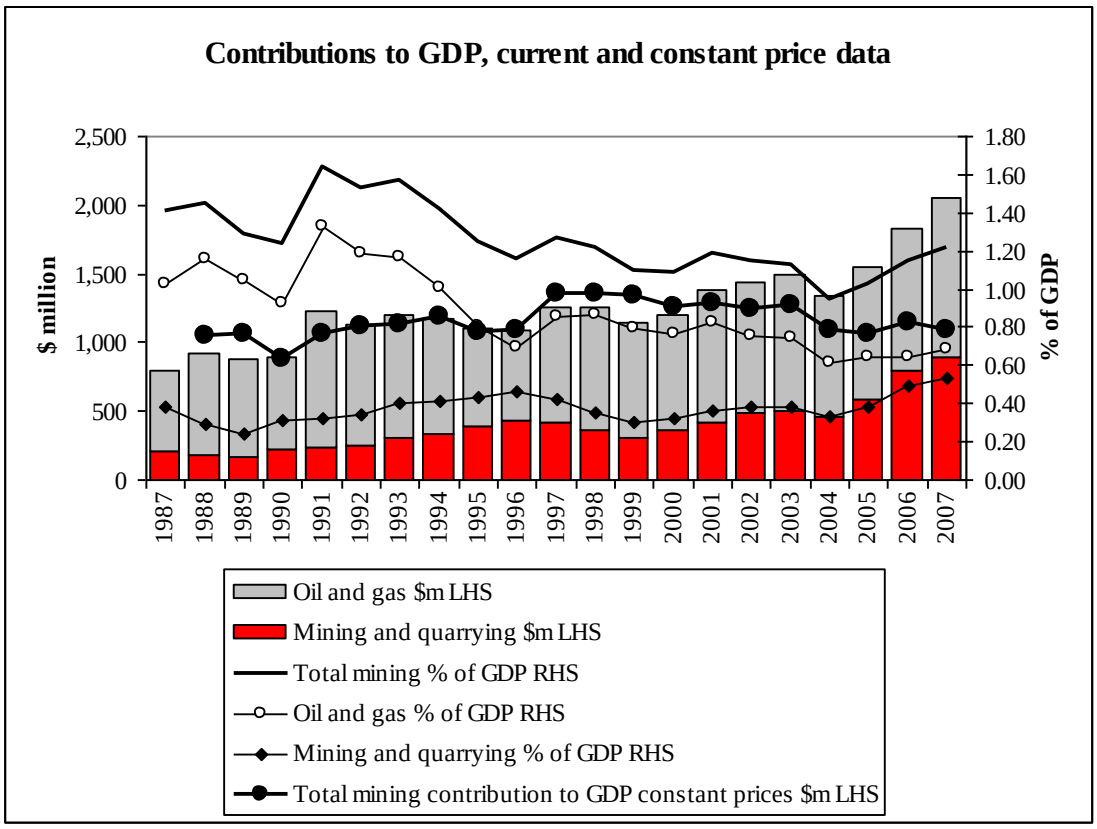
[47] McDouall Stuart Research, *Stepping Up: Options for Developing the Potential of New Zealand's Oil, Gas and Minerals Sector*, Wellington, June 2009, http://www.med.govt.nz/templates/MultipageDocumentTOC____42259.aspx , pages 8 and 9.

Figure 1



Source: Appendix B, Table B1.

Figure 2

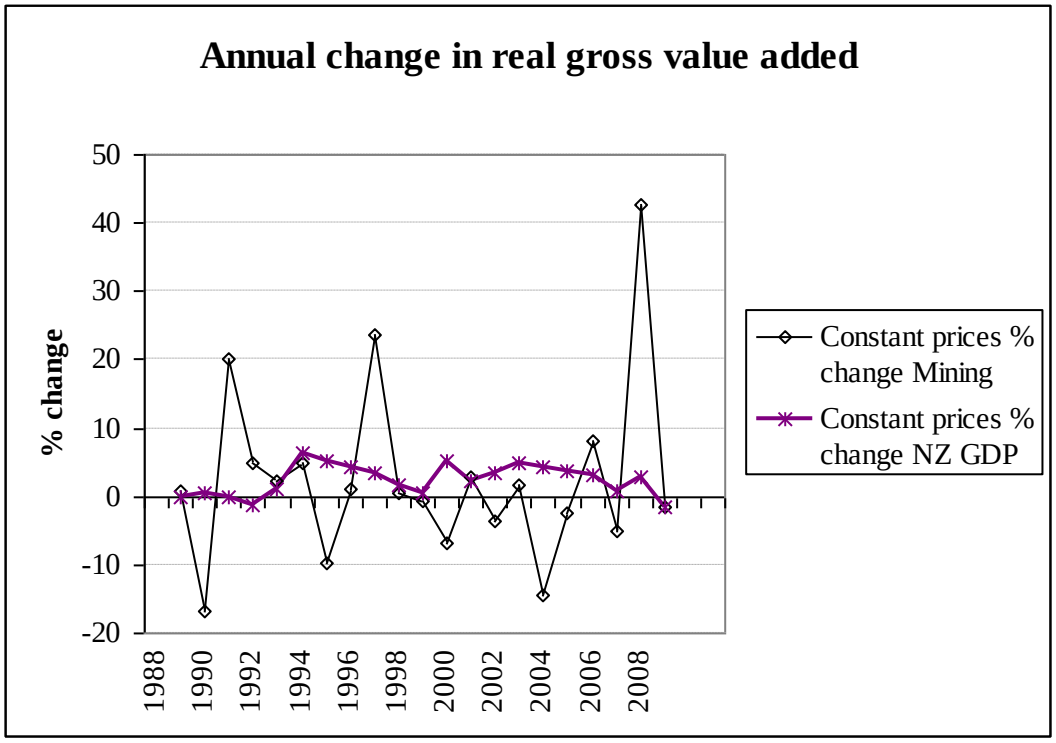


Source: Appendix B, Table B1, and Appendix I Table I1.

New Zealand is not particularly well endowed with easily-accessible mineral resources, compared with other countries, especially when oil and gas are set aside. The main reason for the relatively small size of the sector relative to the key drivers of the national economy such as tourism, dairying, and other agriculture, is the fact that mineral deposits are mostly small by international standards, scattered, and geologically disrupted by faulting. Only Southland lignite, and ironsands (most of which lie offshore along the west coast), come close to the scale of the major Australian mineral deposits.

Mining output is far more unstable (volatile) than national output, consistent with the sector being more boom-and-bust than the average (Figure 3).

Figure 3

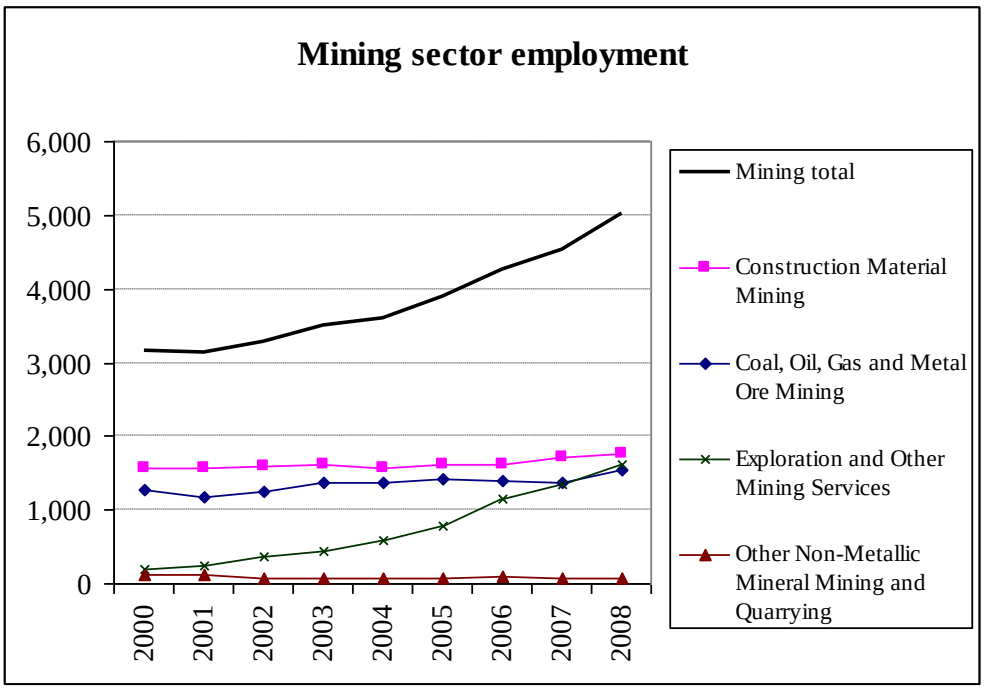


Source: Appendix B Table B2.

Mining is capital-intensive and hence a relatively weak employment generator compared with other sectors of the economy, in terms of jobs created per dollar invested. With around 1% of GDP and nearly 1.5% of the economy's fixed capital, mining provides less than 0.3% of total employment in the New Zealand economy, a

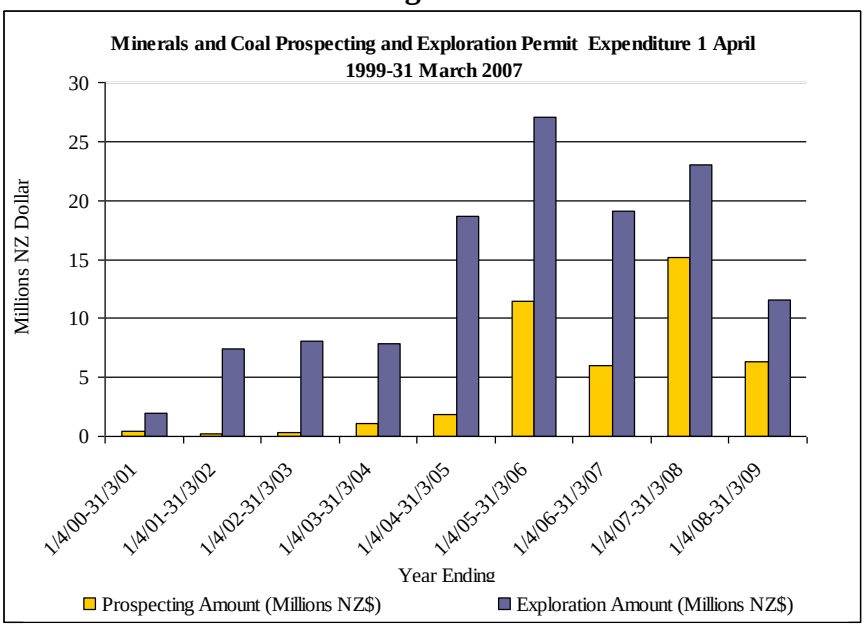
total of 5,000-6,000 including the petroleum sector (Figure 4). The leading source of employment within the sector is quarrying for aggregates, a sub-sector where small-scale locally-owned operations are widespread and capital intensity is relatively low. The growth area for employment in recent years has been "services to mining", partly due to the contracting-out by mining operations of an increasing range of tasks, and partly to a rise in exploration expenditure (Figure 5).

Figure 4



Source: Appendix D Table D1.

Figure 5



Source: Crown Minerals website, http://www.crownminerals.govt.nz/cms/minerals/facts-and-figures .

5.2 Exports

The mining sector's export sales are too small to earn a separate row in the published official Overseas Trade Statistics. Detailed tables assembled from the online statistics database are set out in Appendix C. With oil and gas included, mining accounts for 4-5% of total exports by value, with total earnings in 2007 (the latest year for which coal export figures are available) of $1.5 billion[48]. Excluding oil and gas (but including coal), the sector's contribution falls to 1-1.5% of exports (Table 1), about $0.4 billion in 2007[49]. Metals (mainly ironsands, gold and silver) usually account for less than 1%, though in 2009, with the gold price unusually high, metals exports rose to $669 million, or 1.4% of export earnings. Coal has roughly matched metals exports over the past decade, but with wide fluctuations.

Table 1: Percentage contributions to New Zealand's total export earnings

	Mining exports, % shares of national total								
	Gold & silver	**Ironsand**	**Metal mining total**	**Coal**	**Stone**	**Total non-oil**	**Oil & gas**	**Total mining incl oil and gas**	**Tourism (for comparison)**
1999	0.4	0.1	**0.5**	0.4	0.0	**0.9**	1.6	**2.5**	18.0
2000	0.5	0.1	**0.5**	0.3	0.0	**0.9**	2.1	**3.0**	17.4
2001	0.6	0.1	**0.6**	0.4	0.0	**1.1**	1.8	**2.9**	17.6
2002	0.6	0.1	**0.7**	0.4	0.0	**1.2**	1.5	**2.6**	19.2
2003	0.6	0.0	**0.7**	0.4	0.0	**1.1**	1.1	**2.2**	21.7
2004	0.6	0.0	**0.7**	0.5	0.0	**1.2**	1.1	**2.2**	20.8
2005	0.6	0.0	**0.7**	0.8	0.0	**1.5**	1.2	**2.7**	21.8
2006	0.7	0.0	**0.7**	0.9	0.0	**1.6**	1.3	**3.0**	20.7
2007	0.6	0.0	**0.6**	0.3	0.0	**1.0**	3.3	**4.3**	20.4
2008	0.8	0.1	**0.9**	n.a.	0.0	**0.9***	5.8	**6.7***	18.6
2009	1.4	0.1	**1.4**	n.a.	0.0	**1.4***	3.9	**5.4***	19.8

* excluding coal

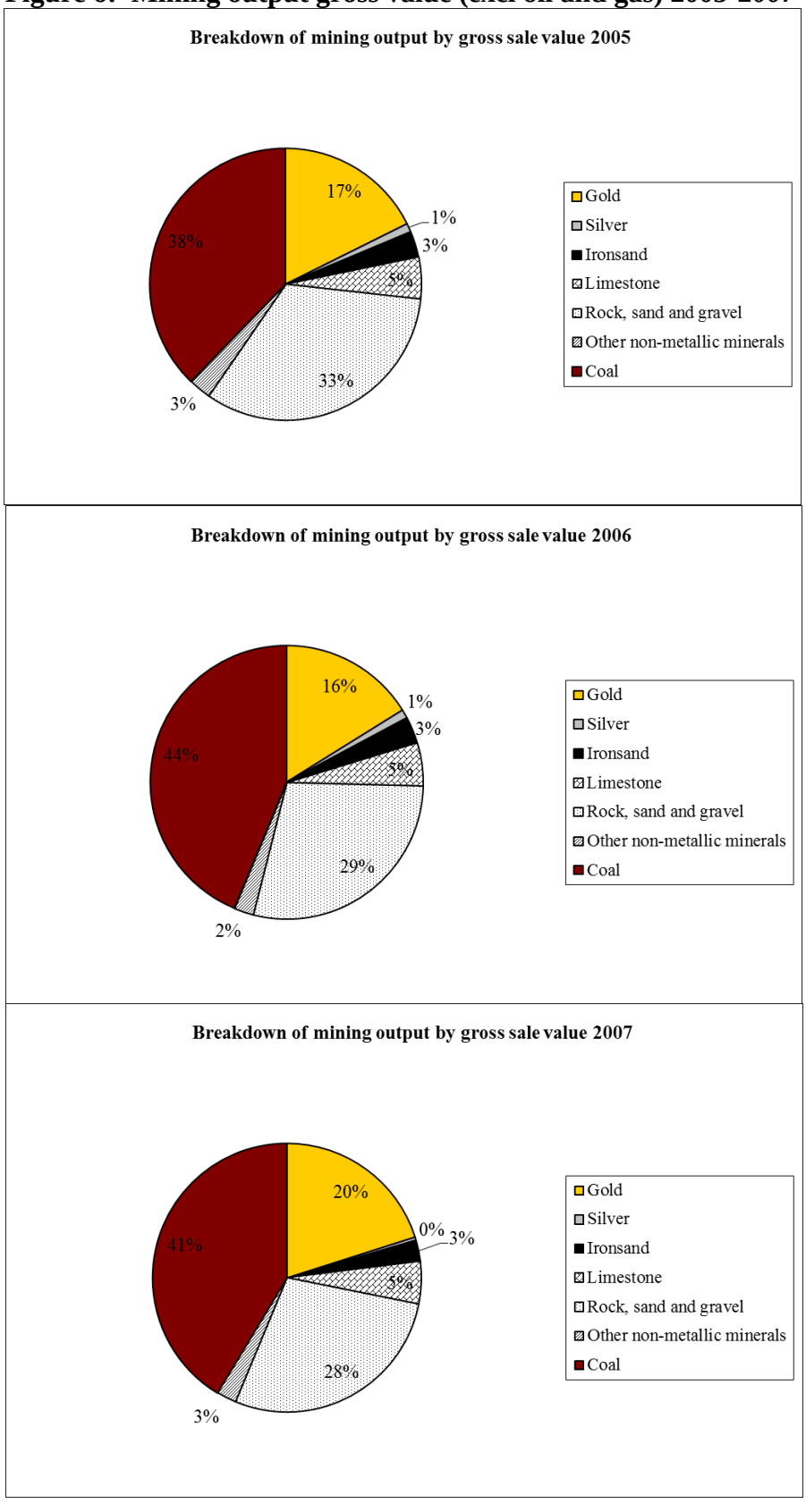
Source: calculated from Appendix C Table 4.

5.3 Dominance of coal and quarrying in non-oil mining

Turning to the estimated total revenue from sales of non-oil mining output, Figure 6 shows three quarters or more of the total to be accounted for by coal and quarried aggregates. Gold and silver account for one fifth or less of the total, and ironsands for just 3%.

[48] Appendix C Table C7.
[49] Ibid.

Figure 6: Mining output gross value (excl oil and gas) 2005-2007

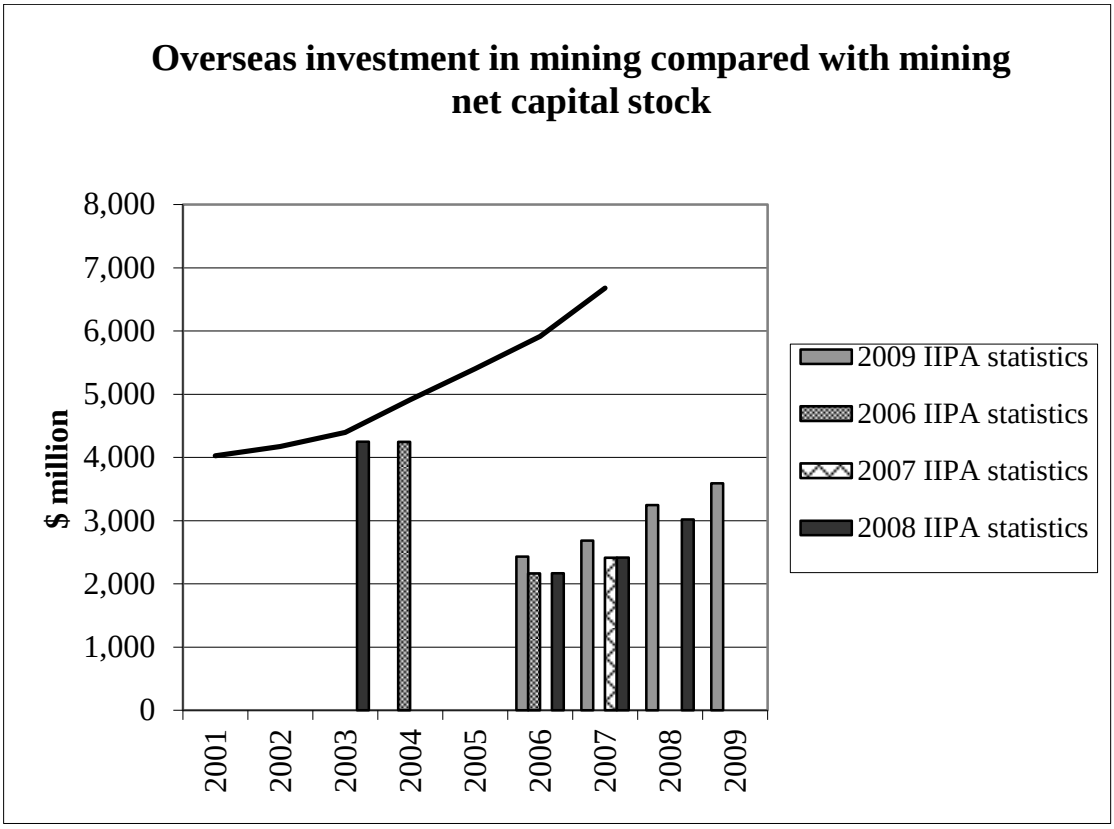


Source: Appendix C Table C5.

5.4 Overseas investment

The extent of overseas investment in the industry can be only roughly judged from available statistics, and only for the sector as a whole including oil and gas. Figure 7 plots overseas investment as reported in the International Investment Position statistics against mining's net capital stock from the national accounts, on the basis of data set out in Appendix E. With reported total mining net capital at $6.7 billion in 2007, overseas investment in the sector was estimated as $2.4 billion, or about 36%. (Comparing the International Investment Position statistics with the national-accounts capital stock figures has to be done with caution; the 2003 figures, if taken as accurate, would suggest 97% overseas ownership, which clearly cannot be correct. The figure of 35-40% overseas ownership implied by the 2006 and 2007 IIPA statistics seem plausible.)

Figure 7



Source: Appendix E Table E1.

The extent of foreign ownership varies greatly across the sector, but has been increasing. Oil and gas, obviously, have substantial overseas ownership. Large-scale metals mining (gold, silver and ironsands) is virtually entirely overseas owned apart

from some New Zealand shareholdings in the overseas companies (Oceana Gold, Newmont Waihi Mining, and Blue Steel). Aggregates quarrying was (and is) primarily locally owned, with Holcim (limestone/cement and aggregate operations) and New Zealand China Clay (china clay) the only large foreign operators. Coal mining was until recently the preserve of state-owned Solid Energy and some small local independents, but new projects at Pike River and Spring Creek have brought a rise recently in foreign participation. The balance-of-payments impact of new mining projects will vary substantially depending on whether they are funded locally or offshore.

5.5 Taxation

Taxes paid by mining operators fall into two groups. First are "production taxes" that enter into the costs of production, being charged before the product reaches the market. Second are taxes and levies taken out of the income generated by sale of output.

Production taxes on mining (basically the Energy Resources Levy plus various minor indirect taxes on inputs) have fluctuated but have never been high. In the early 1970s they were negative (i.e. subsidies). Imposition of the Energy Resources Levy raised the production-tax share to 7% in 1978 and 1990, after which it fell to 4% by 2001, 3% by 2004, and 2% by 2007 - just below the average of production taxes-minus-subsidies for the whole economy. The incidence of production taxes and levies on mining has been falling over the past twenty years.

Royalties are the return to the Crown, as owner of most subsoil minerals, from exploitation of those minerals. In principle this should rise and fall with prices and output volumes, as has happened to some extent recently in the case of gold mining[50], but with a nominal royalty rate of around only 1% of gross value of output and with actual collections running at half or less of this for metals mining (Table 2) the ability of the New Zealand Government to capture via royalties a substantial share of the

[50] James Weir, "$6.5m royalties from mining 'the cherry on the top'", *Dominion Post* 25 March 2010, http://www.stuff.co.nz/business/3502112/6-5m-royalties-from-mining-the-cherry-on-the-top .

benefits from mining profits is restricted. Metals mining has been paying in royalties only about half of one percent of its gross sales revenues.

Table 2: Royalties and Levies

	Years ending June 30	2006	2007	2008	2009 est
Royalties $million					
	Ironsands	0.1	0.1	0.1	0.1
	Coal	2.1	1.9	1.9	1.4
	Minerals (mainly precious metals)	1.6	1.8	2.9	3.8
	Petroleum	51.2	62.1	70.8	169.6
	Total	**55.0**	**65.9**	**75.6**	**174.8**
Energy resources levy $ million					
	Coal	9.0	8.9	8.2	6.9
	Gas	64.2	44.7	38.1	30.0
	Total	**73.1**	**53.6**	**46.3**	**36.9**
Total Crown revenue $million					
	Ironsands	0.1	0.1	0.1	0.1
	Coal	11.1	10.8	10.1	8.3
	Minerals (= precious metals)	1.6	1.8	2.9	3.8
	Petroleum	115.4	106.8	108.8	199.6
	Total	**128.2**	**119.5**	**121.9**	**211.7**
Value of output, calendar years $million					
	Ironsands	48	42	82	na
	Coal	678	678	552*	980*
	Minerals (mainly precious metals)	266	336	645	na
	Petroleum	2,479	na	na	na
	Total	3,471	na	na	na
Royalties and levies as % of value of output					
	Ironsands	0.1	0.1	0.1	na
	Coal	1.6	1.6	1.8	0.8
	Minerals (mostly precious metals)	0.6	0.5	0.4	na
	Petroleum	4.7	na	na	na
	Total	3.7	na	na	na

* Solid Energy only, from its Annual Reports.

Sources: Royalties from http://www.treasury.govt.nz/budget/archive VOTE Energy. Estimated output values from Crown Minerals website (for metals and coal) and from the 2006 input-output table for petroleum. All "mineral" royalties attributed to precious-metals.

The dominant source of both royalties and ERL revenue is oil and gas, which account for 90% of all royalty receipts and over 80% of Energy Resources Levy revenue. Coal accounted for less than 6% of ERL revenues in 1996, rising to 19% by 2009.

There are discrepancies between the Treasury data and those from the Ministry of Economic Development (Appendix F) but they do not materially change the picture.

Table 3: Income tax provisions by major companies

	2003	2004	2005	2006	2007	2008	2009	Aggregated	
	$m	$m	$m	$m	$m	$m	$m	$m	Tax %
Newmont Waihi Gold Ltd								2004-2009	
Pre-tax profit		8.5	-11.4	62.4	26.8	44.6	45.9	176.8	
Provision for income tax		3.6	-0.6	15.2	-7.3	13.3	15.1	39.4	22
After-tax profit		4.9	-12.0	47.2	34.1	31.2	30.9	136.3	
Oceana Gold NZ Ltd								2003-2009	
Pre-tax profit	35.3*	24.4	22.9	-28.4	-232.6	9.0	181.1	11.7	
Provision for income tax	-13.0*	-8.5	7.6	-9.7	-67.9	-0.4	54.3	-37.6	0
After-tax profit	22.3*	15.9	15.4	-18.7	-184.9	9.4	126.8	-13.9	
NZ Steel Mining Ltd								2004-2007	
Pre-tax profit		-0.6	3.1	9.8	5.5	na	na	18	
Provision for income tax		0.0	0.0	0.0	0.0	na	na	0	0
After-tax profit		-0.6	3.1	9.8	5.5	na	na	18	
Solid Energy								2003-2009	
Pre-tax profit	60.7	52.5	8.9	125.8	146.4	52.4	165.3	612	
Provision for income tax	4.7	18.9	2.5	40.0	52.3	18.0	54.5	191	31
After-tax profit	56.1	33.7	6.4	85.8	94.1	34.4	110.8	421	

* Half-year to December.

Note: Individual company reporting years vary. Newmont and Oceana report for calendar years, NZ Steel Mining and Solid Energy for June years.

Source: Newmont 2004-2008., Oceana 2003-2008, and NZ Steel 2004-2007 from Companies Office, http://www.companies.govt.nz/cms/banner_template/CNAME .
Newmont and Oceana 2009 figures from John Hartevelt, "Opencast mining not in plan, says Key", *Dominion Post* 24 March 2010, http://www.stuff.co.nz/dominion-post/news/politics/3498002/Opencast-mining-not-in-plan-says-Key .
Solid Energy from the company's *Annual Reports*.

The company income tax rate was 33% on net profit until 2009, then 30% from 1 April 2009, and will fall to 28% from 1 April 2011. The ability to tax-deduct a wide variety of expenses and to carry tax losses forward means that it is rare for company tax to collect more than a small fraction of industry gross profits. For major companies, the timing of payment of company tax is largely discretionary, and this needs to be borne in mind in interpreting recent news stories about tax payments by gold mining companies[51]. Single-year tax numbers are of little value; the record

[51] John Hartevelt, "Opencast mining not in plan, says Key", *Dominion Post* 24 March 2010, http://www.stuff.co.nz/dominion-post/news/politics/3498002/Opencast-mining-not-in-plan-says-Key , states that Newmont Waihi in 2009 paid $24.6 million in tax plus $3.6 million of

needs to be assessed over enough years for the overall effect of tax accounting practice to show through.

Table 3 presents information from the annual financial reports of four major mining companies. Aggregating over the available years shows an effective tax rate of zero for Oceana Gold and New Zealand Steel Mining, 22% for Newmont Waihi, and 31% for state-owned Solid Energy. The contrast between the SOE and the private-sector operators is striking.

5.6 Government expenditure

The New Zealand Government undertakes a range of expenditure in support of the mining industry. Much of this, however, is for the benefit of oil and gas explorers rather than coal and metals mining.

For example, $15 million was committed in 2004 to a geotechnical data acquisition programme with data made publicly available; and an additional $6 million was provided in the 2006 Budget.[52] In 2009 another $20 million over three years was committed to seismic exploration. Government R&D investment in minerals is around $3 million, according to the NZMIA.[53] In 2010, the Government applied $4.5 million to a large-scale prospecting survey of the Northland and West Coast regions (excluding Schedule 4 areas). (The appropriation for this was diverted from the undersubscribed biofuel innovation fund.)

Expenditure under Vote Energy for management of the Crown mineral estate is shown in Table 4. It was steady at about $6 million annually until the mid-2000s, then rose to $9-10 million by the end of the decade. In September 2010, the Government announced a funding boost for Crown Minerals, against the trend of public service rationalisation elsewhere.

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royalties, with profits [apparently after tax] of $26.8 million; and Oceana Gold paid $29.3 million of tax with profits of $77.3 million. These numbers are a radical increase on previous years, attributable partly to high gold prices and hence exceptionally high profits.

52 From parliamentary library response to Quentin Duthie.

53 Data from http://www.minerals.co.nz/html/main_topics/minerals_industry_in_nz/foresight_project/industry_data_sheet.htm

Table 4: Expenditure on management of the Crown Mineral Estate, $000

1999/2000	actual	6,369
2000/01	actual	5,918
2001/02	actual	6,235
2002/03	actual	5,704
2003/04	actual	6,297
2004/05	actual	6,327
2005/06	actual	7,481
2006/07	actual	8,204
2007/08	actual	10,204
2008/09	actual	9,053
2009/10	actual	9,233
2010/11	budgeted	9,810

Overall, total Government spending in support of mining seems to run somewhere below $20 million per year.

5.7 Conclusion

Having established the general size and makeup of the sector in this chapter, the next step is to ask where the money goes. The next chapter looks at the distribution of sector income amongst the major direct claimants: labour, capital, intermediate purchases, and government. Then chapter 7 turns to the issue of how much of the sector's income is retained within the New Zealand economy, and how much leaks overseas.

6. Distribution of Income Generated by Mining

6.1 Introduction

Out of each dollar of final sales revenue of any economic sector, three spending flows are funded. First, the sector must pay for the inputs ("intermediate goods") it purchases from other sectors of the economy or from overseas. After meeting the cost of these purchased inputs, the remaining sales revenue – known as "value added" - is available to pay the cost of hiring the factors of production – land, labour and capital – whose employment adds value to the purchased inputs, and to pay taxes, royalties and levies collected by the government. Anything left over after all those costs have been met goes as pure profit to the owners of enterprises in the sector.

Each of these flows of spending has a domestic and an overseas component. Adding these up separately enables the analyst to estimate the extent to which the sector contributes to funding the New Zealand balance of payments by earning or saving foreign currency, and also shows what proportion of the sector's earnings are retained within the local economy, potentially generating further rounds of expenditure.

This chapter assembles figures on intermediate purchases, value added, and its distribution between labour ("compensation of employees") and capital/land ("operating surplus"). The next chapter addresses the issues of foreign exchange earning/saving and value retained within the New Zealand economy.

6.2 Data on the broadly-defined mining sector, including oil and gas

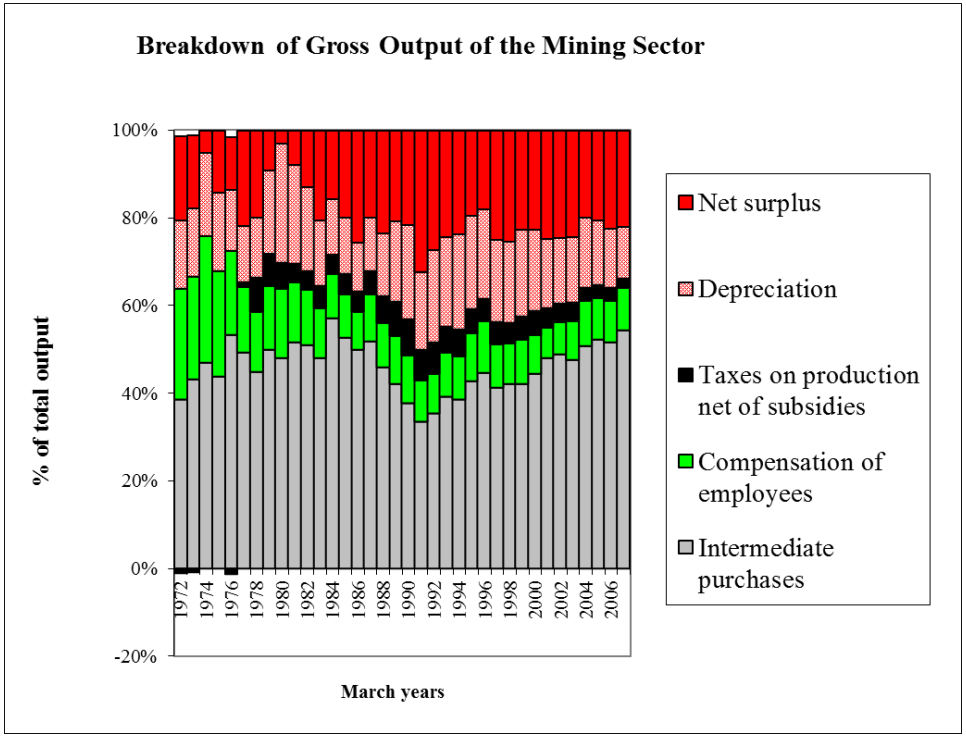
In the New Zealand national accounts, all mining activities – metals mining, quarrying, coal, oil and gas extraction and "services to mining" – are lumped together into a single sector, for which year-by-year figures are available since 1972 showing the amount of value added and the distribution of the income corresponding to that value added. The detailed figures are in Appendix H. Figures 8 and 9 show the distribution of gross income in mining compared with the patterns for the New Zealand economy as a whole.

Comparison of the left and right-hand panels in Figure 8 shows that mining, including oil and gas, is far more capital-intensive than the New Zealand economy average. Gross operating surplus (returns on, and of, capital invested) accounts for around 35-40% of mining output, compared with only about 20% for the national economy as a whole. The high capital share implies a low labour share in mining: "compensation of employees" accounts for les than 10% of output in mining, against 20% of total output across the overall New Zealand economy. The labour share in mining has fallen dramatically since the 1970s. Incomes generated in mining, in short, are heavily skewed towards operating surplus.

The ratio of gross value added to total output in mining has fluctuated, reaching a peak of 65% in 1992 since when it has dropped to 45%, roughly the economy-wide average ratio. The trend in the ratio for mining has been downward in the past two decades. As already noted the great bulk of gross value added goes to capital rather than labour: gross operating surplus, which takes just under half of gross value added across the whole economy, takes between 70% and 80% in mining (Figure 9). Compensation of employees takes 47% of gross value added across the economy, but only 20% in mining. Production taxes in the past two decades (not to be confused with income tax, company tax and royalties, all of which are charges against operating surplus) have taken a similar proportion in mining and in the economy as a whole.

The value-added to output ratio in mining is biased upwards because of the way the conventional national accounts statistics treat consumption of capital (depreciation). The economy-wide figure for depreciation is 7% of gross output, whereas for mining it has ranged between 12% and 20% over the past two decades. Using gross value added (including depreciation) rather than net value added (excluding depreciation) as the measure of "contribution to the economy" makes mining appear more productive than it actually is in adding value to the intermediate inputs used.

Figure 8: Distribution of Gross Output: Mining Sector (Including Petroleum) Compared with New Zealand Economy



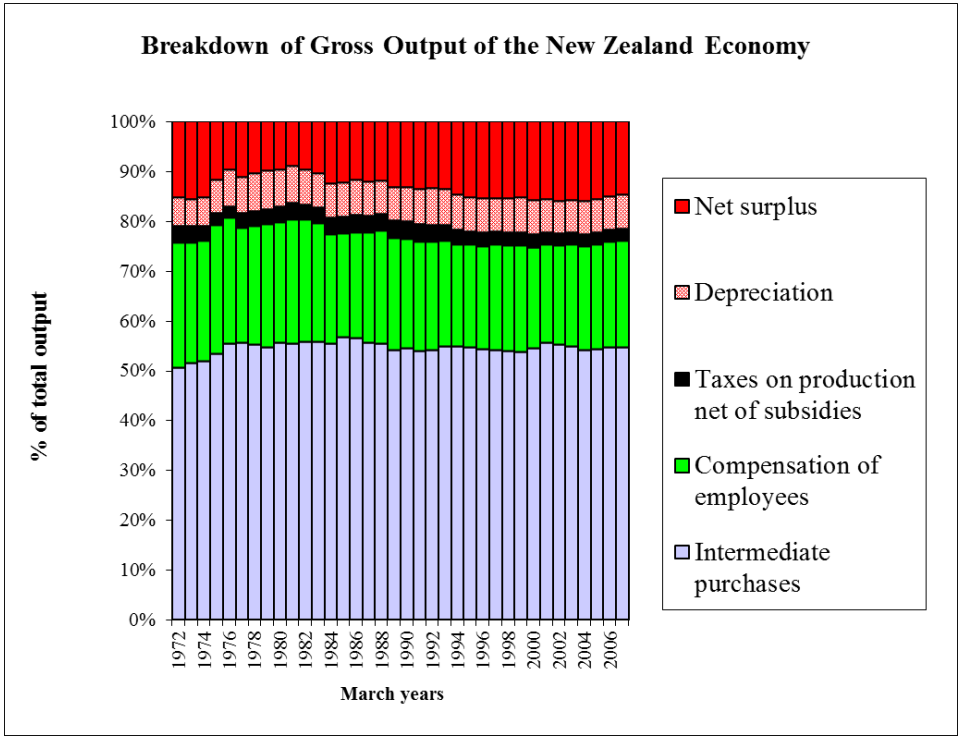
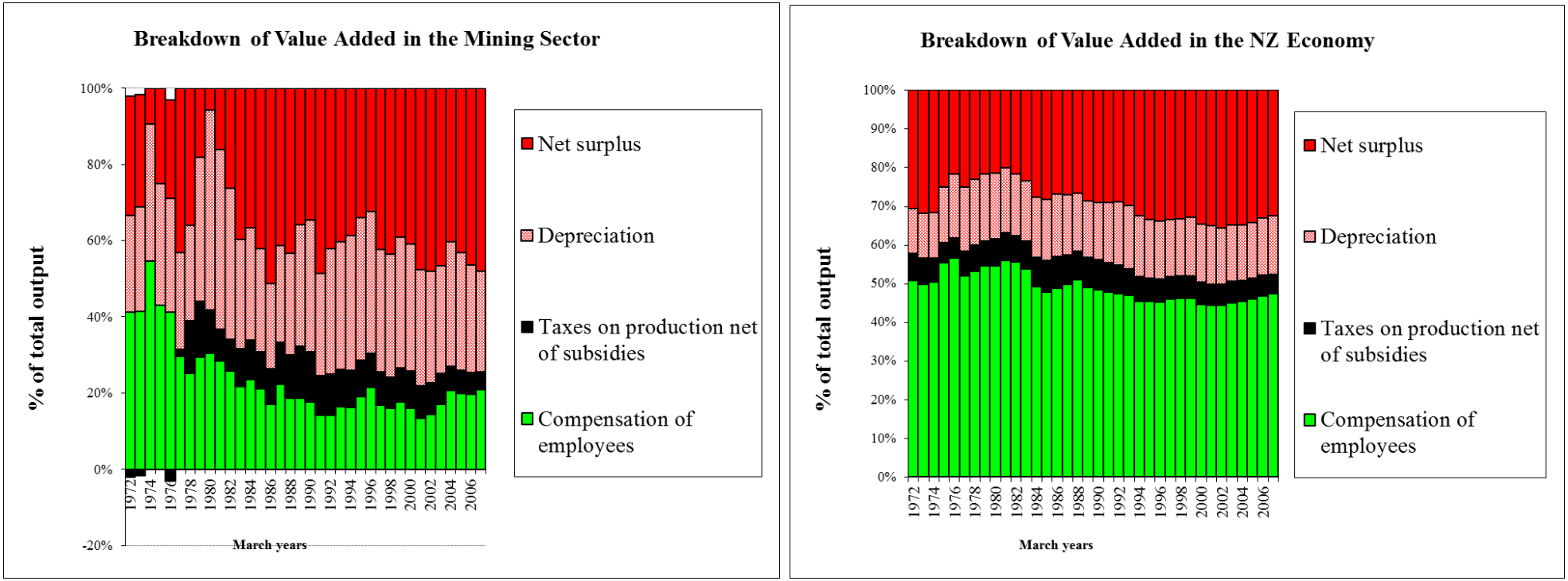


Figure 9: Distribution of Value Added: Mining Sector (Including Petroleum) Compared with New Zealand Economy



Gross pre-tax operating surplus, the income that remains after covering intermediate purchases, compensation of employees and production taxes, is divided in the national accounts between an estimated figure for depreciation allowances on capital, and a "net operating surplus" which is a package of the opportunity cost of capital (that is, the rate of return required to attract and hold capital in the sector), the rental value of land (natural resources), and pure profits.

Depreciation is again a central issue in interpreting these figures. Depreciation is not a cash cost but simply an accounting entry, used mainly to reduce the amount of income tax payable on operating surplus. The cash flow assigned to depreciation allowances goes to the owners of the business, on the basis that it is notionally a return of capital they have invested.

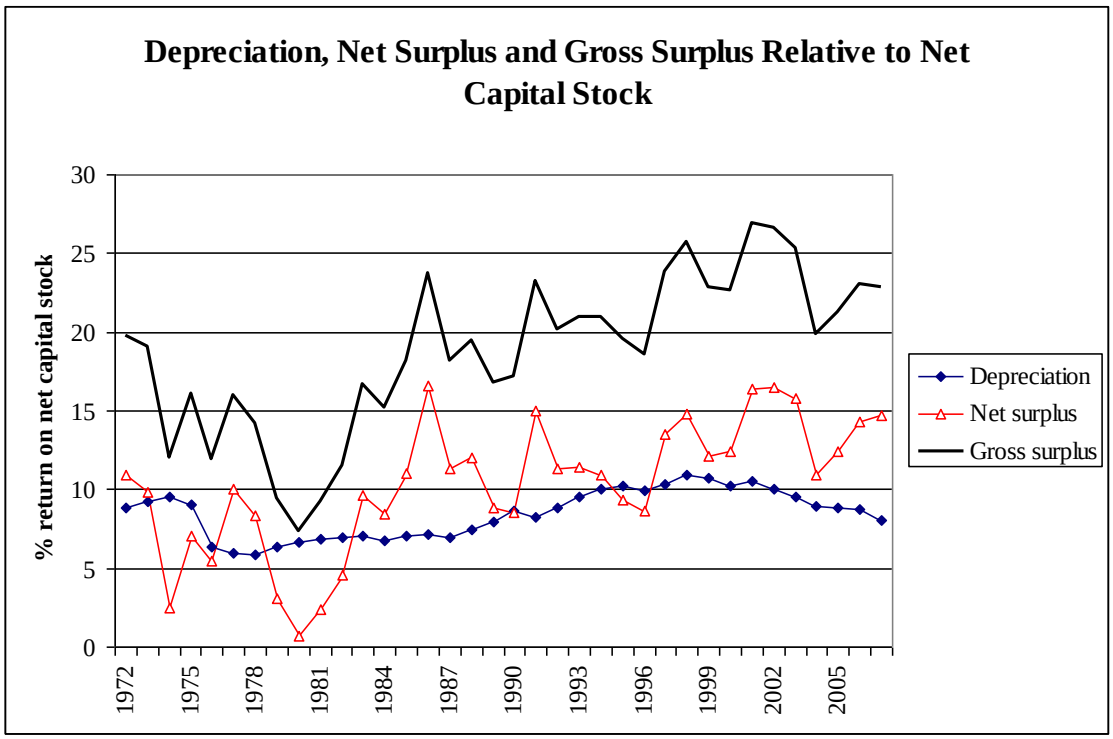
There are major issues around the interpretation of depreciation in modern accounting practice and in the national accounts. Strictly speaking, consumption of capital is a form of intermediate purchase, as physical capital resources are used up in the production process. Only net surplus, after depreciation, represents genuine value added - payment for the services of capital, land, and entrepreneurship as factors of production. Because of measurement problems, depreciation is conventionally thrown together with net surplus as a part of "gross value added" in the national accounts, and this practice is generally reasonable so long as the reason behind it is understood and borne in mind in interpreting the numbers.

Because the mining sector allocates double the nationwide average share of its revenues to depreciation, comparisons between mining and the rest of the economy that use gross rather than net value added as the measure of "contribution to the economy" tend to make mining appear more productive than it actually is in adding value to the intermediate inputs used. Treating depreciation as an intermediate purchase gives a better sense of the effectiveness of mining in adding net value to its inputs: 33% of gross output in mining, versus 39% for the economy as a whole.[54]

[54] Formal provision for depletion of natural capital as mineral resources are extracted is not made in the New Zealand national accounts. As a result, the recorded net surplus of mining is still overstated from the nation's point of view.

Figure 10 shows the recorded return on capital (net surplus), return of capital (depreciation) and gross surplus, as rates of return on the net capital invested in the sector. The gross return is typically 20-25% of net capital, made up of 10% depreciation and 10-15% net surplus.

Figure 10



Source: Appendix H

As noted above, part of the net operating surplus is paid to Government as company tax and royalties on mineral resources owned by the Crown. These tax collections are not shown in the national accounts because they represent reallocation of income after it has been generated by productive activity – not production itself, which is the target of national income accounting. Because (as shown in the previous chapter) the performance of the mining sector as a taxpayer varies greatly from company to company and from mineral to mineral, an important issue in considering the national economic benefits of any mining project is its likely tax performance – especially when the project is an overseas investment, which means that taxes are the main means of retaining a share of the profits within the New Zealand economy.

6.3 The mining sector with oil and gas excluded

The policy debates of 2010 over contentious potential developments within the conservation estate have focused on three particular mining activities – gold and silver, coal, and rare earths – which were the focus of the Government discussion document. In fact the most common mining activity on conservation lands to date has been a fourth activity, quarrying for aggregates to construct roads, buildings and other structures. Quarrying and coal account for the great bulk of consents granted by the Department of Conservation for access to the conservation estate since it was set up in 1987.

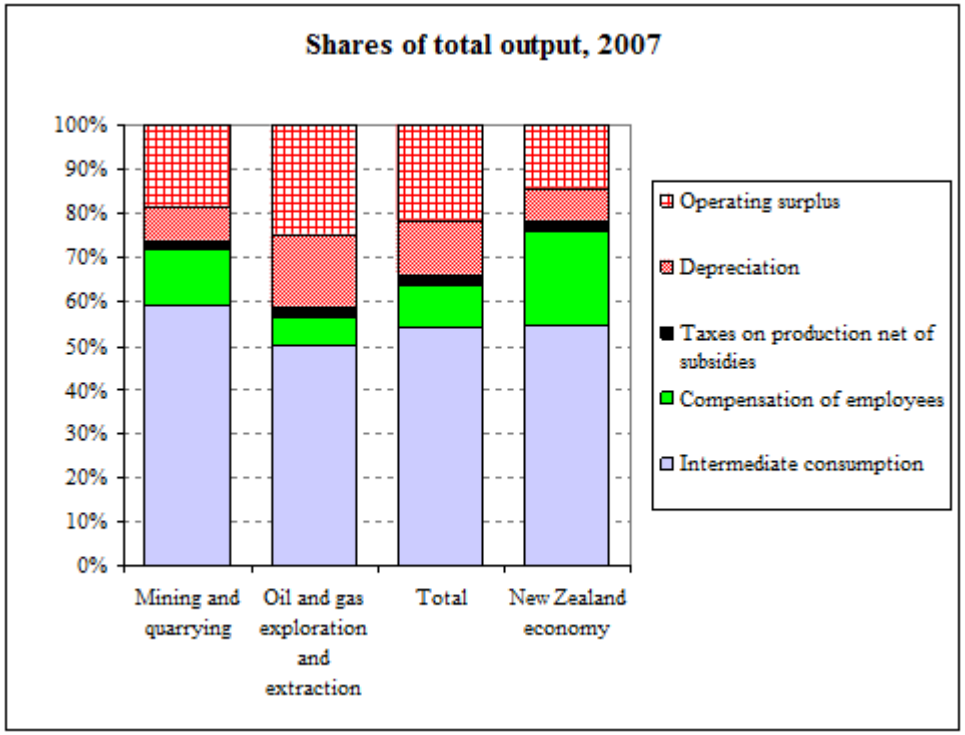
As background to the public debate there is therefore a need for more disaggregated information than what is readily available from the main national accounts. The national accounts do provide a first step in that direction by to showing separately the "contribution to GDP" totals for oil and gas separately from other mining since 1988. These figures are reproduced in Appendix I Table I1, and were plotted in Figure 2 above. The distribution of gross output across intermediate purchases and the income streams discussed in section 6.1, however, is not published except on the rare occasions when Statistics New Zealand prepares input-output tables, or less comprehensive "supply and use tables", for the New Zealand economy. The last full input-output study was for the year ending March 1996, and when the results are aggregated into oil and gas, and other mining, the result is shown in Table I2 and Figures 11 and 12. Use tables for these two sectors are available for the 2003 and 2007 March years, and the data are in Tables I3 and I4, with the 2007 figures graphed alongside the 1996 ones in Figures 11 and 12 below.

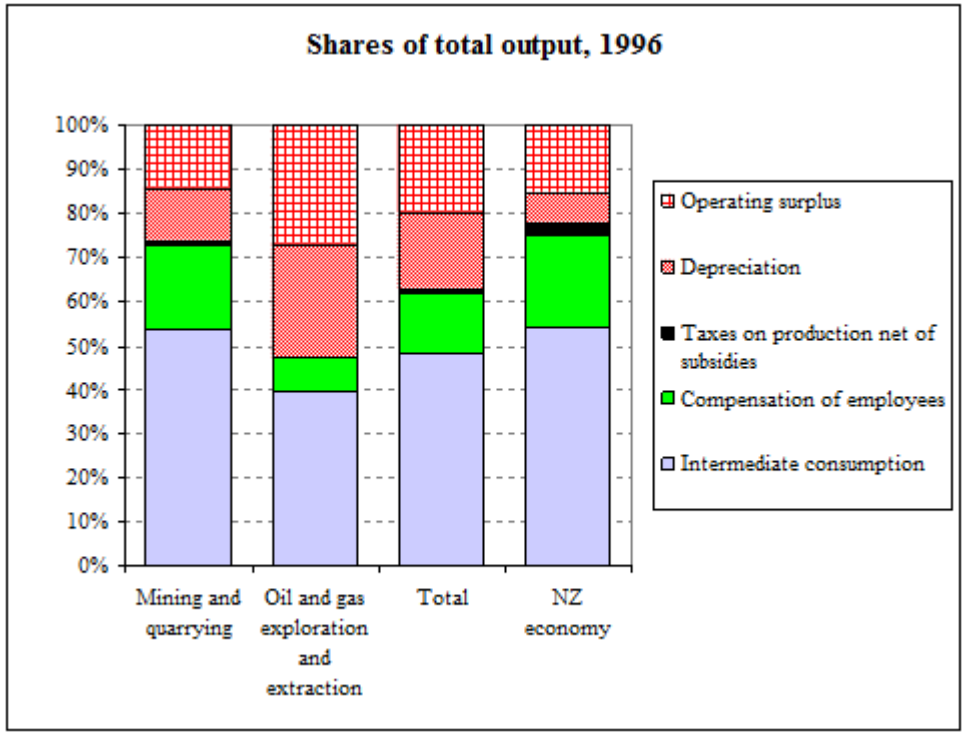
It is immediately obvious that oil and gas has a lower share for intermediate inputs in gross output, a higher share of tax (though this was much lower in 2007 than in 1996, as the value of the Energy Resources Levy fell relative to the oil price), a much higher share for depreciation, and a higher share of net surplus. "Mining and quarrying" with oil and gas stripped out is less out of line with the New Zealand economy

average in terms of a low wage share and high profit share in income, though it still remains more capital-intensive.

Further disaggregation is required to determine whether there remain significant differences amongst coal, quarrying, ironsands and precious metals in terms of their economic structure.

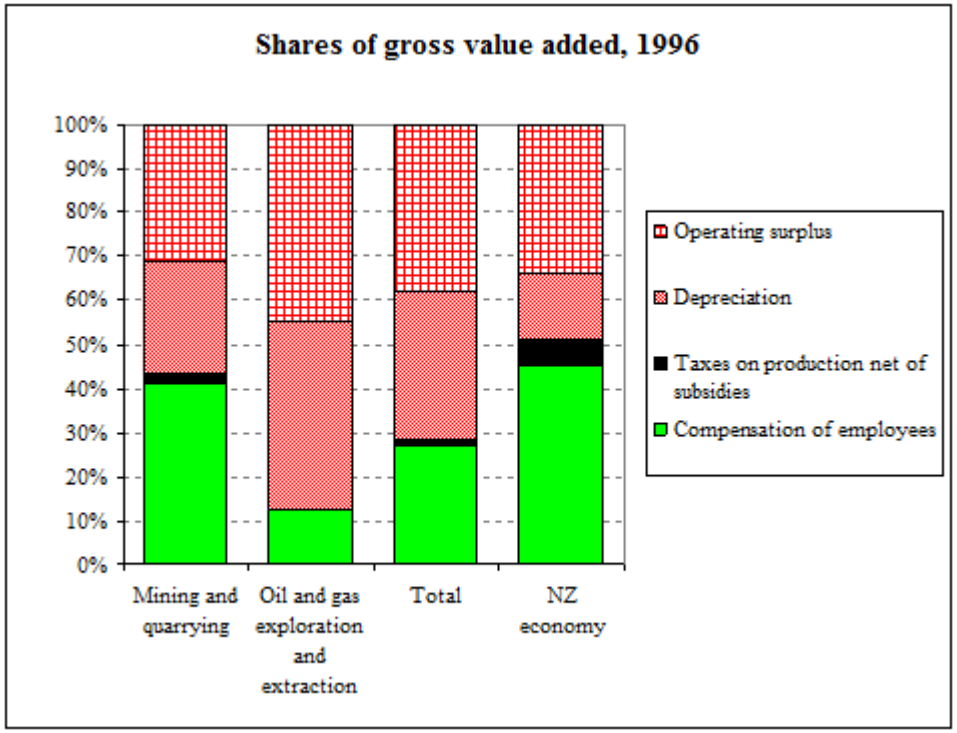
Figure 11: Distribution of Gross Output: Oil and Gas compared with Other Mining, 1996 and 2007

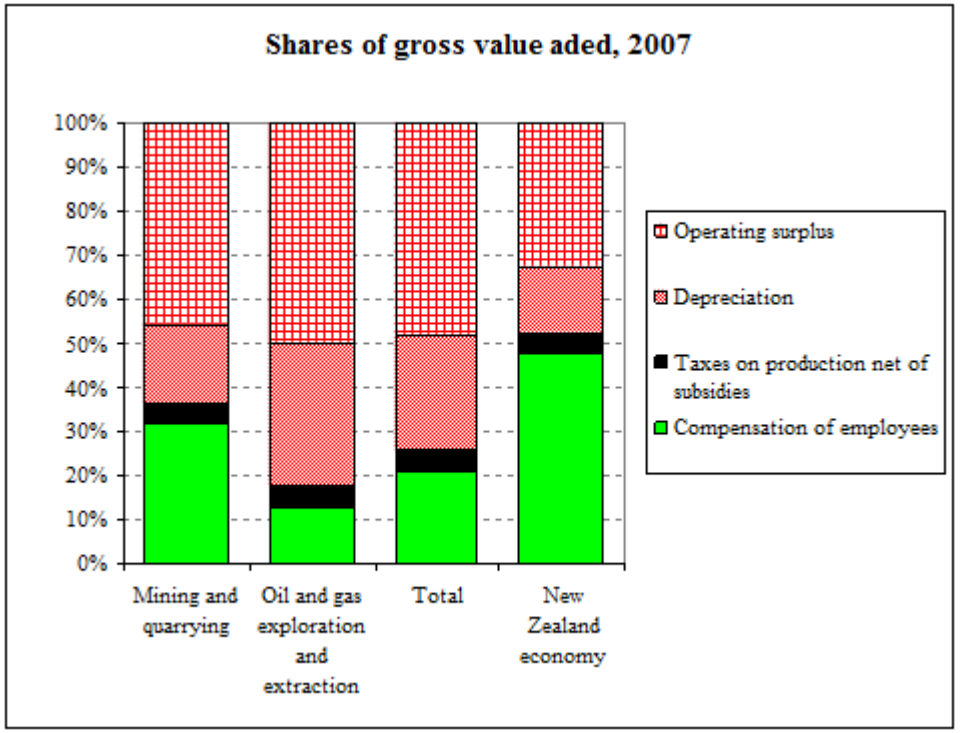




Source: Appendix I Tables I2 and I3.

Figure 12: Distribution of Gross Value Added: Oil and Gas compared with Other Mining, 1996 and 2007





Source: Appendix I Tables I2 and I3.

6.4 Detailed figures for sub-sectors

Figures on the economic structure of coal, quarrying, precious metals and ironsands have been assembled from a range of sources for the year ending March 2007, the most recent for which detailed information could be located. A useful template was provided by the 1996 input-output tables for 126 sectors, which provided cross-section information for that year for coal mining, "other mining and quarrying", oil and gas exploration and extraction, and services to mining, which was used to check data from other sources, given that Statistics New Zealand's 2003 and 2007 supply-and-use tables provide only the twofold classification between 'oil and gas' and 'mining and quarrying'. The data tables are in Appendix J. The proportional income distribution results are reproduced in Table 5.

Figures 13 and 14 show the results for 2007, breaking down first gross output value, and then gross value added, into the component income streams for ironsands, coal, quarrying, services to mining, and gold and silver. The order in which the detailed ANZSIC Level 3 sectors have been plotted is in ascending order of profit share. It can be seen that once the analysis goes behind the aggregated ANZSIC Level 2 distribution of income for "mining and quarrying including services to mining", there are very wide differences across different types of mining. On both intermediate purchases and the wage share of output and value added, ironsands, coal and quarrying lead services and precious metals. Gold and silver mining has a distribution that roughly matches the Level 1 Mining average and is closer to oil and gas than to the other Level 3 "mining and quarrying" activities.

The quality of the data used to construct Figures 13 and 14 varies from case to case. The figures for coal quarrying and precious metals are the most reliable. Ironsands estimates are based on very thin data from the minimalist financial reporting required by the Companies Office, and the services to mining estimates are residual entries to reconcile with the aggregates in the national accounts.

Some clear conclusions nevertheless emerge which have relevance for future debates over which types of mining are most likely to yield benefits for the economy. Quarrying and coal mining have significantly higher purchases of intermediate goods

and services from other sectors than gold and silver mining, and a wage share that is more than one and a half times that of gold and silver (35% in quarrying and coal versus 22% in gold and silver). What this means is that the economic flows generated by gold and silver mining are disproportionately dominated by gross profit. Within gross profit, gold and silver mining allocates a far higher share to depreciation allowances (outside the tax net) than do coal and quarrying. Following from this is a very low income-tax take out of gross value added: gold and silver pay only 8.3% compared with coal's 17% and quarrying's 15%. Only ironsands mining contributes less tax than gold and silver (effectively nothing).

With gross profit so dominant in the income generated by gold and silver mining, the benefit to the New Zealand economy depends especially heavily on ownership – where do the profits accrue, locally or overseas? The virtually complete overseas ownership of large-scale gold and silver mining means that New Zealand participation in its profits is limited to whatever minority shareholdings may be held in Newmont, Oceana, Coeur and any other future overseas entrants to the sector. In contrast, coal and quarrying are predominantly New Zealand owned.

Coal, obviously, faces the prospect of a substantial reduction in profitability in the event that an effective carbon tax is introduced to offset the climate-change externalities of coal burning. Quarrying would then be left as the mining activity with greatest long-term economic benefits for New Zealand.

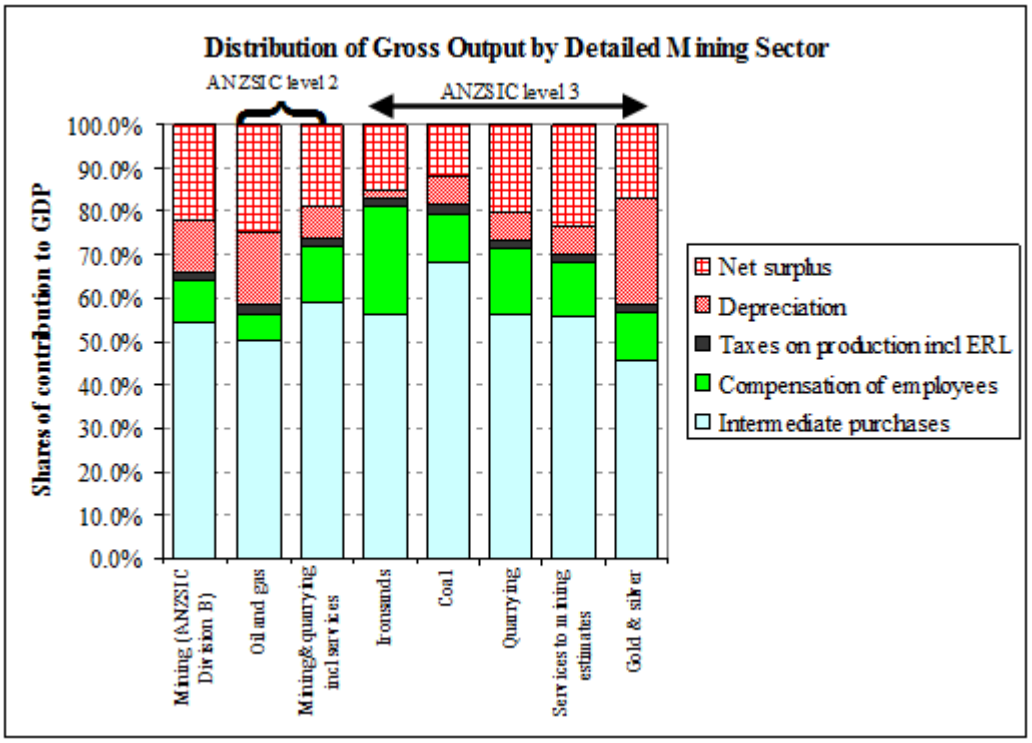
At this point it is time to turn to a direct consideration of the balance of payments contributions of various mining activities. This is the subject of the next chapter.

Table 5
Estimated distribution of income by detailed subsector, year ending March 2007

March year 2007 data or estimates	Mining (ANZSIC Division B)	ANZSIC Level 2		ANZSIC level 3					
		Oil and gas	Mining and quarrying (incl services to mining)	Quarrying	Coal	Gold & silver	Ironsands	Total mining and quarrying	Services to mining estimates
Percentage shares of gross value added									
Compensation of employees	21.0%	12.7%	31.8%	34.6%	35.0%	21.7%	57.1%	32.4%	29.3%
Taxes on production incl ERL	4.6%	10.7%	4.9%	0.0%	4.1%	0.0%	0.3%	1.4%	13.1%
Gross operating surplus	74.4%	82.5%	63.9%	65.0%	60.8%	78.3%	42.9%	66.0%	56.9%
Depreciation	26.3%	32.6%	18.2%	15.9%	20.1%	46.1%	3.5%	24.1%	14.3%
Net surplus	48.1%	49.9%	45.8%	49.1%	40.8%	32.2%	42.9%	42.1%	42.6%
Income tax and royalties	na	na	na	14.7%	16.7%	8.3%	0.3%	13.4%	12.8%
After-tax net surplus	na	na	na	34.4%	24.1%	23.9%	42.9%	28.7%	29.8%
Percentage shares of gross output									
Intermediate purchases	54.5%	50.2%	59.1%	56.3%	68.4%	41.1%	56.3%	68.4%	41.1%
Gross value added	45.5%	49.9%	40.9%	43.7%	31.6%	52.5%	43.7%	31.6%	52.5%
Compensation of employees	9.5%	6.3%	13.0%	15.1%	11.1%	11.4%	24.9%	13.0%	13.0%
Taxes on production incl ERL	2.1%	5.3%	2.0%	0.0%	1.3%	0.0%	0.1%	0.6%	5.8%
Gross operating surplus	33.9%	41.1%	26.1%	28.4%	19.2%	41.1%	18.7%	26.5%	25.3%
Depreciation	12.0%	16.3%	7.4%	7.0%	6.3%	24.2%	1.5%	9.6%	6.3%
Net surplus	21.9%	24.9%	18.7%	21.4%	12.9%	16.9%	18.7%	16.9%	18.9%
Income tax and royalties	na	na	na	6.4%	5.3%	4.4%	0.1%	5.4%	5.7%
After-tax net surplus	na	na	na	15.0%	7.6%	12.6%	18.7%	11.5%	13.2%

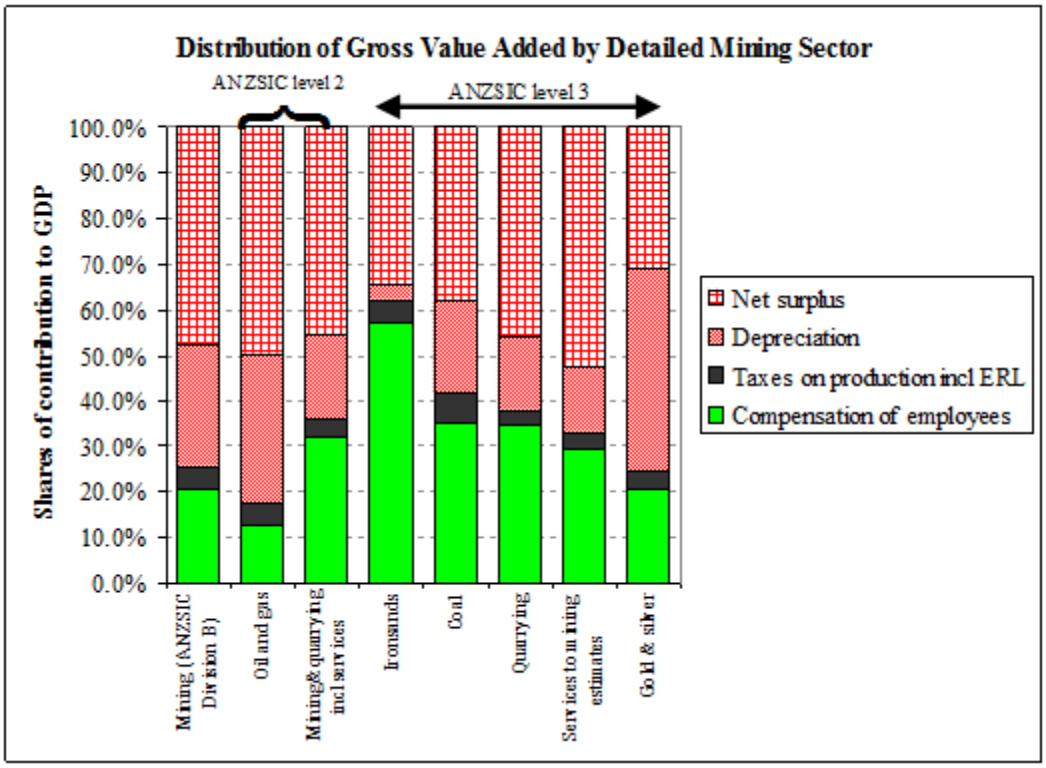
Source: Appendix J Table J5

Figure 13
Estimated distribution of gross output, year to March 2007



Source: Appendix J Table J5

Figure 14
Estimated distribution of gross value added, year to March 2007



Source: Appendix J Table J5

7. Foreign Exchange Contribution

An economic measure often used in development economics to gauge the extent to which expansion of a sector is a net generator of foreign exchange earnings is "retained value" (that is, the extent to which expansion of the sector strengthens or weakens the balance of payments, after taking account of both trade and payments flows in and out of the domestic economy).[55]

The calculation is straightforward once the main economic magnitudes have been estimated for each sector. To calculate the total amount of gross revenue that is spend within the New Zealand economy, we add up intermediate purchases net of imports, wages and salaries paid, all taxes (production taxes, Energy Resources Levy, royalties and income tax) paid to the New Zealand Government), and an estimate of how much of the returns of and on capital after tax (that is, depreciation and amortization, plus after-tax net surplus) accrue to New Zealand owners. The import content of intermediate goods is estimated over two rounds of expenditure (that is, imports include the direct import content of intermediate goods purchased locally, but not import content further up the supply chain), which means that ultimate local content is overstated.

The most difficult issue is estimating the degree of overseas ownership of each sector. As already noted above (and set out in Appendix E), foreign ownership of the aggregate mining sector including oil and gas seems to be around the 36% mark. Some mining activities such as ironsands, and gold and silver, are effectively fully foreign owned, while others such as coal and quarrying are predominantly New Zealand owned. To produce estimates of retained value it has been assumed that New Zealand ownership of ironsands is zero, of gold and silver 10% (because of small placer operations and New Zealand shareholdings in Oceana and Newmont), of

[55] Early applications of this concept to Peruvian economic history were Roemer, M., *Fishing for Growth: Export-led Development in Peru, 1950-1967*, Harvard University Press, 1970; and R. Thorp and G. Bertram, *Peru 1890-1977: Growth and Policy in an Open Economy*, Columbia University Press, 1978.

quarrying 80%, and that 100% local ownership applied, in 2007, to coal mining[56]. Obviously the foreign share in coal has been changing recently, so that the 2007 estimate for the sector will overstate the likely future foreign-exchange contribution of the sector. Solid Energy (about 80% of sector output) is state-owned, and most smaller mines operating in 2006-2007 were owned locally[57]. Overseas ownership is now, however, rising rapidly in coal-mining with the entry of Pike River Coal and Solid Energy's 2007 sale of a half-share in the Spring Creek mine development to Cargill, a transnational.[58]

In quarrying, the most prominent overseas-owned quarrying company is Holcim, which claims to produce around one million tonnes annually of aggregates[59] out of the nationwide total of 35 million, plus large volumes of limestone (much of it for the company's cement manufacturing operation). Of Holcim's total sales revenues of $300 million in 2008 and $257 million in 2009 an unknown proportion is attributable to cement and clinker manufacturing rather than to quarrying per se, but the company still probably accounted for a significant share of the quarrying industry's 2008 output value of $537 million. Allowing for some overseas capital elsewhere in the sector, the quarrying sector has here been assumed to be 80% New Zealand-owned.

Having estimated retained value for each sector, it is straightforward to derive the net foreign exchange contribution by simply taking export earnings and subtracting all imports and surplus accruing to overseas owners, leaving a net contribution to the economy's balance of payments.

Results are in Table 6 and Figures 15 and 16.

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56 Since then the share has been falling rapidly; see below.

57 http://www.crownminerals.govt.nz/cms/coal/overview/operating-coal-mines

58 http://www.coalnz.com/index.cfm/1,214,391,0,html/Spring-Creek-Mine-secures-international-commitment

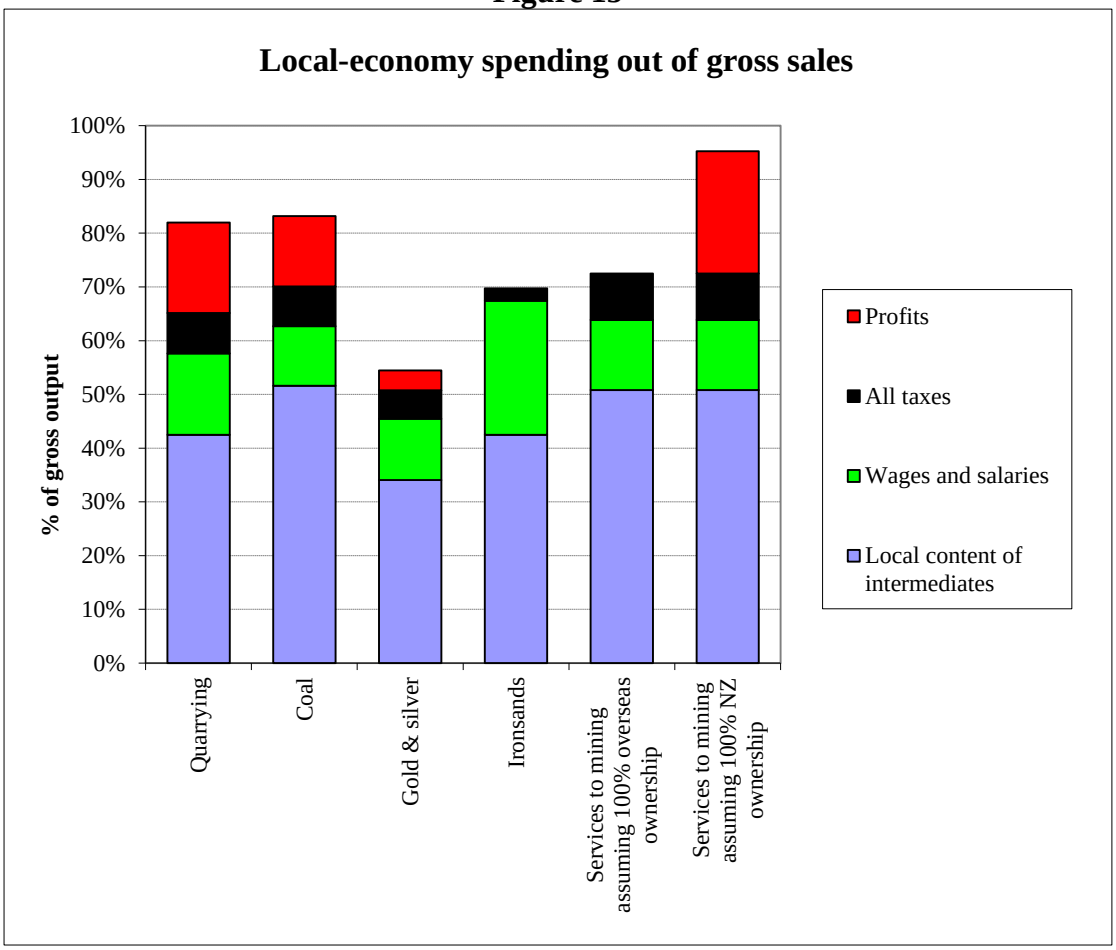
59 Holcim New Zealand Ltd, *Annual Review 2009*, http://www.holcim.co.nz/holcimweb/gc/NZ/uploads/2009%20Annual%20Review.pdf , p.2

Table 6
Retained value and balance of payments contribution by sector

March year 2007 data or estimates	Mining (ANZSIC Division B)	ANZSIC Level 2		ANZSIC level 3					
		Oil and gas	**Mining and quarrying (incl services to mining)**	Quarrying	Coal	Gold & silver	Ironsands	**Total mining & quarrying excl. services**	***Services to mining estimates***
% New Zealand ownership estimated	64%		n.a.	80%	100%	10%	0%		n.a.
Income retained in the New Zealand economy to second round of expenditure, $million			**1,650-1,786**	**463**	**564**	**157**	**32**	**1,217**	**433-569**
Local content of intermediate goods			1,010	240	350	97	20	706	304
Wages and salaries			282	85	75	32	12	204	78
Taxes			160	43	50	15	1	109	52
Gross profits (after tax) accruing in NZ			194-330	95	89	10	0	194	0-136
% of gross income spent in New Zealand			76%-82%	82%	83%	55%	70%	77%	73%-95%
Local content of intermediate goods			47%	43%	52%	34%	43%	45%	51%
Wages and salaries			13%	15%	11%	11%	25%	13%	13%
Taxes			7%	8%	7%	5%	2%	7%	9%
Gross profits (after tax) accruing in NZ			9%-15%	17%	13%	4%	0%	12%	0-23%
Income flowing offshore to imports and profits			384-520	102	114	126	14	356	28-164
Export earnings		489	925	4	371	264	20	659	265
Net direct foreign-exchange contribution $ million			**404-504**	**-98**	**257**	**138**	**6**	**303**	101-237
Net direct foreign-exchange contribution % of gross sales			**19%-25%**	**-17%**	**38%**	**49%**	**13%**	**19%**	17%-40%
Assumed excess cost of importing the product				100%	20%	0%	20%		0
Estimated import-substitution saving			1,873	1,121	369	19	32	1,541	332
Net total foreign exchange contribution $ million			**2,277-2,413**	**1,023**	**626**	**157**	**38**	**1,844**	**433-569**
Net total foreign exchange contribution % of gross sales			**105%-111%**	**181%**	**92%**	**55%**	**81%**	**117%**	**72%-95%**

Source: Appendix J Table J5.

Figure 15



The first question is how much of each dollar of sales revenue is retained in the New Zealand economy, at least over the first two rounds of expenditure. The answer for the total Level 2 mining and quarrying sector including "services to mining" is 76-82%. Excluding services, the figure is 77%.

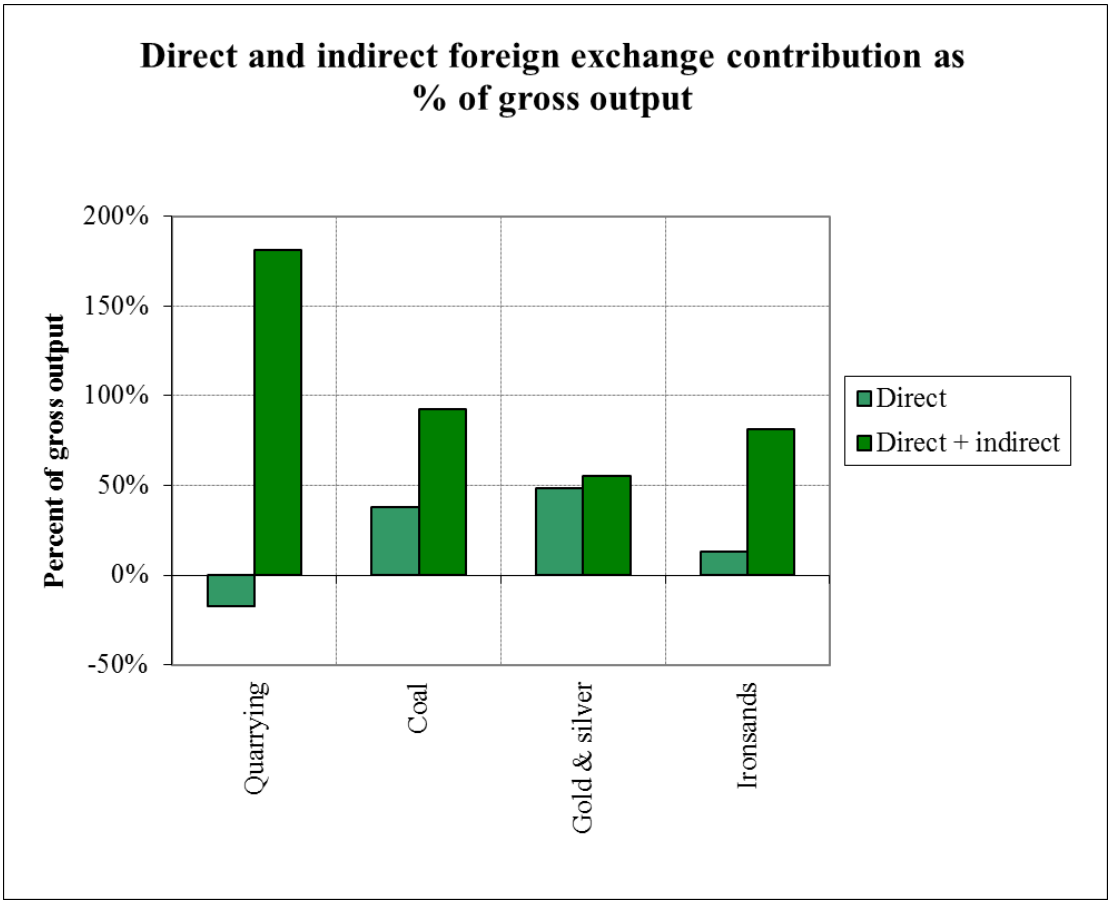
The retained-value ratio varies across the ANZSIC-Level-3 sectors. Quarrying and coal mining exhibit 82-83% of gross sales revenue spent in New Zealand. Ironsands are 70%, and gold and silver 59%. Local-economy spending impacts, thus, are lowest for gold and silver mining.

In July 2010 the Minister of Energy, Hon Gerry Brownlee, claimed that 91% of the gross sales revenue of Newmont Mining was spent in New Zealand, a figure which is conspicuously higher than the 55% estimate for gold and silver in Table 6. It turned out[60]

[60] In response to a parliamentary question asking the Minister for his source, his reply, on 11 August 2010, was that "According to www.anotherview.co.nz Newmont Waihi Gold's

that the Minister was relying upon a newspaper article[61] which had (i) credited all intermediate purchases as local expenditure (overlooking the import content of intermediate purchases), (ii) treated depreciation as a payment within New Zealand, and (iii) treated all profits not immediately distributed as dividends as having been spent within New Zealand. Use of a number (mis)calculated on this basis does not provide a sound basis for analysing the potential contribution of any mining sector to the economy.

Figure 16



Foreign-exchange contribution is calculated in two steps. As the first step, the "direct contribution" is measured by taking each sector's export earnings and subtracting its payments overseas for imports and profit repatriation. This obviously favours export-oriented operations against those producing for the local market, even though supplying the domestic market from local producers also contributes indirectly to the balance of payments by substituting for imports. The direct foreign exchange contribution on its own, therefore, is

mining operations in 2009 generated a total revenue of $193.7M, 91% of which the website advises remained in New Zealand."

61 Chris Rennie, "Overseas Firms Spend Big in New Zealand", *The Press* May 26 2010.

not very informative about the benefits to the economy from operation of a sector until account has been taken of the relevant opportunity costs.

In Figure 16 and Table 6, it can be seen that quarrying has a negative direct foreign exchange contribution because it is not an export-oriented sector, but rather one devoted to meeting the construction industry's needs in the domestic economy. As such, it has to be evaluated as an import-substituting supplier, which means it is necessary to modify the minus-$98-million direct foreign exchange impact in Table 6 by crediting the foreign-exchange cost of importing aggregate, sand, stone and so on, if they were not produced locally. For this purpose it is (arbitrarily but not unreasonably) assumed that the cost of purchasing imported quarry products would be twice the cost of supplying them from local sources, given the very low value-to-weight ratios involved. With account taken of this, quarrying makes the largest overall net balance-of-payments contribution of all the mining activities – well over 100% of total output.

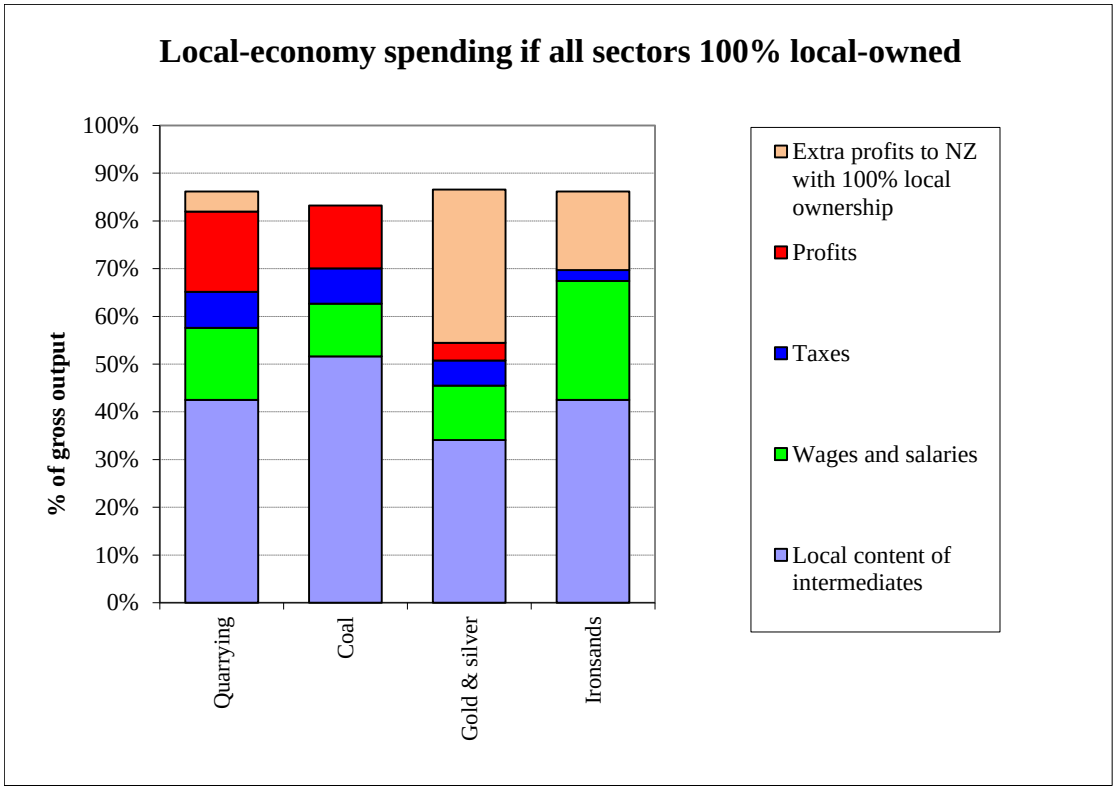
The same need to account for import substitution applies also to coal and ironsands mining. Both sell part of their output to the domestic market and the rest to export markets. The direct foreign exchange contribution for both is therefore dragged down by the substantial domestic-market share of their sales, but adding in their indirect foreign currency contribution from import substitution (replacing local with imported supplies of iron ore and coal) makes a dramatic difference (Figure 16). It has here been assumed that for coal and ironsand the FOB import cost is 20% above the domestic sale value. Coal is then estimated to contribute $626 million to the balance of payments, and ironsands $38 million – respectively 92% and 81% of the vaue of those sectors' total output.

Gold and silver is the sector where the direct and indirect foreign exchange contributions are most nearly the same, because this is an export sector in the full sense, selling virtually all its output overseas with the result that almost all the gross sales revenue is in foreign exchange. There is only a very small import-substitution effect and no reason to think that the price of locally-supplied gold or silver is lower than the import price. The $157 million contribution to the balance of payments in 2007 represented only 55% of the sector's total gross revenue.

On the basis of the direct and indirect foreign exchange contributions combined, it turns out that the most export-oriented mining activity, gold and silver mining, makes the lowest proportional foreign exchange contribution out of its sales revenue.

The main reason for the relatively low foreign exchange contribution of gold and silver is its overseas ownership, which means that gross profits accrue almost entirely outside the New Zealand economy. Foreign ownership obviously relieves the New Zealand economy of the need to fund capital investment, but by the same token reduces the amount of gross sales revenue that remains in the economy. To see how sensitive the retained-value estimates in Figure 15 are to ownership, Figure 17 shows how the ratios would change if there were no foreign ownership. It confirms that the relatively low performance of gold and silver in Figure 15 was due entirely to ownership.

Figure 17



8. Contingent liabilities

8.1 Introduction

Mining is one of those economic activities for which there are significant costs associated with the closing-down of an operation. (Probably the best-known overseas example of such an industry is nuclear power, which incurs heavy costs for containment and storage of used fuel lasting far into the future after closure of a plant.) Provisioning during a mine's lifetime for those long-term future costs is important, but severe uncertainties make it difficult to know whether financial provisions set aside today will be adequate to cover future damages.

When a polluting party fails to take adequate steps to clean up the environmental damage caused by its activity (whether because the polluter has gone out of business, or is domiciled overseas and refuses to pay for remediation, or is able to shelter behind local legal protections), the burden falls on the community, via some combination of suffering the consequences and paying to fix the problem.

The New Zealand Government has an ongoing, but slow-moving, policy of cleaning up "orphan sites" (toxic waste areas where the polluter cannot be identified or the polluter has refused to take action or pay for the cleanup, or the polluter has gone out of business). The two most prominent such sites to date have been the Mapua site of the former Fruitgrowers Chemical Company pesticides factory, cleaned up during 2004-2008 at a cost of $12 million[62], and the Tui mine tailings dump at Te Aroha, where cleanup costs are likely to top $20 million.

Because environmental costs have this tendency to fall on innocent third parties, whether victims of pollution or taxpayers/ratepayers, there is a strong onus on central and local government to ensure that mining (where permitted) is effectively regulated and that the regulations are rigorously enforced. To date the environmental performance of mining companies in New Zealand has too often been poor, and the regulatory system too weak, to sustain public confidence that future mining operations will be conducted in an environmentally responsible fashion and that liability for cleaning up both foreseeable and unforeseen damage will be fully shouldered by those who profit from mining activity.

The large scale of contingent liabilities that have to be insured against if the general public are to be left whole following events such as tailings dam failure, ground subsidence, oil

[62] http://www.mfe.govt.nz/issues/hazardous/contaminated/mapua/index.html , http://www.pce.parliament.nz/reports_by_subject/all_reports/land_use/mapua_site_clean-up .

spills, or waterways and land pollution, will often mean the difference between development or non-development of a mine. Allowing a mine project to go ahead without such full insurance cover, or without strict liability for unforeseen consequences of engineering failures, involves the community in subsidising the mining company by assuming risks which properly attach to the project's promoters.

That mining companies lobby strenuously for less demanding standards of environmental regulation is commercially understandable, but the likely outcome -leaving the risks to be borne by third parties - is not good economics. This chapter briefly reviews the recent New Zealand record and identifies grounds for some concern that the economic incentives to protect the environment that mining companies currently face may not be sufficient to ensure that all due care is taken to avoid and remedy potential damage.

8.2 The Tui case and legacy mining sites

The underground Tui mine operated between 1967 and 1973, producing a concentrate of copper, lead, zinc, cadmium, and some gold and silver, destined for export. The company (Norpac Mining Ltd - a consortium comprising New Zealand's Cable Price Downer, California's North Island Mines and Canada's South Pacific Mines[63]) went into liquidation in 1973, leaving a large volume of processed tailings which leached heavy metals and other contaminants into local streams. Since the mine had been developed under the 1926 Mining Act which imposed no requirements for site rehabilitation, nobody was responsible for the site or the pollution[64]. After various unsuccessful attempts by the Hauraki Catchment Board and the Matamata-Piako District Council to contain the tailings, beginning in 2005 Environment Waikato and the Ministry for the Environment produced a plan for expensive rehabilitation[65] and the cost of cleaning up the site was eventually passed in 2007 to the Ministry of the Environment's Contaminated Sites Remediation Fund (known as the "orphan

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63 Hugh De Lacy, "Cleaning up a Scandalous Legacy", *Q&M* Vol.4 No.4 Aug-Sep 2007 , http://www.contrafedpublishing.co.nz/QM/Cleaning+up+a+scandalous+legacy.html .

64 "Tui Mine", http://en.wikipedia.org/wiki/Tui_mine ;

65 Environment Waikato, *Tui Mine Post Remediation Opetions design study*, http://www.ew.govt.nz/PageFiles/13588/Concept%20booklet_23%20Nov%202009.pdf ; and updates at http://www.ew.govt.nz/projects/Tui-mine/November-newsletter/ and http://www.ew.govt.nz/projects/Tui-mine/March-newsletter/ .

site" fund), and $9.88 million of central government funding was budgeted for the purpose[66]. By 2010 the estimated cost of the cleanup had escalated to $17.4 million[67].

The Tui case contributed to some reform of the regulatory framework for mining. Under the Crown Minerals Act 1991 all new mining developments are subject to the Resource Management Act, and the promoters can be required by the relevant authority (local government agency or DoC) to post monetary bonds and take out insurance to underwrite rehabilitation in the event of company failure. However, there are unclear and overlapping regulatory jurisdictions[68], and it is unclear whether the size of the bonds and insurance required under the RMA is always commensurate with the scale of potential risks. Furthermore, the transitional provisions of the Crown Minerals Act 1991 left untouched the status of mining licenses granted prior to the Act coming into force. According to the Parliamentary Commissioner for the Environment,[69]

> Across the country, there are currently 111 such licences granted under the old mining legislation – 58 under the Coal Mines Act 1979 and 53 (for gold and other minerals) under the Mining Act 1971 Ten of these licenses will not expire for more than 20 years. The last to expire will be Solid Energy's Goodwin licence, for an opencast lignite pit at New Vale in Southland, which will remain operative until 2062... This is an exceptional situation, because this licence is the only one operating under both the transitional provisions of the Crown Minerals Act 1991 and the transitional provisions of the Coal Mines Act 1979.
>
> Of the 111 mining and coal mining licences still operative under the old mining legislation, at least 38 contain Crown land which came under DoC management when DoC was created. As time has moved on, some licences have lost DoC land, and others have gained some. At least 55 currently contain DoC land. None of this land falls within the Schedule 4 classification and presumably can be mined.
>
> The next long-lived licence for a coal mine is that for the opencast Roa mine on the West Coast; it expires in 2034. The last licence to expire which was granted under the Mining Act 1971 is the Wanganui River Quarry.

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66 David Benson-Pope, "Abandoned Tui mine to be cleaned up", 30 May 2007, http://feeds.beehive.govt.nz/release/abandoned+tui+mine+be+cleaned .

67 Kiran Chug, "Abandoned mine cleanup cost put at $17.4m", *Dominion Post* 17 April 2010, http://www.webcitation.org/5p91J0gDS .

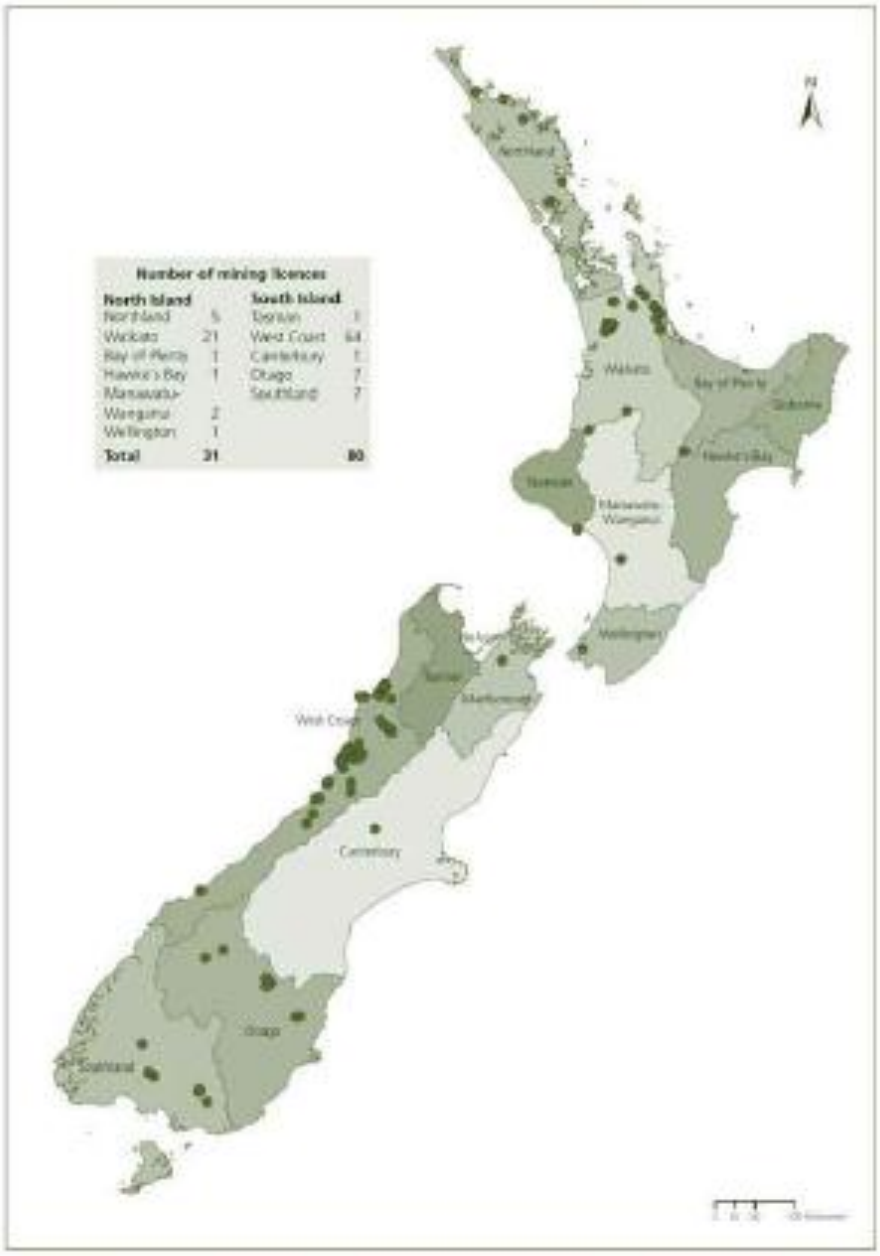
68 "Investigation of complaints to the Parliamentary Commissioner for the Environment about various mines over many years has revealed that confusion within authorities about regulatory roles and responsibilities is common. These include Environment Bay of Plenty, and DoC (Te Puke Stone quarry complaint), Grey District Council and West Coast Regional Council (Roa coal mine complaint), Buller District Council and West Coast Regional Council (Stockton mine complaints). Even Crown Minerals were unclear about responsibilities with regard to the Te Puke Stone quarry complaint, seeking legal opinion." Parliamentary Commissioner for the Environment, *Stockton Revisited: The Mine and the Regulatory Minefield*, Wellington October 2009, http://www.pce.parliament.nz/publications/all-publications/stockton-revisited-the-mine-and-regulatory-minefield, p.57 note 105.

69 Parliamentary Commissioner for the Environment, *Stockton Revisited: The Mine and the Regulatory Minefield*, Wellington October 2009, http://www.pce.parliament.nz/__data/assets/pdf_file/0016/4525/Stockton_mine.pdf , pp.41-43.

> In 1987, mining and coal mining licences that included DoC land required written consent from the Minister of Conservation, and the Minister was also able to add an extra set of conditions to the licence to enhance its protection. However, the coal mining licences including DoC land that were granted directly to the newly created state-owned-enterprise, the Coal Corporation, do not contain written consent from the Minister of Conservation. Moreover, the Minister of Conservation did not take the opportunity to add conservation conditions to these licences.

Consequently, where mining is undertaken under an "old" licence, it is still possible for the task of post-closure cleanup to be passed to the taxpayer under orphan sites arrangements. The Parliamentary Commissioner's Stockton report includes a map, reproduced below, showing the location of the 111 legacy mining permits:

Figure 5.2 Locations of the 111 mining licences still operative, granted under the Coal Mining Act 1979 or Mining Act 1971



Data source: Crown Minerals Group, Ministry of Economic Development; Statistics New Zealand; Land Information New Zealand

The Tui mine has not been the only case where costs of cleanup have fallen on taxpayers and/or ratepayers. The Parliamentary Commissioner notes that[70]

> In the … Hauraki Goldfields, Ohinemuri mine at Maratoto closed down in the early 1970s. The site is now owned by DoC who annually makes environmental provisions of more than $2.4 million. First on the list of obligations to remedy, is that "the tailings and tunnels at the Maratoto mine may excrete contaminants in the water." Other obligations relate to abandoned coal mines in the Benneydale, Mahoenui, Piraongia, Waitewhenua and Ohura coalfields, also now on DoC land.

[70] Ibid. p.46.

She notes also that "*not* updating environmental conditions in a mining licence may expose the Crown to the risk of the site being abandoned in a poor state, and the ensuing clean-up being done at taxpayer and ratepayer expense."[71] The Government has yet to indicate whether it agrees with the Commissioner and what reforms it will consider to update environmental conditions on legacy licences.

8.3 The Golden Cross Case

In the past two decades, large-scale opencast gold mining has incurred some substantial unexpected rehabilitation costs, some of the costs of which have been borne by the companies involved.

The Golden Cross mine at Waitekauri in the Coromandel had a tailings dam located on a site with known geological problems.[72] It operated under pre-1991 regulatory provisions, with a water right granted in 1988 and a mining licence in 1990. Bonds of $12.1 million were lodged as a condition of securing the consents to proceed.[73] BERL noted in 1990 that the details of the bond arrangement were not public, leading to speculation that its value might be reduced at some stage during the project. As BERL pointed out,[74]

> Although the bond amount may be quite significant in terms of its contribution to ameliorating environmental damage, we simply do not know the full costs – including the costs on other industries – of a disaster.

In 1995, it was discovered that an historic slip surface underneath the tailings dam had begun to move. A slab of ground up to 100 metres thick was sliding slowly down-slope on an old slip surface[75]. The engineering work required to stabilize the slope took three years and cost the company $27 million. This case featured in the 1997 parliamentary debates over the addition of Schedule 4 to the Crown Minerals Act.[76] In the event, "bonding provisions … ensured that no ratepayers funds are required to ... rehabilitate the site or cope with any future

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71 Ibid. p.51.

72 Adolf Stroombergen, *The Contribution of Gold Mining to the New Zealand Economy – A Study of the Golden Cross Project*, Wellington: BERL, June 1990, p.12 pointed out that "the dam sits astride a fault".

73 *Green from Gold: the rehabilitation of Golden Cross*, http://www.minerals.co.nz/html/green_from_gold/gx.html .

74 Stroombergen 1990 p.12.

75 A cross-section diagram of the problem is in *Green from Gold: the rehabilitation of Golden Cross*, http://www.minerals.co.nz/html/green_from_gold/gx.html .

76 *Hansard*

maintenance"[77]. But the final cost for the company of the problems with the tailings dam may have been up to $60 million,[78] and there is no guarantee that a repetition of the Golden Cross saga would see equal willingness on the part of a transnational company to protect its reputation and goodwill by underwriting in full the costs of land rehabilitation. Particularly in the Coromandel, geological conditions are often difficult for large potentially-unstable structures such as tailings dams, and the prevailing legal requirements relating to bonds and mandatory insurance appear to rely heavily upon both corporate good citizenship and the exercise of judgment by the relevant consent-granting authorities. Neither of these can necessarily be relied upon in the face of a major ecological disaster. The stakes would be obviously higher in the case of areas of high conservation base if proposed for removal from Schedule 4 of the Crown Minerals Act to allow mining to proceed.

No systematic official risk assessment of the potential for such problems was located during research to the present study. An unsystematic (and correspondingly unsatisfactory) assessment is the following: of four major mining projects in the Coromandel region since 1970 (Tui, Golden Cross, Martha Hill, and Favona) two projects, or 50% of the sample, have had major environmental problems associated with tailings storage. A third (Martha Hill) was implicated in serious subsidence of areas within Waihi township, requiring evacuation of residents, within the past decade.[79] While not conclusive, these incidents are strong warnings that unusually high environmental risks are associated with large-scale mining in geologically-unstable terrain. Unless strict liability for all damage is imposed in some way as part of any and all consenting procedures, the residual responsibility for cleaning up orphan sites remains with the taxpayer, and is thus a Crown contingent liability, largely unquantifiable because the size of the potential costs is unknowable.

(The recent oil spill in the Gulf of Mexico provides a timely reminder of the potential for "surprises" in the minerals sector. BERL's 1990 study of the Golden Cross project drew attention to the possible consequences for the Hauraki Gulf fishery of a major release of heavy metals into the catchment in the event of a large-scale tailings dam collapse.[80] BERL compared the annual value of the regional fish catch - about $12 million direct value plus the

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77 Ibid.

78 According to rumours circulating on the internet.

79 For a highly-coloured account see Andy Hatton, "US Mining Giant's Reign of Terror", *Foreign Control Watchdog* May 2003, http://www.converge.org.nz/watchdog/02/05.htm .

80 Stroombergen 1990, pp.12-13.

value added in downstream processing – with the $10 million reported size of the bond posted by the promoters of the Golden Cross gold mine, as evidence of the relative weakness of legal provisions to cover potential damages.)

Mining operations regulated under the Resource Management Act have seen better environmental conditions imposed and improvements in practice.[81] However, it is still common for mining operations to breach consent conditions and for authorities to be variable in the diligence of their monitoring and slow to take enforcement action. In just a few years of operation to 2010, OceanaGold's Globe Progress mine in Victoria Conservation Park near Reefton has been issued 15 infringement notices with fines between $750 and $1000 for unauthorised sediment discharge into waterways. The West Coast Regional Council issued an abatement notice in 2008 and subsequently pursued a prosecution. OceanaGold sought 'restorative justice' in the Environment Court in May 2010, the case attracting New Zealand and Australian media coverage.[82] Pike River underground coalmine near Greymouth has also received infringement notices for unauthorised discharge of coal fines to water. Even with modern resource management consents, mining operations can encounter difficulties with keeping to their environmental conditions.

8.4 Conclusion

BERL's 1990 conclusion in its Golden Cross study bears repeating[83]:

> The sheer uncertainty and ignorance surrounding hard rock gold mining ventures, regarding both the direct costs and the opportunity costs, renders most such operations, including that of Golden Cross, marginal in terms of net economic welfare. Under [the] reasonably optimistic scenario the Golden Cross operation will probably manage a net positive net national benefit but it is not within our means to assess the likelihood of such a scenario.

The uncertainty surrounding gold mining in particular is increased by the volatility of the gold price, which is currently at an historic high, but has fluctuated by up to 30% within short periods of time, which means that projections undertaken on the basis of 2010 prices can easily be out by at least that margin.

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81 Parliamentary Commissioner for the Environment, *Stockton Revisited: The Mine and the Regulatory Minefield*, Wellington October 2009.

82 http://www.odt.co.nz/news/business/104549/oceana-gold-pledges-redress

83 Stroombergen 1990, p.2.