MANAGING AUSTRALIAN MINERAL WEALTH FOR SUSTAINABLE ECONOMIC DEVELOPMENT

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EXECUTIVE SUMMARY

Introduction

For the past 150 years, governments in Australia have perceived the mining sector to be a platform for, or engine of economic growth. Two consequent policy themes in this period have been encouragement of mining sector activity to stimulate economic development, and appropriation of part of the nett value of mineral resources in the ground through royalties to fund government expenditure programmes.

Over the past 30 years, the perception of mining as an engine of economic growth, and methods of pursuing these policy themes in Australia have been subjected to serious challenges. Major issues have included the following:

- environmental concerns since the early 1970s;
- periodic fears that depletion of mineral resources will limit growth;
- anxiety about “Dutch Disease” from the late-1970s and the “Resource Curse” from the mid-1990s;
- native title issues in the Northern Territory since the mid-1970s and throughout Australia since the early 1990s;
- substantial controversy regarding royalty policy from the mid-1970s;
- severe criticism of typical exploration tenement regimes in Australia by economists since the early 1980s on the grounds that these systems tend to destroy the imputed nett value of minerals;
- criticism during the past decade of artificial impediments to the mining and processing sectors that had been created by policies of State and Commonwealth Governments in Australia.

These issues have been encapsulated by discussions of sustainable development a a result of popularisation of that principle during the past decade. They have been explicitly addressed in this report on “Managing Australian Mineral Wealth for Sustainable Development”, which was commissioned by the Australian Minerals and Energy Environment Foundation on 21 May 2001.

Concepts of Sustainable Development

The term sustainable development has been prominent only since the late 1980s. It was founded on old anxieties regarding the capacity of natural resources to sustain continuing economic growth nationally and globally. These concerns have been recurring periodically over the past 200 years. The origins of sustainable development concepts have been reviewed in section 2.1 of chapter 2.

There is no generally accepted definition of sustainable development, but one in a report by the United Nations World Commission on Environment and Development in 1987 has been widely quoted. It proposed:

“…..new paths of progress which meet the needs and aspirations of the present generation without compromising the ability of future generations to meet their own needs.”
The principle of sustainable development now has multiple dimensions including, economic growth, the efficient use of natural and other resources, social development, intergenerational equity and intragenerational equity. The principle has been embraced by groups that have typically held widely divergent views about these matters. These groups interpret sustainable development according to their own particular interests, preoccupations or ideologies.

Various views on the meaning and policy implications of sustainable development in the context of mining activity tend to fall into two basic categories outlined in section 2.3 of chapter 2 and evaluated in section 7.2 of chapter 7.

A narrow concept of sustainable development is that the quantity and quality of natural resources available to future generations must remain relatively unaffected by current human activity. Adherents to the narrow concept are pessimistic about new discoveries and technologies keeping pace with rising demand for minerals.

A broad concept of sustainable development does not impose artificial restrictions on how the present generation provides for future generations. The only limitations are the practicalities and economics of substitution, capital accumulation, and the development and application of new viable technologies. Adherents to the broad concept are optimistic about technological advance providing lower cost ways of finding, mining, processing and using mineral resources.

The broad concept of sustainable development implies substantially less intervention by governments than the narrow concept. However, it indicates that governments still have a responsibility to ensure that:

- the ecological processes on which life depends are maintained or restored;
- enterprises and governments are fully accountable for the social costs of adverse environmental and other effects of their activities.

It is apparent from the objectives of Australia’s *National Strategy for Ecologically Sustainable Development* and discussion of the mining sector in the document that the Council of Australian Governments (COAG) accepted a broad concept of sustainable development. The strategy has been briefly discussed in section 2.4 of chapter 2.

**Policy Assessment Criteria**

The emergence of sustainable development has not necessitated the addition of any new criteria for analysis and formulation of policy for managing mineral wealth for sustainable development. The established criteria, equity, economic efficiency and administrative efficiency remain appropriate. This has been explained in detail in chapter 3.

However, sustainable development has increased emphasis on:

- the intergenerational aspect of the equity criterion;
- internalisation of environmental impacts in pursuing economic efficiency; and
- intertemporal and dynamic aspects of economic efficiency.
Australian Institutional Framework

Chapter 4 provides an outline of key elements of the constitutional and legislative framework in Australia relevant to management of mineral wealth by governments. The discussion covers:

- the division of constitutional powers;
- the principle of government ownership of minerals and control of mining;
- exploration and mining tenement regimes;
- implications of native title for ownership of and access to minerals;
- implications of other privately held surface rights for access to minerals;
- mineral royalty arrangements and de facto royalties;
- environmental policy arrangements; and
- taxation powers.

Imputed Nett Value of Minerals

For more than 200 years, the imputed nett value of minerals in the ground (in situ) has been a primary focus of the economics literature relating to the mining sector. Particular attention has been paid to the role of the imputed nett value of minerals as the price of a resource, a source of income and wealth, and a base for taxation. The economics literature usually refers to the imputed nett value of minerals as resource rent, rent of mines or mineral rent.

Resource rent is central to the task of managing Australian mineral wealth for sustainable development. Indeed, if Australian mineral resources have no imputed nett value in situ, there is no mineral wealth to manage.

To the extent that imputed nett value of minerals is positive and significant, four challenging, interrelated tasks must be tackled by governments:

- guiding the distribution of the imputed nett value of minerals among the various competing interests in a manner that is judged to be fair;
- ensuring that the imputed nett value of minerals is not diminished or partly destroyed by efforts to appropriate it and/or by poor government policy design;
- correcting market imperfections, including externalities, to ensure that imputed nett value is not overstated or understated;
- keeping administration (including enforcement and compliance) costs associated with government intervention to a minimum.

The imputed nett value of minerals derives from demand for mineral products and from supply characteristics of mineral resources. The key characteristics are exhaustibility, variability (heterogeneity) and scarcity.

Mineral deposits can be depleted by mining. They are exhausted in an economic sense when all economically recoverable material has been extracted. However, reserves can be augmented/replaced by exploration, technological advances, activities by governments and other private sector entities, and higher real prices.
There are multiple variations between mineral deposits. Also, there are multiple variations between units of material within individual deposits.

Deposits possessing a commercially favourable combination of characteristics are relatively scarce. The more attractive is the combination of relevant characteristics of a deposit (summarised as “quality”), the greater is its relative scarcity.

Exploitation of relatively scarce deposits can yield a positive nett present value after covering the full costs of discovery, assessment, development, mining, processing and transportation, including the relevant cost(s) of capital (discount rate(s)). Because minimum required returns to inputs are deducted in this nett present value calculation, the resulting figure is a value directly imputable to the *in situ* mineral deposit itself.

The nett present value of a particular deposit will obviously vary with the configuration and efficiency of the exploitation process, as well as the “quality” of the deposit. It will also vary with the timing of key events, such as exploration, development, and exploitation. Important timing issues have been discussed in chapters 6 and 12.

The maximum nett present value at a particular point of time that can be realised by discovering, assessing and exploiting each mineral deposit in an appropriate future time period is the value that should be imputed to the mineral deposit *in situ* at the particular point time. In this report, it will be referred to as imputed nett value of a deposit or minerals *in situ*.

Also, different unit nett values can be imputed to different units of ore within a deposit. Within an economic deposit, units of ore with a negative unit nett value will be left behind or discarded as waste because extracting and/or processing them will cost more than the return and reduce the overall surplus.

At any particular point of time, incremental supplies of mineral products from known deposits will be available only at increasing incremental costs and therefore increasing product supply prices. However, technological advances that lower costs of exploration and exploitation, and discoveries of additional low-cost reserves from time to time can cause each quantity to be offered at a lower price or larger quantities offered at each price.

Small cost-reducing technical advances are being made continuously and major technical breakthroughs are made from time to time. Historically, technological progress and consequent discoveries of low-cost deposits have more than offset the short-term tendency towards higher incremental costs and real market prices as production expands to meet increased demand.

This phenomenon does not imply that minerals *in situ* cannot have an imputed nett value. At any particular point of time, there will still be only a limited number of deposits that can be exploited economically. The relative scarcity of these deposits and the nett present values they can generate (the maximum in each case being the imputed nett value) will increase with their “quality”.


When imputing nett value to minerals *in situ*, allowance must be made for risk and uncertainty. This applies whether an estimate is made before or after outcomes are known. Consideration needs to be given to attitudes to risk as well as the degree of risk and uncertainty after taking account of the wide range of available mechanisms for ameliorating risk and uncertainty. Even royalty arrangements based on realised outcomes can operate as risk-sharing mechanisms between governments and mining enterprises, with the distribution of risk depending on the type of royalty and the rate, as discussed in sub-section 13.8.4 of chapter 13.

The role and bases of the imputed nett value of minerals have been discussed in detail in chapter 5.

**Economic Functions of Imputed Nett Value**

*Allocation of Supply*

The return to mineral resources, the imputed nett value *in situ*, has a role to play in allocating supply:

- between uses and users; and
- over time.

The first of these functions is well understood. Therefore, it is discussed only briefly in chapter 6 of this report.

There are three elements of the intertemporal allocation function:

- the optimal timing of extraction after commencement of mining;
- deciding the ideal time to commence development and mining;
- determining the best time to undertake exploration.

There is a well-established economics literature on the first of these intertemporal allocation issues. Therefore, it is discussed only briefly in sub-section 6.1.2 of chapter 6. The second and third issues have received relatively little attention in the economics literature, even though they are important for maximising imputed nett value. Also, they have very important implications for tenement and royalty policies, as explained below and in Chapters 12 and 13. The timing of exploration and development have been given considerable attention in this report.

A diagrammatic model has been formulated and used in sub-sections 6.1.3 and 6.1.4 to illustrate the economically efficient timing of exploration and development when tenement systems are perfect. The model has been extended in chapter 12 to illustrate the severe adverse effects of flaws in existing tenement regimes in Australia.

*Eliciting Supply*

There has been considerable controversy as to whether or not the imputed nett value of mineral resources plays a role in eliciting supply of mineral resources. Most economists claim that, in principle, the imputed nett value of minerals does not need
to be appropriated, wholly or partly, by exploration and mining enterprises to induce an efficient supply of exploration and extraction activities. Others assert that resource rent is zero or trivial, because all or most of the revenues from mining must be available to exploration and mining enterprises to ensure that exploration and mining are not discouraged in the long term.

The various arguments have been considered in detail in section 6.2 of chapter 6. The analysis leads to the conclusion that imputed nett value of minerals exists, and is a differential, pure economic surplus that increases with the quality of deposits and individual units of ore \textit{in situ}. The imputed nett value of minerals, which by definition excludes the risk-adjusted opportunity cost of all inputs other than minerals \textit{in situ}, does not need to be captured by prospectors and mining enterprises to elicit an economically efficient supply of exploration and mining activity.

Unfortunately, the practical task of designing a practical royalty or tax system that can capture a substantial proportion of the imputed nett value of minerals without interfering with an efficient allocation of resources involves a number of difficult problems. These problems have been addressed in chapter 13.

**Depletion and Sustainable Development**

Depletion of mineral resources has been portrayed by some conservationists and scientists as a constraint to sustainable development in Australia.

Depletion may have severe negative economic consequences on a regional basis. However, the probability of this problem occurring is likely to reduce as geographical area and the range of geological environments increase. Therefore, it is much less likely globally and nationally than at the regional level.

The historical evidence in respect of Australia and the rest of the world indicates that depletion of known resources has not constrained growth. New discoveries and cost-reducing technological progress have generally more than offset depletion, and reserve-to-consumption ratios have been maintained at high levels on a very long term basis, both globally and in Australia. Consequently, mineral prices have exhibited general long-term downward trends over the past century.

However, there is an open question as to how long these trends will continue. This is at the heart of the strong disagreement on the meaning and policy implications of sustainable development. To shed some light on this issue, an assessment of the narrow and broad concepts of sustainable development in the context of mining activity has been undertaken in section 7.2 of chapter 7.

The narrow concept is underpinned by a pessimistic view of new discoveries and technological advance. Its proponents seek to severely constrain the composition of the accumulated capital made available to future generations.

The narrow concept is not consistent with the historical record over the past 200 years, and its proponents have not provided any convincing evidence to support rejection of the lessons of history. The narrow view requires extensive government
intervention that would be inconsistent with the economic efficiency criterion and would far exceed the reasonable requirements of intergenerational equity. Therefore, pursuit of the narrow concept of sustainable development will hinder development rather than sustain it.

The broad concept is underpinned by an optimistic view about the effects of new discoveries and technological innovation. It implies substantially less intervention by governments than the narrow concept. However, it indicates that governments still have a responsibility to ensure that:

- the ecological processes on which life depends are maintained or restored;
- enterprises and governments are fully accountable for the social costs of adverse environmental and other effects of their activities.

As long as new discoveries and technological progress continue to offset the effects of depletion on known mineral resources and constrain mineral commodity prices, such action should satisfy reasonable requirements in respect of intergenerational equity. Government intervention to properly internalise social costs of adverse environmental and other effects is consistent with an efficient allocation of resources.

The key issue is the appropriateness of the optimistic view of new discoveries and technological progress. The optimists, like the pessimists, have not provided adequate data to support their position, although history is on the side of the optimists. Unfortunately, glib optimism is no better than brooding pessimism as a foundation for policy in respect of sustainable development.

Recurring bouts of pessimism about new discoveries and technological advances prompted economists to derive conditions for sustaining a constant level of consumption in an economy dependent on mineral resources not replenished by new discoveries and technological progress. The fundamental requirement is to maintain the aggregate productive capacity of the stock of capital. Depletion of mineral resources through mining reduces the natural component of that capital stock. Investment is required to restore the productive capacity of the capital stock. In the absence of successful exploration and research to replenish mineral reserves, investment in other assets is required to compensate for depletion of natural capital.

To the extent that reproducible capital can be substituted for natural capital, the required compensatory investment in the former is equal to the reduction in the imputed nett value of the resource. That reduction is not the nett cash flow realised by mining in the current period. Instead, it is the nett present value of cash flows in respect of the relevant amount of production foregone in a later period or periods. The future output foregone could be incremental additions to production in a number of later periods or production during an additional period of operation.

The concept of sustaining a constant level of consumption by investing in reproducible capital to replace mineral resources not replenished by exploration and technical advances has been criticised because of:

- calculation difficulties;
- the desire of governments for growing rather than static consumption;
- the historical record of discoveries and technological advance more than offsetting the effects of depletion;
the pessimists’ argument that the elasticity of substitution of man-made capital for natural capital is lower than unity, will fall as substitution proceeds, and in some cases may approach zero.

Unfortunately, participants in the controversy regarding substitutability of reproducible capital for natural capital have addressed the issue only superficially. Also, the significance of the issue is dependent upon the relevance of assumptions regarding the effectiveness of future exploration and technological advance in offsetting depletion.

Economists in The World Bank have extended the concept of investing in reproducible capital to compensate for depletion or degradation of natural resources. They explained that positive “genuine saving” is the key to sustainable development, because it adds to wealth or the value of the stock of capital, which in turn adds to capacity to provide future flows of benefits. “Genuine saving” is the nett result of investments (additions to wealth) and disinvestments (reductions in wealth) involving natural resources, human capital and built capital. “Genuine saving” is a more comprehensive concept of saving than that used in conventional national accounts, which focuses on built capital.

The World Bank has released indicators of “genuine saving” for more than 100 countries for the years 1997, 1998 and 1999. These indicators should not be construed as precise estimates of “genuine saving”, because there are some important gaps in respect of natural resources and human capital.

Kirk Hamilton of The World Bank recently improved the estimates for human capital. Also, he adjusted the “genuine saving” indicators to a *per capita* basis to provide a much more meaningful guide as to whether or not an economy is on a sustainable development path.

If “genuine saving” *per capita* is persistently positive, the capacity to provide *per capita* well-being should be rising continuously. The economy will be on a sustainable development path.

Analysis of the indicators of “genuine saving” *per capita* yields disturbing results. In the majority of countries with *per capita* income below the median level, the indicator of *per capita* “genuine saving” is negative. While high income, developed countries generally achieved positive *per capita* “genuine saving”, Australia was a notable exception. During the three-year period, 1997-1999, the indicator of “genuine saving” *per capita* in Australia was negative and therefore, *per capita* wealth was declining. If Australia’s weak “genuine savings” effort persists, development/growth and *per capita* well-being will not be sustainable and will eventually exhibit a declining trend. To the extent that the indicators significantly overestimate “genuine saving” as Kirk Hamilton claims, improving the accuracy of the indicators will make the results more disturbing.

The analysis in chapter 7 has important policy implications.

- It is important to ensure that sufficient of the realised resource rents are saved and invested to achieve objectives regarding economic development.
There are several reasons for governments in Australia to err on the high side when determining the proportion of realised resource rents that should be saved and invested. These reasons have been outlined in section 7.5 of chapter 7.

The recommended precautionary bias towards saving and investment of realised resource rents from mining should not absolve governments in Australia from action to correct existing government created (artificial) impediments to saving and investment that have contributed to Australia’s negative per capita “genuine savings” rate.

Policies that destroy the imputed nett value of minerals should be abandoned. To the extent that the resource rents are destroyed, the capacity to invest to sustain or increase future consumption is reduced.

Transitory mineral price increases provide opportunities to increase investment without having to cut consumption. The failure of governments in various countries to take advantage of such opportunities has been identified as a factor probably contributing to the relatively poor growth performance of natural resource-rich countries. It has exacerbated the consequences of the decline in investment in such countries that has generally followed mineral price decreases.

“Resource Curse” and Sustainable Development

About 25 years ago, the traditional perception of the mining sector as an engine of economic growth in Australia was challenged by the “Gregory Thesis” that a booming mining sector will result in shrinking agricultural and manufacturing sectors. This also became known as “Dutch Disease” or “de-industrialisation”. During the past decade, the challenge has been broadened and intensified following formulation of the “Resource Curse Thesis” and suggestions that it applies to Australia.

The “Resource Curse Thesis” portrays mineral wealth as detrimental to, rather than a foundation for sustainable economic development. The gist of theory is that:

- relative abundance of natural resources predisposes countries to sub-standard per capita economic growth;
- after natural resource booms, per capita growth rates are below pre-boom levels;
- natural resource wealth triggers various factors contributing to poor growth;
- “Dutch Disease” is just one of these factors; and
- the star economic performers are typically natural resource-poor countries.

The “Resource Curse Thesis” has been based on generalisations derived from the results of several studies comparing economic growth of developing countries. The most influential of these studies was a substantial econometric investigation by Jeffrey Sachs and Andrew Warner in 1995. They identified a statistically significant, robust negative relationship between natural resource abundance and economic growth during the period 1971 to 1989.

These generalisations have been criticised for the following reasons:

- The growth records of relatively natural resource-rich countries are diverse. These economies are included amongst the best and worst performers in respect of per capita growth.
The relative performance of natural resource-rich economies varies with the period of study. For example, during the decade before the 1970s “boom” in oil and mineral commodity prices, and the subsequent “bust” in the 1980s, the developing mineral exporting countries performed significantly better on average than the average of all developing economies.

Other econometric evidence suggests internal strife arising from ethnic conflicts provides a better explanation of poor government policy making and resulting economic under-performance than relative abundance of natural resources.

A recent econometric study attributed the “Resource Curse” to mineral exporting countries using high commodity prices in the 1970s as implicit collateral for increased foreign debt, and then experiencing difficulties servicing the debt when commodity prices fell in the 1980s. Contractionary measures in response to these difficulties exacerbated other effects of the decline in commodity prices. This study systematic re-analysed data used by Sachs and Warner, analysed alternative data sets, and investigated various potential influences on economic growth.

Political scientists, geographers and economists have suggested several mechanisms and characteristics of natural resource-based industries that may impart “Resource Curse” effects to economies that are relatively rich in natural resources.

- Political scientists have argued that natural resource abundance leads to weak government, which results in economic mismanagement. Natural resource abundance per se is perceived to be the basic cause of economic under-performance and government performance is considered to be endogenous.
- It has been suggested that countries natural resources-rich countries will experience sub-standard economic growth because of the long-term decline of prices of mine and farm products relative to prices of manufactured goods.
- Growth-inducing externalities associated with manufacturing exceed those in agriculture and mining according to proponents of the “Resource Curse Thesis”.
- “Resource Curse” effects have been attributed to “Dutch Disease” and to government mismanagement of the process of economic adjustment to “booms” and subsequent “busts” in natural resource-based sectors.
- Destruction of resource rents has been identified as an important source of sub-standard economic performance in natural resource-rich countries. In the literature on the “Resource Curse”, this has often been discussed in terms of the concept of “rent-seeking” behaviour. In chapters 9-14 of this report, it is discussed in terms of artificial impediments to mining, processing and sustainable development, which arise from poor design of policy instruments by governments.
- Wastage of resource rents has been recognised as an important mechanism contributing to economic underperformance of countries rich in natural resources.

The political scientists and geographers, who have strongly promoted the “Resource Curse Thesis”, have argued that mechanisms such as these, particularly the first three, justify government-led diversification out of natural resource-based industries into export oriented manufacturing.

Sections 8.3 and 8.4 of this report discuss the various mechanisms for imparting “Resource Curse” effects and the diversification argument in detail. This analysis clearly demonstrates that the arguments relating to weak government, terms of trade, growth inducing externalities, and diversification out of mining lack substance. Also, it shows that destruction and wastage of resource rents and mismanagement of
economic adjustments to cycles in natural resource-based industries will impede sustainable economic development.

Symptoms of the so-called “Resource Curse” are consequences of inappropriate government policies, rather than natural resource abundance. The solution is to correct existing policy flaws. A strategy of suppressing and/or exiting natural resource-based industries in which a nation has a comparative advantage would not correct a policy flaw. Instead, it would add another monumental policy mistake to those that have already been made.

A few basic guiding principles for government policy making in natural resource–rich economies have been specified in section 8.5 of chapter 8. These principles reiterated pertinent conclusions from chapters 7 and foreshadowed policy implications of analysis in chapters 9-14. The principles are to:

- ensure that sufficient of the realised resource rents are saved and invested to achieve objectives regarding economic development;
- favour saving and investment rather than consumption of the resource rents;
- avoid treating realised natural resource revenue windfalls as permanent income gains, particularly in the case of spikes in commodity prices, and allocate pertinent government revenues to an investment and stabilisation fund;
- use fiscal and monetary policy to maintain a low inflation rate, which will help to maintain competitiveness of export and import competing sectors;
- eliminate the numerous artificial impediments that handicap industries in which Australia has a comparative advantage, destroy resource rents, misallocate resources and reduce economic growth.

Artificial Impediments

Concept of Artificial Impediments

Government intervention has created artificial impediments to sustainable economic development and particular sectors of the economy through poor design of policy instruments, inducing producers to alter otherwise preferred economic decisions with resulting misallocation of resources. In the case of mining and processing, artificial impediments may distort economic decisions concerning:

- industries or activities in which to participate;
- the amount, timing and location of exploration;
- the timing and magnitude of investment in mining and processing activities;
- the extent of recovery in mining and processing;
- production methods;
- input mixes; and
- location of activities.

The consequences will be:

- at least partial destruction of imputed nett value of minerals or resource rent;
- lower investment and output in adversely affected industries and under-exploitation of mining and processing opportunities; and
- underperformance of the Australian economy.
Artificial impediments involve government intervention that discriminates against particular types of economic activity, locations or ways of operating without valid economic reasons. Well-designed government measures that discriminate in order to improve efficiency by correcting “market failure” are not artificial impediments. Examples of “market failure” include excessive pollution, abuse of monopoly power, or under-provision of public goods.

Artificial impediments should not be confused with natural impediments, which include remote geographical locations, harsh climatic conditions, difficult topography, geological and metallurgical constraints, conflicts with use or conservation of other natural resources, constrained access to complementary natural resources, etc. Governments and business enterprises have to surmount or otherwise cope with natural impediments. Governments responsible for creating artificial impediments can eliminate them, and have a responsibility to do so.

The concept of artificial impediments is discussed in detail in section 9.1 of chapter 9.

**Examples of Artificial Impediments**

Government intervention has created a plethora of artificial impediments to sustainable economic development in Australia. Many of these have adversely affected the mining and processing sectors.

Policy measures described as “incentives” are often artificial impediments in disguise. Unfortunately, someone always has to pay. “Special incentives” to some industries are other industries’ artificial impediments. For example, a special tax break, grant or other form of subsidy for one industry means higher tax burdens, fewer benefits and/or more inflation for other entities in the economy. Similarly, protection of some industries through import barriers imposes burdens on other activities competing in world markets via higher costs and a higher exchange rate.

Because artificial impediments in Australia are so numerous, it was not practical to discuss all of them in any depth in this report. Instead, attention has been focussed on just a few examples to illustrate how artificial impediments operate and to indicate the extent of the range of artificial impediments impacting on the mining and processing sectors.

The artificial impediments discussed in this report can be divided into two categories:

- burdens caused by government intervention that is not directly related to managing of mineral wealth; and
- inefficiencies created by misguided or poorly designed government intervention in the mining and processing sectors.

Examples of artificial impediments in the former category include import barriers to protect manufacturing industries, government sanctioned inefficiencies in infrastructure sectors and labour markets, taxation of intermediate inputs and sovereign risk. These examples are discussed in chapter 10.
Artificial impediments arising from direct government intervention in the mining and processing sectors include existing exploration tenement systems and existing royalty instruments. These artificial impediments are discussed in chapters 12 and 13, respectively, in the context of more general discussions of the appropriate design of land access regimes and royalty policy.

Some artificial impediments may fall into both categories. They include some aspects of the current native title regime and poorly designed environmental policies. These artificial impediments are discussed in chapters 11 and 14, respectively, in the context of more general discussions of the appropriate design of land access regimes and mechanisms for internalising adverse environmental externalities.

**Significance of Artificial Impediments Affecting Mining and Processing**

There is no doubt that numerous artificial impediments have combined to destroy a substantial part of the imputed nett value of minerals or resource rent, to cause substantial under-exploitation of mining and processing opportunities in Australia, and as a result, to impose substantial costs on the Australian economy.

A decade ago, the Industry Commission attempted to quantify the impacts of elimination of a very limited range of government induced impediments to the mining and minerals processing sectors. The reforms in the assessment included:

- the complete removal of assistance to manufacturing industries;
- a 25% reduction in 1987 levels of agricultural assistance;
- removal of rail and sea transport impediments; and
- improved efficiency in electricity supply.

Such a reform package is far from complete, excluding many important artificial impediments described in this report. However, the estimated gains from these very limited reforms for the mining and processing sector and the Australian economy as a whole were still substantial. The results have been summarised in section 9.2 of chapter 9.

A number of distinguished economic commentators have noted that the Australian economy performed poorly relative to other developed/advanced economies for most of the twentieth century. This was attributed to matters described as artificial impediments in this report. It was also noted that attempts since the late 1980s to dismantle such policies had resulted in Australia becoming one of the better performing instead one of the poorer-performing developed economies.

**Why Processing Appears Inhibited More Than Mining**

For decades, politicians, senior public servants, and business leaders have complained that the amount of minerals/energy processing in Australia has been disappointing, having regard to Australia’s abundant world-class natural resources, its infrastructure base, and political and social stability. In contrast, they have been complacent about the mining sector, because Australia is a low cost producer by world standards of many products of mining.
While it is apparent that Australia’s potential comparative advantage in minerals/energy processing has not been fully exploited, underperformance of the mining sector has been masked by the existence of some outstanding mines. Yet, the return on aggregate exploration and mining investment in Australia has been no better than the average for all industries. Australia’s potential comparative advantage in mining has been substantially frittered away, just as it has in processing. Mining faces most of the natural and artificial barriers affecting mineral processing. However, superior mineral deposits are better able to carry the burden of artificial impediments than potentially good processing sites, because the former yield much larger scarcity values. Therefore, underperformance of the mining sector has simply not been as noticeable.

If artificial impediments do not render mineral deposits uneconomic, their effects are manifested in higher cut-off grades, reduced mining depths, smaller reserves, shorter mine lives, lower outputs per period and reduced profitability. The survival of superior mineral deposits despite these effects has tended to mask the magnitude of the economic damage caused by artificial impediments.

**Policy Implications**

When there are numerous inefficiencies arising from “government failure” and “market failure”, as in Australia, the theory of the “economics of second-best” (see section 3.3.2 of chapter 3) has shown that piecemeal action to remove inefficiencies may result in an overall reduction in economic welfare rather than an improvement. However, this does not justify government inaction. Instead, it means that:

- any piecemeal reform should be undertaken only when it is clear that the social benefits exceed the social costs; and
- the ideal approach is comprehensive reform to remove all of the numerous existing artificial impediments and to deal with uncorrected “market failure”.

It is clear that wide-ranging reform to remove artificial impediments adversely affecting the mining and processing sectors would yield very substantial benefits to the economy as a whole. However, a common political obstacle to removal of artificial impediments is the issue of painful short-term adjustments in sectors that lose special deals representing artificial impediments to others. This genuine problem may need to be managed through provision of short-term adjustment assistance. It should not be construed as an artificial impediment because it deals with market imperfections leading to imperfect mobility of factors of production in the short-term.

**Surface Rights and Land Access**

The issue of access to the surface of land held by private interests is a major issue facing the mining industry. It is a source of serious conflict and needs to be resolved. The matter has been discussed in chapter 11.

The problems appear to have arisen from poorly specified property rights in the context of the historical separation of surface rights and ownership of minerals in situ.
When the Commonwealth Government legislated in relation to native title it failed to learn from the mistakes of the States/Territories in respect of other privately held land. Indeed, it extended those mistakes, blurring the distinction between rights to the surface and ownership of minerals to a greater extent than the States had done historically in their mining legislation. This was done through the controversial “right to negotiate” provisions of the Native Title Act. It appears to have been motivated, at least in part, by a desire to deal with the severe disadvantage of Aboriginal people, and opportunism.

Governments must find better ways of addressing Aboriginal disadvantage than the “right to negotiate” provisions of the Native Title Act and other existing policies that have clearly failed to deliver outcomes that any reasonable person could regard as equitable. Also, these provisions have created impediments to mining and sustainable development and are economically and administratively inefficient.

Legislation to clearly define and protect property rights is important for ensuring that resources are allocated efficiently. However, the distinction between surface rights and mineral rights has been poorly handled by the Commonwealth’s Native Title Act and State/Territory exploration and mining legislation. The result has been misallocation of resources and administrative waste.

Native title and other surface rights are not the cause of the problem. Poor legislation in relation to those property rights and mineral rights is. Therefore, a re-think of provisions relating to consent, negotiation and compensation is necessary. The aim should be to ensure that owners of surface rights are fairly and fully compensated, while exploration and mining enterprises and communities that benefit from their activities (directly or through government royalty revenues) are not subjected to uncertainty, delays, complex compliance arrangements and de facto royalty imposts.

A largely overlooked issue with enormous policy implications for governments in Australia is the possibility that the High Court may decide to attach mineral rights to native title, at least in some States. The effects would be revolutionary. Existing exploration, mining and royalty policy regimes in affected States would disintegrate. Exploration and mining investment would come to an abrupt halt in an enormous policy vacuum. The position of existing mining operations would be uncertain.

**Exploration and Mining Tenement Systems**

Exploration tenement systems established by governments in Australia have typically been designed to bring forward exploration activity and increase exploration expenditure. These conditional first-come-first-served and work programme bidding regimes have been described in section 4.3 of chapter 4. Those policy instruments have been assessed in chapter 12 from the perspective of economic efficiency, administrative efficiency and equity criteria derived in chapter 3.

**Conditional First-Come-First-Served System**

Conditional first-come-first-served regimes consist of two basic elements:
highly conditional, insecure tenure designed to force the pace of exploration; and
allocation of tenements on a strict or discretionary first-come-first-served basis.

The strict, first-in-time allocation mechanism grants an exploration tenement to the first applicant who satisfies application requirements. A lottery is used if applications are deemed to be lodged simultaneously. The legislation specifies the minimum amount of expenditure per unit area that. This system applies in Western Australia for minerals other than petroleum.

The discretionary allocation mechanism applies elsewhere in Australia for minerals other than petroleum. It provides the administering authority with discretion to accept a proposed exploration programme, specify an alternative that is considered to be satisfactory, and judge whether or not financial and technical capabilities of the applicant are adequate. As a result, expenditure and other programme conditions such as timing and content will vary from case to case. If applications for an area conflict, a tenement is allocated on the basis of judgements concerning the “best” proposed exploration programme and technical and financial capabilities of proponents.

Conditional first-come-first-served regimes cause departure from the socially desirable timing and quantum of exploration by inducing too much exploration, too soon to pre-empt access by other enterprises. The incentive is particularly strong when the discretionary allocation mechanism applies.

To obtain secure title to attractive ground under a conditional first-come-first-served regime, an explorer would be induced to commence exploration as soon as “lease value” covers exploration and other assessment costs. “Lease value” is the imputed nett value of the right to exploit a prospect plus the discounted efficient exploration cost. “Lease value” rises at a rate equal to the risk-adjusted cost of capital.

In section 12.3.1 of chapter 12, a model developed in chapter 6 has been utilised to demonstrate that the imputed nett value of the right to exploit, in excess of the amount captured by royalty, is destroyed by:

- the opportunity cost of (foregone returns on) capital invested in pre-emptive exploration; and
- exploration expenditure in excess of the efficient amount.

Risk and uncertainty exacerbate the problem. The less information that is available about prospects, the more difficult it is to differentiate good from poor prospects in advance. Then, incremental pre-emptive exploration is more likely to be motivated by the average outcome rather than the marginal product of exploration activity. In effect, the imputed nett value of good prospects encourages exploration activity on poor prospects. This will strengthen the inducement to undertake pre-emptive activity in areas not yet regarded as being highly prospective.

Conditional first-come-first-served systems also are unattractive in terms of the administrative efficiency criterion. They involve unduly high administration costs, which represent social waste and effectively reduce realised resource rent. They are expensive to administer because:

- they rely heavily on bureaucratic/ministerial involvement and discretion; and
their highly conditional nature requires substantial monitoring by governments and enterprises.

The strict, first-in-time allocation mechanism appears to have an advantage over the discretionary allocation mechanism in respect of the administrative efficiency criterion. However, that edge may be illusory in some cases, as indicated by substantial lobbying and legal expenditures in respect of the Bronzewing South tenement adjacent to the major Bronzewing gold discovery in Western Australia.

Conditional first-come-first-served systems have distributional or equity implications that need to be considered. Because the imputed nett value of minerals in excess of the amount captured by royalty is destroyed, the relevant government, on behalf of the community, is denied a fair market price for rights to explore and mine. This is inconsistent with the benefit principle of equity. Destruction of the imputed nett value of minerals also means that it cannot be invested for the benefit of future generations. Therefore, conditional first-come-first-served systems are inconsistent with concepts of intergenerational equity.

The distributional winners from conditional first-come-first-served systems are providers of exploration and tenement administration services who, as a result of increased and earlier demand for their services, may gain incomes in excess of the opportunity cost of their services. There is no indication that governments or the community regard providers of these services as more worthy recipients of a portion of the imputed nett value of minerals than other members of the community who would benefit from increased investment, government services, or lower taxes.

If competition for an area is strong, the discretionary, conditional first-come-first-served method of allocation takes on the character of work programme bidding.

**Work Programme Bidding**

Work programme bidding regimes described in sub-section 4.3.1 of chapter 4 consist of two basic elements:

- highly conditional, insecure tenure designed to force the pace of exploration; and
- allocation of tenements on the basis of an assessment of work programme commitments offered by competing enterprises.

Under a work programme bidding system, the allocation mechanism has the following key features.

- The administering authority invites applications to explore particular areas.
- The application must include a proposed expenditure programme and a description of the financial and technical capabilities of the applicant.
- Tenements are generally allocated to the proponent of the exploration programme that is judged to be the “best”, subject to the technical and financial capabilities of the proponent being considered adequate.
- The administering authority has considerable discretion in setting programme conditions and granting tenements.
To capture secure title, an explorer could spend up to the “lease value”, which is the sum of the imputed nett value of the right to exploit a prospect and the discounted efficient exploration cost. A work programme bidding system tends to destroy imputed nett value through a combination of:

- exploration expenditure in excess of the most efficient quantum; and
- the opportunity cost of (foregone returns on) capital invested in pre-emptive exploration.

As in the case of conditional first-come-first-served systems, exploration risk and uncertainty will tend to exacerbate the capacity of work programme bidding to destroy imputed nett value of minerals.

If a tenement allocated by work programme bidding turns-out to be less attractive than anticipated, the specified programme will not be sustainable. Attempts by the administering authority to enforce the original programme can render future activity in the area uneconomic. Some enterprises may be prepared to submit to such pressure proceed to avoid being declared ineligible for future grants of tenements and write-off the losses against other ventures. The aggregate imputed nett value of minerals will still be reduced.

If bids are not enforced, the credibility of the work programme bidding system will be undermined. It will become a method of allocating tenements to those who can make unrealistic programme promises most convincingly. Therefore, the integrity of the system is likely to be under constant threat.

Work programme bidding systems also perform very poorly with respect to the administrative efficiency criterion. They are expensive for governments and enterprises to administer for three reasons:

- recurring threats to the integrity of the system;
- substantial bureaucratic/ministerial involvement and discretion in respect of multiple issues; and
- a requirement for substantial monitoring effort in respect of work programme, relinquishment and other requirements.

Such unduly high administration costs represent social waste. Effectively they reduce realised resource rent.

Work programme bidding suffers from the similar deficiencies in terms of equity to a conditional first-come-first-served system.

**Timing of Development**

Proponents of conditional first-come-first-served and work programme bidding systems have argued that inducement of earlier and additional exploration is a good thing because it will result in earlier development of resources. However, only if a newly discovered deposit is ripe for exploitation, will it be developed immediately after expeditious exploration and assessment.
Premature discovery certainly does not justify early development and cannot be expected to induce it. To the extent that discovery provides relatively secure tenure, a rational enterprise will not seek to develop and exploit the deposit until the sum of “immediate exploitation value” and exploration/assessment costs:

- is positive; and
- stops rising faster than the relevant risk-adjusted opportunity cost of capital.

A rational mining enterprise would favour that timing, whether or not pre-discovery tenure is conditional and insecure and exploration is pulled forward. Prior to that time, the mining enterprise and society earn a higher return from appreciation of the natural asset and the exploration investment in it, than from exploiting the deposit and investing the surplus. Premature development is commercially and socially undesirable.

Various government policy requirements may cause deferment of development. For example, acquisition of development tenure may require unreasonably protracted environmental assessment and approvals processes (see chapter 14) or unreasonably prolonged mandatory negotiation and arbitration procedures with Native Title claimants (see chapter 11). Then, part of the imputed nett value of the deposit will be destroyed by foregone interest on capital invested in prior exploration, assessment and planning. That social loss adds to those arising from excessive costs of negotiating environmental approvals and land access, and any deadweight losses arising from the form of environmental and other land access conditions.

**Royalty Partly Offsets Adverse Effects of Existing Tenement Regimes**

To the extent that the imputed nett value of minerals is captured by royalty and taxation regimes, the tendency of conditional-first-come-first-served and work programme bidding systems to misallocate resources and destroy resource rent will be restrained. This occurs because siphoning-off imputed nett value reduces the potential value of the prize to be captured by undertaking too much exploration, too soon. However, to the extent that a royalty or taxation system excludes returns to exploration investments from the royalty/tax base, the incentive to explore too much, too soon is preserved and the government revenue base is undermined by such activity. Royalty systems based on gross revenue (*ad valorem* systems) or quantity of output (specific systems) avoid this because they disallow costs, and therefore, include exploration expenditure and returns thereto in the royalty base.

This does not justify retention of *ad valorem* and specific royalty systems, which apply throughout Australia. As explained in chapter 13, these royalty systems have various severe deficiencies, which include tendencies to reduce recovery, output and development investment, as well as exploration. The effects increase as the royalty rate is raised and as the royalty base is broadened. As a result, *ad valorem* and specific royalty systems are not able to capture a substantial portion of the imputed nett value of minerals without causing substantial damage to recovery, output and investment. To the extent that royalty rates are kept down to reduce these adverse effects, the usefulness of *ad valorem* and specific royalty systems as devices for offsetting the incentive to explore too much, too soon will be limited.
Royalty systems that exclude exploration investments and the associated opportunity cost of capital from the royalty base should not be rejected because they tend to preserve the proclivity of existing tenement systems to destroy the imputed nett value of minerals. Realised economic profits, realised nett value and competitive, lump-sum cash bidding royalty systems are far superior to ad valorem and specific royalty systems when linked with tenements that do not induce destruction of the imputed nett value of minerals. Therefore, the appropriate policy response by State and Commonwealth Governments in Australia is comprehensive reform involving simultaneous replacement of highly imperfect tenement systems and deficient royalty systems, rather than piecemeal reform of either tenement or royalty policy.

Replacing Seriously Flawed Tenement Systems

There are two key requirements for a replacement for existing, seriously flawed tenement regimes in Australia:
- elimination of tenement conditions that interfere with the efficient supply of resources to exploration; and
- an allocation criterion that does not distort the allocation of resources to exploration and is equitable and objective.

Deficiencies in respect of tenement conditions can be rectified by:
- attaching mining rights as well as exploration rights to the auctioned tenement;
- providing secure, long term tenure, without relinquishment requirements;
- eschewing conditions that increase the quantity or advance the timing of exploration and development activity;
- making tenements freely tradeable without approval of the administering authority; and
- confining conditions to requirements for improving the efficiency of resource use such as internalisation of social costs of impacts on the natural environment, local residents and the workforce.

A competitive, lump-sum cash bidding (tenement auction) system has been strongly advocated in the economics literature as a mechanism for allocating tenements. In this report, it is assessed on the assumption that the deficiencies in tenement conditions are corrected as indicated in the preceding paragraph.

Under a competitive, lump-sum cash bidding (tenement auction) regime, the relevant administering authority invites applicants to offer up-front, lump-sum, cash payments for the right to explore and mine particular areas. Tenements are allocated on the basis of the magnitude of payments offered.

The underlying premise is that enterprises with superior combinations of knowledge, expertise, other resources, and capacity to manage risk and uncertainty will submit higher bids and win access to the resource. The winning bid should be the highest price an industry participant is prepared to pay up-front at the time of the bidding for the right to explore and mine.

The tenement auction system used by the Government of the United States is a first-price, sealed bid auction. Under this system, potential buyers submit sealed bids and
the highest bidder is awarded the tenement for the price offered by that bidder. However, there are a number of different types of auction that could be used.

A tenement auction regime serves dual purposes. As well as being a mechanism for allocating tenements, it is a device for charging an up-front, lump-sum royalty determined in the market for exploration and mining rights.

Economic arguments in favour of competitive lump-sum cash bidding are as follows.

- It is an economically efficient tenement allocation and royalty mechanism. A cash bid determined and paid before allocation does not distort subsequent exploration, investment and operating decisions by the tenement-holder because the cash payment is a sunk-cost when those decisions are being made.
- Competitive, lump-sum cash bidding relies on an objective allocation criterion, avoiding arbitrary decisions and bureaucratic/ ministerial discretion. Therefore, it involves much lower administration costs than existing tenement regimes that are heavily reliant on bureaucratic discretion. The royalty aspect requires no additional administration costs.
- Competitive, lump-sum cash bidding is an equitable tenement allocation and royalty mechanism. It complies with the benefit principle of equity that beneficiaries of goods and services provided by government should contribute in accordance with the benefits they receive. It is consistent with intergenerational equity concepts because it preserves the imputed nett value of minerals, so that it is available for re-investment for the benefit of future and present generations.

A number of issues have been raised regarding a competitive lump-sum cash bidding system. They include concerns relating to:

- effects on exploration of switching from existing tenement regimes;
- availability of funds for exploration;
- speculative dealings in tenements;
- adequacy of competition;
- informational externalities and asymmetries;
- risk and uncertainty; and
- revenue yield.

These issues have been discussed in section 12.7 of chapter 12. It has been shown that the perceived problems are either unfounded or rectifiable.

It is recommended that conditional first-come-first-served and work programme bidding systems be abandoned and replaced by a tenement regime combining long-term, secure exploration and mining tenure with allocation via competitive, lump-sum cash bidding. This policy change should be accompanied by reform of existing royalty arrangements and elimination of a wide range of artificial impediments. Together these reforms should ensure an efficient supply of exploration effort, while piecemeal reform will not. Also, tenement policy reform is a pre-requisite for reform of royalty regimes. Reform of royalty arrangements conditional on outcomes may also enhance the performance of competitive, lump-sum cash bidding as a royalty instrument as discussed in chapter 13. Therefore, tenement reform should be undertaken as part of a comprehensive reform programme, rather than in isolation. Such an approach is consistent with the lessons of the “economics of second best” discussed in sub-section 3.3.2 of chapter 3.
Royalty Policy

A detailed analysis of existing royalty regimes in Australia has been undertaken in chapter 13. Alternative systems that have been proposed in the economic literature have also been thoroughly assessed.

Existing *ad valorem* (revenue-based) and specific (output-based) royalty regimes, which are by far the most common systems used in Australia, perform dismally in terms of economic efficiency and equity criteria. They cause otherwise economic material to be left behind, with the effect increasing with the royalty rate, because they make no allowance for extraction costs. *Ad valorem* and specific royalty systems represent major artificial impediments to the mining sector and sustainable development in Australia because of their destructive effects on the imputed nett value of minerals. There can be no doubt that the damage to exploration, investment and recovery incentives, and to capacity to raise revenue caused by these regimes overwhelms administrative savings that they provide relative to systems based on accounting profits, realised resource rent, economic profits or nett value of minerals.

An accounting profits royalty system, such as the one applying in the Northern Territory, allows for nearly all costs and adjusts for variations in prices. Therefore, it is much less likely than *ad valorem* and specific systems to cause material to be left in the ground and to damage incentives to explore and invest. However, an accounting profits royalty taxes minimum required rates of return on equity capital in exploration and project development.

An accounting profits royalty regime is much less destructive of the imputed nett value of minerals in the process of capturing a portion of it for the community, than *ad valorem* and specific systems. Therefore, it is greatly superior in terms of the benefit principle of equity, inter-generational equity concepts, and economic efficiency.

An accounting profits royalty will involve significantly greater administration costs than *ad valorem* and specific royalty systems. However, unless rates are trivial, the economic efficiency and equity advantages are likely to swamp the administrative efficiency disadvantages.

A resource rent royalty, such as the system applied as a tax to offshore petroleum by the Commonwealth Government, represents a significant step forward from an accounting profits royalty in terms of the economic efficiency criterion, because it seeks to avoid taxing the minimum required rate of return to capital invested in exploration and development. This system allows negative cash flows to be carried forward at the estimated minimum required rate of return (threshold rate) to be offset against future positive cash flows. However, the threshold rate differs between phases of a project and between companies and is not easily estimated. Setting a single or a couple of threshold rates will induce overcapitalisation in some cases and underinvestment in others.
In addition, a resource rent royalty will not treat negative cash flows equivalently with positive cash flows in some circumstances. If an exploration venture or a mining project yields negative net cash flows that cannot be recouped by the enterprise along with the threshold rate at a later time, the frequency/probability distribution of nett present values will be skewed negatively by the royalty system. The expected (anticipated average) nett present value of some investments could become negative. Investment in exploration and development would be discouraged to some extent, and ranking of investments could be affected.

A resource rent royalty system with a very high royalty rate would damage incentives to operate efficiently. The incentive to realise nett value of minerals would diminish, and the penalty for ill-advised and wasteful expenditures would decrease, as the royalty rate rises.

Despite its deficiencies, a resource rent royalty should capture a significantly larger portion of the imputed nett value of minerals for a given degree of destruction of that base than an accounting profits royalty, and a very much larger portion than ad valorem and specific royalty systems. Therefore, it is correspondingly superior to these other royalty regimes in terms of the equity criterion.

The administration costs associated with a resource rent royalty regime are likely to be less overall than with an accounting profits system. However, they are likely to be significantly higher than for ad valorem or specific systems.

Deficiencies of a resource rent royalty arising from imperfections of estimates of minimum required rates of return and failure to allow for losses in all circumstances, prompted arguments in the Australian economics literature that a royalty based on realised economic profits was preferable. A realised economic profits royalty collects a percentage of periodic positive cash flows and provides rebates at the same rate for periodic negative cash flows. These full loss offsets ensure that risk-taking, exploration and investment expenditures are not discouraged and eliminate the problem of determining minimum required rates of return on capital.

However, a realised economic profits royalty system with a very high royalty rate would still damage incentives to operate efficiently. The incentive to realise economic profits would diminish and the penalty for ill-advised and wasteful expenditures would decrease as the royalty rate rises. The problem is likely to be more severe than in the case of a resource rent royalty, because of the availability of full loss offsets at the very high royalty rate. The damage to incentives to operate efficiently would be reinforced if the royalty base includes some implicit returns, in excess of deductible payments, to the synergistic efforts of skilled technical and management teams.

A major obstacle to acceptance of an economic profits royalty is the issue that apparently spawned the resource rent tax/royalty concept, namely, negative political perceptions of paying rebates to exploration and mining enterprises when cash flows are negative. One proposal to reduce the significance of this obstacle is to combine a resource rent royalty with a government guarantee to pay rebates at the royalty rate after exhaustion of opportunities to carry forward negative cash flows with interest to offset against subsequent positive cash flows. This realised nett value scheme means:
• the interest rate can be set at the long-term government bond rate; and
• the equivalent of the full loss offsets is provided; but
• rebates are avoided during the development and expansion phases of projects, when negative cash flows are substantial.

Competitive, lump sum cash bidding has received strong support in the economics literature for its role as an up-front or *ex ante* royalty regime, as well as for its function as a tenement allocation mechanism. However, there are differing views as to whether it is suitable as a stand-alone royalty system or whether it should operate in tandem with a royalty scheme based on realised outcomes that is a relatively strong performer in terms of economic efficiency and equity criteria.

Competitive lump-sum cash bidding is an economically efficient, equitable and administratively efficient royalty mechanism. It does not distort exploration, investment and operating decisions by the tenement-holder subsequent to the bidding process, because the cash payment is a sunk-cost when those decisions are being made. It complies with the benefit principle of equity that beneficiaries of goods and services provided by government should contribute in accordance with the benefits they receive. It is consistent with intergenerational equity concepts because it does not destroy any of the imputed nett value of minerals. It does not involve any administration costs additional to those required for its operation as a tenement allocation system, which are substantially lower than administration costs associated with existing tenement regimes that do not collect any royalty revenue.

Despite these strengths, reservations have been expressed regarding reliance on competitive, lump-sum cash bidding as a stand-alone royalty system. First, it has been suggested that low bids in response to risk and uncertainty may tempt governments to apply other imposts if a prospect acquired for a low bid subsequently becomes a “bonanza”. The consequent “sovereign risk” causes lower bids for other tenements in future, exacerbating the problem and undermining the capacity of the system to collect the imputed nett value of minerals. Second, it has been argued, in the context of imperfections in available mechanisms for risk sharing/spreading, and risk-averse attitudes of enterprises and governments, that the value to government of royalty revenue could be increased if the government is prepared to share risk and uncertainty by combining a realised economic profits or nett value royalty with competitive, lump-sum lump cash bidding.

These criticisms of competitive, lump-sum cash bidding as a stand-alone royalty system have been questioned by other economic analysts. Therefore, the validity of the criticisms is not clear.

To the extent that the “sovereign risk” and risk-sharing arguments are valid, the revenue yield of the system and its appeal on equity grounds will be undermined. In those circumstances a case can be mounted for combining a realised economic profits or nett value royalty with competitive, lump-sum cash bidding. Such a combination also provides a solution to two concerns about a realised economic profits or nett value royalty. First, the up-front royalty revenue from competitive, lump-sum cash bidding means that it is not necessary to set a high royalty rate for a realised economic profits or nett value system royalty in order to capture a high proportion of the imputed nett value of minerals. Second, competitive lump-sum cash bidding for long-
term, secure, freely tradeable rights to explore and mine would eliminate the tendency of existing tenement systems to destroy the revenue yield of a realised economic profits or nett value royalty system.

Because a realised nett value (or economic profits) royalty and competitive, lump-sum cash bidding enhance each other’s performance, this combination is far superior to any other combination of royalty and tenement regimes in terms of equity and economic efficiency criteria. Administrative efficiency considerations further highlight the importance of considering royalty and tenement regimes as a package, rather than separately. The administrative efficiency gains from replacing existing tenement systems should outweigh administrative efficiency disadvantages of replacing the existing predominant *ad valorem* and specific royalty systems.

Implementation of a combination of a realised nett value or economic profits royalty with competitive, lump-sum cash bidding for secure, long-term exploration and mining rights would greatly increase government royalty revenue and eliminate the very substantial inefficiencies created by existing royalty and tenement regimes in Australia. The additional revenue could be used to reduce distortionary taxes and charges imposed by governments, reducing aggregate inefficiencies caused by government revenue instruments in Australia. Alternatively, governments could increase investments or reduce debt for the benefit of present and future generations. In each case, aggregate inefficiencies in the Australian economy will be reduced.

The mix of up-front and conditional royalty can be altered by changing the rate of royalty applying under the latter system. A lower or higher royalty rate would increase or reduce the magnitude of bids, respectively. The appropriate mix is an issue requiring further research.

State and Commonwealth Governments should cooperate to design a uniform combined realised nett value royalty and competitive, lump-sum cash bidding regime. Industry organisations and bodies independent of industry and government that are concerned about efficient use of and equitable community returns from natural resources should be involved in the design process.

**Mining and Environmental Policy**

Chapter 14 stresses the importance of internalising environmental costs imposed on humanity in the interests of economic efficiency and sustainable economic development. Internalisation means enterprises should bear the social costs of adverse environmental effects that they generate. Properly designed measures to internalise environmental externalities improve the allocation of resources. They should not be confused with artificial impediments, which cause production inefficiencies, detracting from economic efficiency.

As indicated by the “economics of the second-best”, governments in Australia should eschew piecemeal reform in favour of comprehensive reform including a simultaneous attack on causes of “market failure”, such as environmental externalities, and “government failure” in the form of poorly designed policies adversely affecting the mining and processing sectors. Then, with externalities
internalised and artificial impediments removed, economic efficiency will be enhanced and genuine sustainable development can be achieved.

When framing environmental policies, governments and environmental lobbyists need to note that internalisation of negative externalities does not imply that all adverse effects are eliminated. Rather, it means that the gains from trading-off lower/higher social benefits against lower/higher social costs are exhausted.

Relevant government authorities in Australia need to give serious attention to the task of developing a methodology for determining the economically efficient level of rehabilitation activity for each mining operation within a social-cost benefit analysis framework. The current practice of specifying rehabilitation requirements based on bureaucratic discretion or arbitrary standards is not conducive to efficient use of resources.

In Australia, governments have generally adopted command-and-control mechanisms, rather than market-oriented mechanisms to internalise social costs of mining and processing. On economic grounds, there is a strong case for greater reliance on market-oriented mechanisms and less on command-and-control measures. Further research is required on the efficacy of these different approaches for internalising social costs of environmental externalities generated by the mining and processing sectors in Australia.

There is an unreasonable degree of legislative proliferation and complexity in relation to environmental effects of mining and processing in Australia. This matter needs to be addressed by State and Commonwealth Governments.
1 INTRODUCTION

For most of the period since Colonial Governments were established in Australia, governments in this country have perceived the mining sector to be a platform for, or engine of economic growth. The source of this growth was considered to be linkages with other industries or potential industries and investment of economic surpluses arising from the imputed nett value of minerals (resource rents). Therefore, two persistent themes over the past 125 years have been encouragement of exploration, mining and processing activity to stimulate economic development, and appropriation of part of the nett value of mineral resources in the ground through royalties or de facto royalties to fund government expenditure programmes.

Over the past 30 years, the role of mining as an engine of economic growth, and ways in which these policy themes have been pursued by governments in Australia have been subjected to serious challenges on multiple fronts. Major issues have included the following.

- In the early 1970s, concerns were aroused about the effects on the natural environment of economic growth, mining, and use of products of mining. Subsequently, exploration, mining and processing have been subjected to substantially increased statutory requirements and public scrutiny regarding protection of the natural environment. Over the past decade, political pressure for increased environmental constraints on these industries has intensified in the context of concerns about “greenhouse” gas emissions and ecological sustainability of development.

- Depletion of mineral resources has been cited as a growth-limiting factor by some conservationists and scientists. This issue attracted substantial public and political attention in the early 1970s, and subsequently, has re-emerged from time to time.

- The traditional view of mining as an engine of growth for the Australian economy was challenged in the late 1970s and early 1980s because of anxiety about “Dutch Disease” or the “Gregory Effect”. During the 1990s, concerns about the broader problem of the “Resource Curse” have raised further doubts about the role of the mining sector as a source of economic growth in natural resource-rich Australia. These theories attracted the attention of politicians as well as academic economists.

- Increasing concerns about the welfare of Aboriginal people focused public attention on Aboriginal land issues from the early 1970s. This induced politicians and the judiciary to provide land title to Aborigines, and politicians to provide holders of native title with direct access to some of the imputed nett value of mineral resources. The difficulties and cost of accessing land subject to native title for exploration and mining has been a major political issue in the Northern Territory since the mid-1970s and the rest of Australia since the early 1990s.

- In the context of an “oil crisis”, increasing mineral commodity prices, and considerable political rhetoric regarding mining-based growth, royalty policy
became a serious research interest of Australian economists from the mid-1970s. Existing royalty systems based on output and production and gross revenue were condemned because of their adverse effects on exploration for, investment in and recovery of minerals. Alternative systems based on resource rent or the nett value of minerals in the ground were promoted by academic economists as means of capturing a much higher proportion of the imputed nett value of minerals without adversely affecting incentives to explore and mine. These proposals generated considerable debate among economists, politicians, bureaucrats and mining sector representatives.

- In the early 1980s, some Australian economists observed that typical exploration tenement regimes in Australia, which were designed to force the pace of exploration, were likely to lead to at least partial destruction of the imputed nett value of minerals. Because of this, it was also noted that these tenement systems were likely to undermine the capacity of royalties based on resource rent or the nett value of minerals to collect substantial revenue. This issue has not yet received the political and bureaucratic scrutiny that it warrants.

- In 1991, the Commonwealth Government’s Industry Commission pointed out that past policies of State and Commonwealth Governments in Australia had handicapped mining and processing activities in a number of ways and that the aggregate effect on the level of activity in these sectors has been substantial. Political recognition of at least some of the past policy mistakes has been manifested in tariff reduction and microeconomic reform programmes initiated in the late 1980s and early 1990s, respectively. However, these programmes appear to have stalled because of lack of political will.

During the past decade, all of these issues have been encapsulated by the concept of sustainable development. They have been explicitly addressed in this report on “Managing Australian Mineral Wealth for Sustainable Development”.

The concept of sustainable development has become widely accepted in many nations, including Australia. It has been endorsed by groups that have typically held widely divergent views about the conservation and use of natural resources, the allocation of resources within the economy and over time, and the distribution of income and wealth within and between generations.

In Australia, as in other countries, sustainable development objectives have been formulated by governments and pursued alongside traditional policy objectives. The mining sector has been explicitly covered by these policy initiatives. In general, degrees of emphasis applying to pre-existing objectives and strategies have been adjusted, rather than completely new policy thrusts being introduced. Nevertheless, in activities such as mining, which extract some natural resources and impact on others, sustainable development principles have added new dimensions to the task of managing use of natural resources in both categories.

On 21 May 2001, Corporate & Economic Strategies Pty Ltd was commissioned by the Australian Minerals and Energy Environment Foundation to investigate ways of improving the management of Australia’s mineral wealth to enhance the contribution
of the “mining and minerals sector” to sustainable economic development. This report outlines the findings of the investigation and the underlying analysis.

In this document, “mining and minerals sector” has been interpreted to include exploration for, mining of and processing of minerals. The term “minerals” has been interpreted broadly to include petroleum, coal, mineralised ores, precious stones, rock, clay, sand, and gravel. “Exploration” refers to activities to locate mineral deposits and to assess the various characteristics of those deposits that are relevant to commercial exploitation. “Mining” refers to planning, development/investment and operational activities to remove “minerals” from the earth. The term “processing” refers to crushing, grinding, screening, washing, leaching, concentrating, separating, smelting and refining activities in respect of products of “mining”.

2 CONCEPTS OF SUSTAINABLE DEVELOPMENT

2.1 Origins of Concepts of Sustainable Development

The term sustainable development has held a prominent position in public policy discussion since the late 1980s. It rose to prominence because of a revival of old anxieties regarding the capacity of natural resources to sustain continuing economic growth nationally and globally.

A report entitled *Our Common Future* (the Brundtland Report) released by the United Nations World Commission on Environment and Development in 1987 has been credited with popularising the concept of sustainable development. The Brundtland Report argued that the prevailing pattern of economic growth was not ecologically sustainable. It proposed:

“…..new paths of progress which meet the needs and aspirations of the present generation without compromising the ability of future generations to meet their own needs.”

The Brundtland Report triggered various national and international initiatives relating to sustainable development. In June 1992, representatives of most of the governments in the world met in Rio de Janeiro at the United Nations Conference on Environment and Development (UNCED). Documents signed at UNCED have been credited with establishing a broad foundation for sustainable development on a global basis.

Concerns regarding capacity of natural resources to sustain continuing economic growth are not new. They have been surfacing and submerging periodically for at least the past 200 years.

In 1798, an English clergyman, Thomas Malthus, wrote an *Essay on the Principle of Population*. It quickly became a best-seller and had a strong influence on political and economic thought for many decades. Malthus pointed out that growth of population at a geometric rate would lead to the occupation of all arable land. Thereafter, the law of diminishing returns would come into play as increasing amounts of labour are applied to scarce land. The contribution of each additional worker declines and real wage rates fall accordingly, while land rents rise. Population would continue to grow at real wage rates above the subsistence level and would be reduced by death at a level below subsistence. The eventual outcome would be an equilibrium at the minium level of subsistence. Economists’ focus on this problem in the early part of the nineteenth induced Thomas Carlyle to label economics, “the dismal science”.2

Malthus’ theory was subsequently discredited. He had not anticipated the capacity of capital accumulation from land rents and technological progress to more than offset the law of diminishing returns by a very large margin, allowing real wages to rise very

substantially in absolute terms and relative to rents, while population continued to rise.

In 1865, a prominent English economist, Stanley (W.S.) Jevons addressed the issue of increasing coal consumption associated with economic growth in Britain. He argued that there was a “natural law of social growth”, which involved exponential or geometric growth, to which “exterior nature presents a certain absolute and inexorable limit”. He warned that coal prices would rise as deeper shafts were sunk and thinner seams were mined and expressed concern that this would destroy Britain’s competitive advantage in world markets for manufactured goods.³

The price of coal in Britain rose dramatically in 1872. However, new resources were identified and new mining capacity was commissioned. As a result of this and a substantial downturn in demand for iron and a more general recession, the price of coal fell to around the level it had been before the 1872 price escalation.⁴

Jevons concern that “external nature presents a certain absolute and inexorable limit” receded, initially as a result of investment in exploration and mining capacity, and subsequently as a result of the emergence of new types of fuels and technological advance in respect of discovery, production and transportation of primary energy sources.

Nevertheless, spokesmen for the emerging conservation movement remained pessimistic. For example, in 1910, Gifford Pinchot, a leader of the American Conservation Movement wrote:

“Our supplies of iron ore, mineral oil, and natural gas are being rapidly depleted, and many great fields are already exhausted. Mineral resources such as these when once gone are gone forever.”⁵

In 1931, Harold Hotelling commenced his pioneering contribution on the economics of an exhaustible resource with the following statement:

“Contemplation of the world’s disappearing supplies of minerals, forests and other exhaustible assets has led to demands for regulation of their exploitation. The feeling that these products are now to cheap for the good of future generations, that they are being selfishly exploited at too rapid a rate, and that in consequence of their excessive cheapness they are being produced and consumed wastefully has given rise to the conservation movement. The method ordinarily proposed to stop the wholesale devastation of irreplaceable natural resources, or of natural resources replaceable only with difficulty and long delay, is to forbid production at certain times and in certain regions or to hamper production by insisting that obsolete and inefficient methods be continued.”⁶

Around that time, a similar mentality was prevalent in government in Australia. There was considerable concern about low mineral reserves, particularly in the case of petroleum and iron ore. From the 1920s to the mid-1960s, the Commonwealth Government subsidised petroleum exploration. It also provided a range of tax concessions to the mining sector. The Commonwealth imposed a ban on iron ore exports in 1938 and maintained it until 1960. As late as 1955, it was justified on the grounds that Australia was poorly endowed with iron ore.7

Concerns about scarcity of mineral (including energy) resources also resurfaced in the United States and Europe in the early 1950s and were discussed in reports commissioned by governments. These concerns receded as a result of major discoveries of a range of mineral (including energy) discoveries around the world, including Australia, during the late 1950s and 1960s. These resulted from increasing demand for minerals, particularly from Japan, and major advances in exploration, mining and transport technology.

From the mid-1960s, concerns shifted to the effects on the natural environment of mining, processing and use of energy and other minerals. This occurred in the context of increasing questioning of the desirability of economic growth because of associated effects on the natural environment and lifestyles.

However, from the early 1970s, anxieties were re-focused on exhaustion of energy and other mineral resources. This followed the restriction of crude oil production by members of the Organisation of Petroleum Exporting Countries (OPEC), sharp increases in other commodity prices associated with worldwide economic expansion, and publication of The Limits to Growth by the Club of Rome in the early 1970s.8 This report predicted collapse of per capita food and industrial production as a result of scarcity of arable land and mineral resources. It was suggested that, in the absence of tough corrective action by governments, the “doomsday” scenario could be realised as early as the middle of the twenty-first century.

The Limits to Growth was widely read and publicised. As a result it generated considerable public concern about scarcity and exhaustibility of natural resources. However, the report was savagely criticised because of its pessimistic assumptions regarding technological advance, recycling, new discoveries, and discovery and extraction costs.9 It was further discredited by the re-appearance in the 1980 of the long term downward trend in mineral and agricultural commodity prices accompanying the expansion of output and known resources.

Since the late 1980s, concern about environmental degradation, natural resource depletion and other perceived adverse effects of economic growth has metamorphosed or re-emerged in revised form as part of the concept(s) of sustainable development. Interest in this topic has persisted to the present time. There is now much more

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9 See, for example, the papers in Pearce, D.W. and Rose, J. (eds), The Economics of Natural Resource Depletion, London: Macmillan, 1975.
emphasis on environmental and community effects of extraction, processing and use of minerals, and less on exhaustion of resources. Also, there appears to be more emphasis on sustaining economic growth, rather than restricting it, although that tends to vary according to the pre-existing ideology and interests of whoever is interpreting the meaning of sustainable development.

2.2 The Capital Stock, Genuine Saving and Sustainable Development

Because the stock of capital (wealth) per capita available to a nation represents the capacity to provide flows of future benefits to current and future generations, it is the key to sustainable development. If the quantity and quality of the stock of capital per capita are declining, static or increasing, capacity to provide future benefits is diminishing, constant or rising, respectively. Persistence of the latter case is required for sustainable development.

A nation’s stock of capital can take various forms:
- built assets such as buildings, plant and equipment, and infrastructure;
- human and intellectual resources;
- natural resources including -
  - land and landscapes,
  - flora and fauna;
  - minerals (broadly defined to include petroleum, minerals, and other commodities extracted by mining, quarrying or dredging);
  - water; and
  - the atmosphere.

These assets provide flows of benefits to current and future generations of humanity. Some of these benefits are provided directly by natural resources. Most are produced by mankind through the exploitation of natural resources.

The broadly-defined income of a nation is the flow of all benefits provided by the aggregate capital stock in all its forms. The nett present value of these flows of benefits is the aggregate value of the broadly-defined stock of capital. That aggregate value is the wealth of a nation.

Following restrictions on crude oil production by OPEC and *The Limits to Growth* controversy in the early 1970s, economic analysts focused on a range of issues relating to exhaustible natural resources. One of these matters was the role of exhaustible natural resources as part of the stock of capital. It was noted that extraction of such resources reduced the available stock of natural capital and the future productive capacity of the economy, just as depreciation of built capital did, thereby diminishing the future flow of benefits to humanity. Saving and investment were required to restore the productive capacity of the economy and maintain the flow of benefits. In the absence of successful exploration and research, saving and
investment in other assets were required to compensate for depletion of natural capital.\textsuperscript{10} This matter is discussed in more detail in section 7.3 of chapter 7.

In the 1990s, in the context of substantial interest in the concept of sustainable development, economists noted that degradation of the natural environment, as well as depletion of natural resources, reduced the available stock of natural capital. Degradation of the natural environment results in a diminished flow of natural amenities just as depreciation of built capital and depletion of natural resources lead to a reduced flow of other benefits or forms of income. Once again, saving and investment were required to restore natural capital or compensate for its degradation.\textsuperscript{11}

In this context, economists in The World Bank commenced work on methodologies for measuring the value of the stock of capital or wealth of nations and changes in that wealth to ascertain whether or not the world’s economies are on sustainable development paths. This work has yielded important progress in developing measures or indicators of wealth and changes in wealth that incorporate natural resources and human capital as well as built capital. A number of reports have been published outlining progress with this research.\textsuperscript{12}

The World Bank’s approach to measuring changes in national wealth or the capital stock was based on the concept of “genuine saving”. This is a more comprehensive measure of a country’s rate of saving than estimates in conventional national accounts, which incorporate only saving and dissaving in respect of built capital. “Genuine saving” incorporates saving (additions to wealth) and dissaving (reductions to wealth) involving human capital and natural resources, as well as built capital. This measure and associated issues have been discussed in section 7.4 of chapter 7.

2.3 Interpreting the Meaning of Sustainable Development

2.3.1 Principle with Wide Appeal and Differing Interpretations

Sustainable development is a principle with very wide appeal. It has been embraced by groups that have typically held widely divergent views about the conservation and


use of natural resources, the allocation of resources within the economy and over time, and the distribution of income and wealth within and between generations.

The principle of sustainable development appeals to those who desire sustained economic growth, because the term appears to be consistent with that objective. Because of the qualification of sustainability or ecological sustainability, it has been embraced by those who are concerned about the consequences of economic growth for the quality of the natural environment. Economists consider that sustainable development is compatible with an efficient allocation of resources between uses in the economy and over time, because it involves sustained economic growth and takes account of adverse environmental effects. Also, sustainable development has strong appeal to those who are concerned about intergenerational equity, because it is perceived to have a focus extending far beyond the current generation. Moreover, it is often suggested that to be sustainable, development requires the acceptance of regional and indigenous communities and should benefit residents of those communities as well as citizens of the nation as whole. Therefore, the issue of equity or distribution of income and wealth between groups in society has become an integral part of the principle of sustainable development.

While the principle of sustainable development has wide appeal, there is no generally accepted definition of it. Indeed, there is a wide spectrum of views concerning the precise meaning of sustainable development. A major contributing factor is that various groups within society tend to interpret the principle or emphasise particular aspects of it in ways that coincide with their own particular interests, preoccupations, or ideologies. As a result, pre-existing tensions regarding environmental, distributional and resource allocation issues remain largely unresolved.

Particular characteristics of the mining sector and its natural resource base greatly complicate the task of interpreting and defining the principle of sustainable development. While individual deposits are exhaustible, the extracted material can be replaced or augmented by successful exploration and by activities such as technological improvements and provision of infrastructure that transform previously unattractive deposits into economic propositions. The risk and uncertainty associated with exploration and research on technology add to the range of interpretation issues arising from exhaustibility and replenishability of known resources.

The multitude of views on the meaning and policy implications of sustainable development in the context of mining activity tend to fall into two basic categories. These two categories are briefly discussed below.

2.3.2 Narrow Concept of Sustainable Development

A narrow concept of sustainable development is that the quantity and quality of natural resources available to future generations must remain relatively unaffected by

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current human activity. According to this view, growth of per capita wealth is not enough.

This concept of sustainable development requires a very tough line on protecting the natural environment, a much more stringent approach than that applied historically. In the case of mineral resources, the minimum requirement of the narrow concept is that depletion through mining must be fully offset by replenishment of known economic resources through exploration and technological advances, so that there is no rise in real prices in the long-term. A strict interpretation would require that this applies to each mineral commodity, not just to mineral resources as a whole.

Over the past century, real prices of mineral commodities have generally exhibited a long-term downward trend. This strongly indicates that the effects of exploration, other investment in the mining sector, and technological change have more than offset the effects of depletion during that period.\(^{14}\)

However, adherents to the narrow concept tend to be pessimistic about the capacity of new discoveries and technological advance to continue to keep pace with rising demand for mineral commodities. In part, this arises from suspicion that rising real prices in such circumstances may not provide adequate incentives to constrain consumption, increase recycling, extract lower grade material, increase exploration effort, and encourage research into improved technologies. On the other hand, to the extent that such incentives are effective, proponents of the narrow concept are concerned about environmental damage caused by increased exploration for, extraction of, and usage of mined commodities, and the unforeseen consequences of application of new technologies.

### 2.3.3 Broad Concept of Sustainable Development

A broad concept of sustainable development does not impose artificial or arbitrary restrictions on how the present generation provides for future generations. The only limitations are those imposed by the practicalities and economics of substitution, capital accumulation, and the rate of development and application of new or improved economically viable technologies. The broad concept allows for substitution of one type of ore for another, one mineral product for another, an alternative product for a mineral product, built and intellectual capital for mineral resources (greater capital and intellectual intensity of mining and processing), and the replacement of natural capital in the form of mineral resources by compensating investments in intellectual/educational capital and manufactured or constructed assets.

The logic underlying the broad concept has been expressed by Nobel Laureate in Economics, Robert Solow, in the following way.

“The standard of living achievable in the future depends on a bundle of endowments, in principle on everything that could limit the economy’s capacity to produce economic well being. This includes non-replenishible resources, of course, but it also includes the stock of plant and equipment, the

\(^{14}\) Industry Commission, op cit, Volume 3, p. 222 and Attachment 8A.
inventory of technical knowledge, and even the general level of education and supply of skills. A sustainable path for the economy is thus not necessarily one that conserves every single thing or any single thing. It is one that replaces whatever it takes from its inherited natural and produced endowment, its material and intellectual endowment. What matters is not the particular form that the replacement takes, but only its capacity to produce the things that posterity will enjoy.”

Adherents to the broad concept of sustainable development tend to be optimistic about continuing technological advance providing better and lower cost ways of finding, mining, processing and using mineral resources. They point out that if the cost-reducing effects of technological advance are not able to maintain the long term downward trend in real mineral commodity prices, countervailing effects will be induced by market forces. The emergence of rising real mineral commodity prices would provide additional incentives to increase exploration, extract lower grade material, develop cost-saving technologies, investigate substitutes, and so on. Rising mineral commodity prices would also increase economic surpluses or resource rents from mining. Saving of a portion of the increasing surpluses would provide capital to explore, expand capacity to mine and process lower grade ores, and undertake research and development activities to otherwise augment supplies of mineral products.

Acceptance of the broad concept of sustainable development implies substantially less intervention by governments than the narrow concept. However, it indicates that governments still have a responsibility to ensure that:

- the ecological processes on which life depends are maintained or restored;
- mining, minerals processing and all other enterprises and governments are fully accountable for the social costs of adverse environmental and other effects of their activities.

Proponents of the broad concept of sustainable development also argue that pressures on governments to act to internalise social costs of adverse environmental and other effects will continue to increase with income, as has been the case for the past three decades. This will induce research and development activities in respect of cost saving ways of ameliorating adverse impacts.

The narrow and broad concepts of sustainable development have been assessed in chapter 7.

2.4 Australia’s Strategy on Sustainable Development


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Governments (COAG) endorsed the *National Strategy for Ecologically Sustainable Development* on 7 December 1992. The document claimed that ecologically sustainable development represented one of the greatest challenges facing Australia’s governments, industry, business and community in the coming years.

The document noted that there was no universally accepted definition of ecologically sustainable development, but offered the following definition that had been suggested by the Commonwealth Government in an earlier discussion paper:

“……using, conserving and enhancing the community’s resources so that ecological processes on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.”

The *National Strategy for Ecologically Sustainable Development* specified the following objectives.

“The Goal is:
Development that improves the total quality of life, both now and in the future in a way that maintains the ecological processes on which life depends.

The Core objectives are:
- to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
- to provide for equity within and between generations;
- to protect biological diversity and maintain essential ecological processes and life-support systems.”

COAG stated its position on sustainable development in respect of the mining sector as follows.

“Challenge
To further develop the mining industry in a way which manages the renewable and non-renewable resources on which it depends in an efficient manner which is also consistent with the principles of ESD.

Strategic Approach
This will be achieved by ensuring exploration and mining activities are conducted in accordance with the principles underlying this Strategy. The primary focus of action will be on improving opportunities for ecologically sustainable minerals and energy development through:
- enhanced decision making;
- achieving a high standard of environmental and occupational health and safety performance;
- strengthening the geoscientific information base;
- optimising the economic return to the community from mining; and improving consultative mechanisms.”

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Australia’s *National Strategy for Ecologically Sustainable Development* did not address issues relating to different concepts of sustainable development in the context of mining activity. However, it is apparent from the objectives of the strategy and the discussion of the mining sector in the document that COAG implicitly accepted a broad concept of sustainable development.

In August 2001, the Government of the Commonwealth of Australia (Commonwealth Government) released a discussion paper on its intended participation in the World Summit on Sustainable Development in Johannesburg, South Africa, from 2-11 September 2002. The paper said that the “overarching challenge” and “particular focus” of policy making at the international level related to the effective integration and reconciliation of policies in respect of economic development, social development, and environmental protection at international, national and sub-national levels. The paper claimed that this imperative was widely recognised by industry, governments and the broader community in Australia. However, the discussion of “Australia’s Involvement in Sustainable Development” focused only on initiatives relating to the natural environment.\(^\text{19}\)


3 POLICY ASSESSMENT CRITERIA

3.1 Identifying Appropriate Policy Assessment Criteria

3.1.1 Relevance of Established Criteria to Sustainable Development

Equity, economic efficiency and administrative efficiency have become widely accepted by economists, political analysts and governments in developed economies as key policy objectives and criteria for designing and assessing policy proposals and instruments. In Australia, since the early 1970s, these criteria have been used in reviews or analyses of a range of important policy issues undertaken by Commonwealth and State Governments of varying political persuasions, independent committees of inquiry, and economic analysts. Australian policy issues analysed with the aid these criteria have included taxation reform, mineral royalty and tenement regimes, and environmental policy issues.

The National Strategy for Ecologically Sustainable Development (National Strategy) directly and indirectly included equity and economic efficiency among the objectives of that strategy. In doing so, the Council of Australian Governments (COAG) acknowledged that pursuit of ecologically sustainable development was aimed at furtherance of these fundamental objectives. However, the concept of sustainable development has increased the degree of emphasis applied to some aspects of these principles.

“Equity within and between generations” was listed as one of the “core objectives” of the National Strategy. In the past, attention has been focused mainly on equity within generations. The concept of sustainable development has placed similar emphasis on equity between generations.

One of the objectives in the mining chapter of the National Strategy was “to provide appropriate community returns for using mineral resources.” That is clearly a specific aspect of the more general objective of equity within and between generations.

The rate of economic development/growth, which is central to the National Strategy, is a dynamic aspect/consequence of economic efficiency or an efficient allocation (use) of resources. The mining chapter of the National Strategy also specifically targets the efficient use of renewable and non-renewable resources. The “guiding principles” for the Strategy include the aim, “to enhance international competitiveness”, which is an aspect of improving the efficiency of resource allocation. Also, internalisation of social costs of adverse environmental effects, which is a key part of the National Strategy, is an important element of the objective of improving economic efficiency. This element has received additional emphasis following emergence of the concept of sustainable development.

The National Strategy does not specifically mention an administrative efficiency criterion. However, administrative efficiency is effectively an aspect or extension of economic efficiency, because its focus is minimisation of economic waste.20

20 This view was also adopted by Commonwealth of Australia, Australian Bureau of Agricultural and Resource Economics, Alternative Approaches to Natural Resource Management, Background Report
3.1.2 Taxation Policy Criteria

Taxation provides governments with the means to purchase the resources needed to provide goods and services to their constituents and to redistribute income and wealth. Simultaneously, taxation reduces private sector purchasing power allowing the government to purchase resources without driving up prices.

In performing these functions, most taxes distort production and/or consumption incentives and choices, causing inefficiencies in the allocation of resources, thereby imposing costs in excess of the revenue raised. These additional burdens are referred to in the economics literature as “excess burden” or “deadweight loss”. Poor design of tax instruments that leads to “deadweight loss” has sometimes been described as “government failure”.

Additional burdens result from the need to raise extra revenue to cover costs of collection and enforcement of taxes and to incur expenditure to comply with tax laws. These burdens are also forms of “deadweight loss”.

In addition, some taxes may affect the distribution of income and wealth in ways considered to be inequitable by the community in general. Other taxes are used to redistribute income in accordance with the value judgements of the government.

These various consequences of taxation, have prompted economists and social philosophers to consider principles or criteria for design and assessment of taxation systems. Over the past 225 years, since Adam Smith formulated four “canons of taxation” in his pioneering economic work, *The Wealth of Nations*,21 economic and political analysts have further developed and refined these canons to provide a set of three principles of taxation that have become widely accepted by economic and political analysts and governments. These three criteria can be briefly summarised as equity, economic efficiency and administrative efficiency. A common short-hand term for the latter is “simplicity”.

Consistent with the widespread acceptance of these criteria, they have been used in several reviews of the Australian taxation system or aspects of it that have been initiated by governments of different political persuasions since the early 1970s.22
3.1.3 Royalty Policy Criteria

A royalty is a charge or price for the right to mine resources owned by the Crown and to use or sell products from those activities. As such, a royalty is not legally a tax. However, in other respects, a royalty serves the same purposes as a tax. Also, royalty systems are typically modelled on various types of taxes, particularly taxes based on quantity, gross value of output or some measure of profit. A royalty has equivalent effects to a tax applied at the same type to the same base. Therefore, it is just as appropriate to assess royalty regimes by reference to equity, economic efficiency and administrative efficiency criteria as it is to use these principles to evaluate taxes. Indeed, over the past 20 years in Australia, these criteria have been used in numerous analyses of alternative royalty policy regimes by professional economists and by inquiries commissioned by State and Commonwealth Governments.

Typically, the equity objective underpinning these analyses of royalty regimes was expressed in terms such as the government obtaining an adequate return as owner of the mineral resources. One of the objectives in the mining chapter of the National Strategy for Ecologically Sustainable Development was specified in a similar way: “to provide appropriate community returns for using mineral resources.”

The mining chapter of the National Strategy for Ecologically Sustainable Development also specifically highlighted the importance of economic efficiency in the context of royalty policy. The economic efficiency objective referred to in various analyses of royalty regimes in Australia over the past two decades has often been expressed in terms of the desirability of avoiding adverse effects on exploration, investment, extraction and processing decisions.

3.1.4 Land Access Policy Criteria

Government policy regarding access to land by the exploration and mining sector is a critical determinant of the level of activity and resource use in that sector. Important land access policy issues involving the mining sector include:

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the choice between alternative methods of allocation of exploration and mining tenements;
relinquishment and work/expenditure conditions attaching to tenements;
reconciling exploration and mining rights attaching to tenements with surface rights associated with native title and other forms of land title;
denial or limiting of access to land for exploration or mining purposes on environmental grounds.

The alternative mechanisms available for dealing with these matters produce widely varied effects on the distribution of the imputed nett value of minerals (resource rents) or economic surpluses from mining, and the extent to which resources are used efficiently or misallocated (These effects are discussed in detail in chapters 11, 12 and 14). An efficient use of resources implies that externalities have been internalised and economic surpluses from mining have been maximised. To the extent that resources are used inefficiently, the economic surpluses (after internalisation of externalities) available for distribution are reduced. Because of these effects, it is appropriate to assess land access policies using equity, economic efficiency and administrative efficiency criteria. This view is reinforced by the relevance of these criteria to policies in respect of internalisation of externalities and payments for mineral rights (royalties), which are closely intertwined with land access policies.

Equity, economic efficiency and administrative efficiency have been used as criteria in assessments of alternative tenement allocation and management regimes by a number of economists and inquiries commissioned by governments in Australia over the past 20 years. Most of these studies have emphasised that a strong interrelationship exists between tenement policies and revenue yielded/resource rent captured by royalty regimes. This issue is discussed in detail in chapters 12 and 13.

Equity, economic efficiency and administrative efficiency were implicitly cited as objectives of Commonwealth Government in respect of native title issues in a policy discussion paper released by that Government in June 1993. These principles have also been applied, explicitly or implicitly, in various assessments of native title regimes during the past decade.

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26 Commonwealth of Australia, Mabo: the High Court Decision on Native Title - Discussion Paper, Canberra: AGPS, June 1993, pp.7, 31, 32, 38, 39, 40, 79-80, 105
3.1.5 Environmental Policy Criteria

The fundamental purpose of environmental policy and a key element of the *National Strategy for Ecologically Sustainable Development* is to deal with costs imposed on others by producers and consumers through use of the natural environment for their activities. Social costs such as these, which producers and consumers have not previously been required to pay for or otherwise bear when making investment, operational, and consumption decisions, are referred to by economists as external costs, external diseconomies or negative externalities.

The existence of uncorrected externalities (negative or positive) is a consequence of “market failure” or failure of markets to allocate resources in the best interests of society. An efficient allocation of resources, including natural resources, requires that all externalities be properly accounted for or “internalised” in economic decision making. When “markets fail”, government intervention to correct the resulting misallocation of resources is justified, provided the benefits of intervention exceed the costs.

Unfortunately, environmental policy instruments (along with other forms of government intervention) may be poorly designed, resulting in unintended distortions of otherwise preferred economic decisions and consequent misallocation of resources or economic waste. Such “government failure” warrants corrective action by governments in the interests of economic efficiency, just as “market failure” does.

Additional economic waste arises from unnecessarily high costs of enforcement of and compliance with environmental policy instruments. The administrative efficiency criterion, like the economic efficiency principle, is concerned with minimising economic waste.

Alternative methods of internalising environmental externalities may affect the distribution of income and wealth in different ways. The community in general may regard some measures as less equitable than others.

As a result of these issues, it is clearly appropriate to assess environmental policy measures with the aid of economic efficiency, administrative efficiency and equity criteria. These principles have been effectively specified by Commonwealth and State Governments as criteria for environmental policy on a number of occasions during the last decade.

In 1992, they were effectively included in the *National Strategy for Ecologically Sustainable Development* by the Council of Australian Governments. They were referred to in the Prime Minister’s 1997 policy statement, *Safeguarding the Future: Australia’s response to Climate Change*, and in subsequent discussion papers prepared by the Australian Greenhouse Office.28 In 1998, in a paper on *Reform of Commonwealth Environment Legislation*, issued by the Commonwealth Minister for

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the Environment, specific reference was made to the core objectives and guiding principles of the *National Strategy for Ecologically Sustainable Development*. The document then specified several criteria that can be summarised as economic efficiency and administrative efficiency and stated that the principle of intergenerational equity would be expressly recognised in reforming Commonwealth environmental legislation. Also, during the last decade, key advisory bodies to the Commonwealth Government have recently used equity, economic efficiency, and administrative efficiency criteria when assessing alternative environmental policy instruments.

**3.1.6 Criteria for Competition Policy and Other Microeconomic Reform**

During the 1980s, the Commonwealth Government recognised that Australia’s economic performance had been hampered by substantial misallocation of resources arising from regulation of markets, heavy protection of manufacturing industry, government sanctioned lack of competition in key infrastructure sectors and some other industries. This inefficiency in the allocation of resources was manifested by a higher cost structure in sectors such as mining and processing which competed in world markets and were unable to pass on the additional cost burden. Activity in these handicapped sectors was thereby retarded. This phenomenon of artificial impediments has been discussed in detail in chapters 9 and 10.

Subsequently, financial markets were deregulated and a programme of phased reductions in import barriers was implemented from the late 1980s. In the early- to mid-1990s, the Council of Australian Governments (COAG) agreed to implement further substantial microeconomic reforms to address inefficiencies in key infrastructure sectors dominated by government enterprises and to increase competition in these and other sectors of the Australian economy. The package of Reforms agreed by COAG is known as “National Competition and Related Reforms”.

It is clear that the primary objective of all of these reforms was to improve the efficiency of the allocation of resources in the Australian economy. However, COAG also intended that reform process would have regard to equity. Indeed, the microeconomic reform process has lost momentum since the late 1990s because of concerns regarding the distributional consequences of the microeconomic reform process.

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3.2 Equity

3.2.1 Principles of Equity

The literature relating to the economics of taxation and public expenditure, including various reviews of the Australian taxation system, typically refers to two widely accepted concepts of intragenerational equity. These concepts are the “ability to pay” and “benefit” principles.

Both concepts have long histories which can be traced back to Adam Smith’s first canon of taxation in *The Wealth of Nations* \(^{32}\) and beyond to earlier political and social philosophers. The ability to pay approach had its origins in the sixteenth century and the benefit principle originated in the seventeenth century.\(^{33}\)

Historically, the economics literature has tended to focus mainly on intragenerational equity. Discussion of intergenerational equity issues has not received a great deal of attention. However, popularisation of the concept of sustainable development over the past decade requires that much greater attention be given to intergenerational equity.

3.2.2 Ability to Pay

The ability to pay principle is that individuals should contribute to the cost of government in accordance with their “ability to pay”. This principle has two dimensions:

- horizontal equity – equal contributions by individuals with equal abilities to pay;
- vertical equity – different contributions when capacities to contribute differ.

The ability to pay principle is widely accepted as a starting point for the redistributive role of government and as a basis for funding the high proportion of government expenditure not considered appropriate for the application of user-charges. However, interpretations of ability to pay differ greatly, and measurement problems are formidable.

The ability to pay concept is meant to relate to equity between people, not business entities. Also, it is relevant to taxation, welfare and government expenditure policy as a whole, rather than to particular taxes, government user-charges (including royalty and environmental levies), tax proxies for user charges, subsidies, or other expenditure items. Consistent with this, it is normal for Governments to use income tax, transfers and expenditure policies to compensate for perceived inequities arising from the incidence of indirect taxes and user charges. This approach was taken by the Commonwealth Government when it changed the income tax regime and welfare

\(^{32}\) Adam Smith, op cit, volume 2, p. 307.

payments to compensate for perceived inequities arising from introducing a broadly-based value added tax, the Goods and Services Tax (GST) in July 2000.

Despite these points, policy makers have often attempted to consider particular tax, royalty and other policy proposals affecting business entities within an ability to pay framework.

For example, in April 1999, when the Queensland Government proposed changes to transitional arrangements forming part of a royalty regime for export coal announced in September 1993, it stressed that it wished to treat different producers even-handedly.34 If a government desires to apply the ability to pay concept to royalty arrangements for individual mines, “ability to pay” must surely relate to economic surpluses above all costs, including finding and assessment costs and the cost of capital. Then, the ability to pay approach would indicate that enterprises with different economic surpluses should pay different amounts of royalty (vertical equity) and those with the same surpluses should pay the same amount (horizontal equity). Unless there are unpaid returns to ability, such an application of the “ability to pay” principle will yield the same royalty regime as the benefit principle discussed below.

Another example was the Prime Minister’s claim in 1997 in a major policy statement on greenhouse gas emissions 1997 that the Commonwealth Government would be “fairly spreading the burden of action (to reduce greenhouse gas emissions) across our economy.”35 That implies application of the ability to pay principle.

### 3.2.3 Benefit Principle

The benefit principle of equity is that beneficiaries of goods and services provided by government should contribute in accordance with the benefits they receive.

An important advantage of the benefit principle over the ability to pay approach is that the former has an inherent, efficient mechanism for rationing supply, namely the price system. Therefore, it tends to be consistent with economic efficiency.

A disadvantage of the benefit principle is that, in general, it is not useful as a guide for the re-distributive role of government. That is the strength of the ability to pay principle.

**General** benefit taxation is of interest mainly from a theoretical perspective. However, **specific** benefit taxes have practical applications in circumstances in which benefits of goods and services can be imputed to and internalised by specific users, and there is rivalry for those benefits. Then, the benefit principle can be applied through user-charges. Typical examples include charges for services provided by government infrastructure facilities such as ports, railways, airports, power stations, water supply facilities, and toll-roads/bridges.

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The benefit principle is also an appropriate concept of equity for royalty policy. When a government provides a right to mine, in return for a royalty, it is selling mineralisation in the ground to a sole beneficiary, the holder of the right to mine. Conceptually and legally, the royalty is a price or user-charge, not a tax.

According to the benefit principle, the government, on behalf of the community, is entitled to a price for the mineral in the ground that reflects the benefit conferred on the holder of the right to mine. If the benefit differs, the price should differ. If the benefit is the same, the price should remain the same. The benefit is the value of the mineral in the ground or its imputed nett value after deducting all costs including finding and assessment costs and the cost of capital.

The benefit principle is consistent with the objective of obtaining an adequate return as owner of the mineral resources, which has been specified by various State Governments and included in the mining chapter of the National Strategy for Ecologically Sustainable Development.

The benefit principle can also be applied when governments, on behalf of the community, make the natural environment, which is a scarce natural resource, available to absorb pollutants not wanted by the rest of the community. According to the benefit principle, it is equitable that those who cause environmental damage be responsible for carrying the burden of abatement in accordance with the benefits they receive from using the natural environment. The burden may be imposed on polluters through taxes, purchase of emission permits, or regulatory requirements. In this context, the benefit principle provides support for the “polluter pays” principle of environmental policy.

However, making those who cause environmental damage responsible for abatement does not mean that they will be ultimate bearers of the burden of abatement. Some of the burden will be shifted forward to industrial and domestic consumers. Some will be shifted backwards to suppliers of inputs, including employees. Some of the burden will fall upon providers of capital to the emitter and to other enterprises to which part of the burden has been shifted.

Some might argue that the benefit principle could alternatively justify payments in accordance with social benefits arising from reduction of adverse environmental effects. Obviously, this interpretation has very different implications for the distribution of income and wealth in the economy. Although it does not seem to have widespread appeal, this interpretation seems to have influenced the formulation of some but not all of the “Measures for a Better Environment” grafted onto the Commonwealth Government’s tax reform package implemented from July 2000.

Of course, if the ultimate distribution of the burden of abatement among individuals in the community arising from the benefit principle is inconsistent with the government’s perception of “ability to pay”, it may wish to take re-distributive action to spread the burden in a manner that it judges to be more equitable.
3.2.4 Intergenerational Equity

The concept of sustainable development is inseparable from notions of intergenerational equity. Accumulation of capital and research by the current generation involve sacrifice of consumption by that generation and bequeathing of capital stock and advances in technology as a legacy to the next generation. On the other hand, depletion and degradation of natural resources deprive future generations of natural capital.

Dealing with intergenerational equity involves greater problems and complexities than the difficult problem of intragenerational equity. First, redistributive action is asymmetrical in the intergenerational case. The current generation can adjust the quantity and quality of the capital stock, including natural capital, bequeathed to future generations, but there is nothing that later generations can do to improve the circumstances of previous generations. Second, there is much more information available to guide decisions regarding distribution between individuals within a generation than between present and future generations.

While the literature on sustainable development has ballooned over the past decade, it does not appear to have been accompanied by adequate serious analysis of principles to guide action in respect of intergenerational equity. It is important that much more attention be given to formulation of such principles.

In the absence of such analytical work, the general approach in the economics literature on sustainable development and natural resource depletion has been to accept Robert Solow’s proposition regarding intergenerational equity in the context of natural resource depletion and degradation. Solow argued that the current generation is entitled to use natural and other capital as long as that generation invests sufficiently to maintain the quantity and quality of the aggregate stock of capital so that capacity to provide future flows of benefits to society is maintained.36 This principle of intergenerational equity is discussed in more detail in sections 7.3 and 7.4 of chapter 7.

3.3 Economic Efficiency

3.3.1 Concepts of Economic Efficiency and Deadweight Loss

Economic efficiency is a widely accepted objective of economic policy. This objective is concerned with ensuring that the various resources available in the economy, such as capital, labour, intellect, and natural resources, are allocated to uses that yield the highest valued patterns of production and consumption.

Economic efficiency has two components: consumption efficiency and production efficiency. Policy instruments, such as taxes, transfers, government charges and regulation, will interfere with economic efficiency to the extent that they detract from

consumption efficiency or production efficiency. However, policy instruments may improve economic efficiency to the extent that they correct “market failure”.

Pursuit of economic efficiency involves designing or re-designing government policy instruments to correct “market failure” and to avoid distorting otherwise preferred economic decisions. Poorly designed policy instruments impose economic waste, losses or burdens on the economy known as “deadweight loss” or “excess burden”, which arise from the distortion of consumption and production patterns by the operation of those instruments. Carefully designed policy instruments minimise “deadweight losses”.

3.3.2 Economics of the “Second-Best”

In a perfect world, one could correct all inefficiencies in the economy that arise from market failure and eliminate all government-induced inefficiencies. As a result, everyone could be made better-off.

Unfortunately, we live in a highly imperfect world. In reality, some inefficiencies are inevitable.

Governments intervene to change the distribution of income and wealth more to their liking, to stabilise the economy, and to correct perceived “market failure”. In the process, they may cause inefficiencies through distortionary policy actions arising from imperfect knowledge, poor selection and design of policy instruments, and the perceived impracticality of raising all of the revenue they require from taxes and charges that do not distort otherwise preferred economic decisions.

When the presence of constraints makes some important distortions inevitable, an optimal allocation of resources or full economic efficiency is not an achievable policy goal. Then, the economic efficiency objective becomes minimisation of aggregate inefficiencies or deadweight losses, subject to the various constraints. Analysis of this type has become known as the economics of the “second-best”37. The branch of this type of analysis that is concerned with taxation policy and is extendable royalty policy has been called the theory of optimal taxation38, but the theory of “second-best” taxation is a more accurate label.

The body of economic literature focusing on the economics of “second-best”, particularly the branch concerned with taxation, is complex and highly technical. Results of the literature that are pertinent to the analysis of economic efficiency

considerations in respect of management of mineral wealth have been summarised briefly below.

In theory, economic rents (economic surpluses), such as resource rents, can be appropriated by governments without adverse effects on the efficiency of the allocation of resources. To the extent that it is practical for governments to do so through direct application of taxes or government user charges, it would facilitate minimisation of aggregate inefficiencies or deadweight losses arising from the taxation regime as a whole. When economic rents are captured by governments in a non-distortionary way, less revenue needs to be raised by governments by means of distortionary taxes.

If economic rents can be fully captured by government taxes and user charges, including royalties, and all factors of production and final consumption of produced goods and services are taxable, production efficiency is desirable for minimising aggregate deadweight losses or inefficiencies in the economy. Production inefficiency can be justified only if economic rents or particular goods and services cannot be taxed for practical or political reasons without causing production inefficiency, and if more substantial inefficiencies are thereby avoided.\(^{39}\)

The mainstays of the Australian taxation regime certainly do interfere with consumption efficiency. The income tax detracts from consumption efficiency by distorting the work-leisure choice and by distorting the choice between present consumption and future consumption through discouragement of saving. The GST, which is a value added tax, is a major improvement over the wholesale sales tax, which it replaced, but it still distorts some relative prices. It does so by exempting some goods and services, notably food. An overlooked exemption is leisure. The latter exemption interferes with the work-leisure choice and discourages work.

The deficiencies of these mainstays of the Australian taxation regime with respect to achievement of consumption efficiency do not justify departures from production efficiency. These deficiencies could be addressed without distorting decisions affecting production. For example, exemptions from GST could be removed, goods and services complementary to leisure could be taxed more heavily, and the savings component of income could be exempted from income tax.

Achievement of production efficiency requires that all producers face the same prices. This condition is violated if intermediate inputs\(^{40}\) are taxed. It is also violated if factors of production or other inputs to production are taxed differently in some uses than in others.


\(^{40}\) Intermediate inputs are produced goods and services that are used in production of other goods and services. They are distinguishable from primary inputs such as labour, intellect, natural resources and capital, which are referred to as factors of production.
If an intermediate input is taxed, the costs of using it in production of other goods and services will rise. Users of that input will face a higher price than producers of the input. The higher tax-inclusive price faced by the user encourages that enterprise to economise on use of that input to a greater extent than the full economic costs of producing it would indicate. As a result, intermediate inputs and factors of production are converted into final products in ways that are less efficient than otherwise preferred methods and therefore, aggregate output in the economy will fall.

To the extent that the price of commodities produced using the taxed intermediate input can be raised, part of the tax will be passed on (shifted forward) to consumers or other producers. The rest of the tax will be borne by (shifted back to) suppliers of factors of production (primary inputs) and other inputs. Ultimately, the tax on intermediate inputs will be borne by final consumers and/or suppliers of primary inputs. Consequently, consumption efficiency as well as production efficiency will be reduced. Directly taxing factors of production and final consumption of goods and services could raise the same revenue without interfering with production efficiency.

If taxation of inputs (primary or intermediate) differs between uses, there will be a tendency to switch resources from activities in which they are taxed more heavily to those in which they are taxed less. This distortion of the allocation of resources between various activities will reduce the efficiency of resource use in production, cutting aggregate output in the economy.

Differential taxation of inputs (factors of production and intermediate inputs) and taxation of intermediate inputs resulting in production inefficiency may be consistent with minimising aggregate deadweight losses in the economy if such taxation is the least distorting way of indirectly taxing a factor of production or a good/service that cannot be taxed directly or that a government cannot charge for providing because of practical or political considerations. For example, if direct charging for road use is considered impractical or politically unacceptable, differential taxation of fuel, which is complementary to road use, could be used a “second-best” pricing instrument. Also, if direct charging for exploitation of scarce natural resources is ruled-out for some reason, returns to capital could be taxed more heavily in relevant sectors, as a “second-best” approach to charging for depletion or degradation of scarce natural capital.

When there are numerous inefficiencies in the economy, as in Australia, and some inefficiencies are inevitable, it is important to consider the possibility that dealing with an individual cause or other piecemeal corrective intervention may result in an overall reduction in economic welfare rather than an increase. If a distortionary action by government is the best way of avoiding a greater inefficiency, removing the former would do more economic harm than good. Obviously, any decision to undertake piecemeal reform should be based on a thorough assessment of the benefits and costs of that action.

3.4 Administrative Efficiency

In the context of assessment of policy instruments such as taxes, royalties, subsidies, expenditure programmes and regulatory mechanisms, the “administrative efficiency”
criterion is concerned with minimisation of implementation, enforcement and compliance costs. Because reducing complexity is generally regarded as a key element of this task, the administrative efficiency criterion is commonly referred to as “simplicity”.

Administration costs are losses to the economy from government action. They involve economic waste and therefore, they are akin to deadweight losses.

Complex, inconsistent, and uncertain legislation and regulations and arbitrary administration of those laws impose high compliance costs on business entities and high enforcement costs on government. The latter costs are ultimately borne by the community in the form of higher taxation or smaller benefits provided by government.

Discriminatory application of, and exemptions from taxes, subsidies and other policy instruments invariably add to complexity, inconsistency and uncertainty regarding applicability. This, in turn, adds to economic waste in the form of inflated administration and legal costs for private sector entities and government.

3.5 Other Potential Criteria

3.5.1 Economic Growth

State and Commonwealth Governments have often cited economic development or growth as an important objective in respect of mining/mineral resources policy. However, it is not appropriate to consider economic development as an additional criterion to economic efficiency and equity (including intergenerational equity) criteria discussed above. There are at least three reasons for this.

First, the rate of economic growth depends critically on how efficiently resources are allocated between uses and over time. Economic growth is a dynamic aspect or outcome of economic efficiency.

Second, economic growth, as conventionally recorded, ignores depletion of natural resources and generates environmental and other negative externalities, which need to be taken when assessing the real extent of social improvement. The economic efficiency objective is concerned with the efficient allocation of all resources including depletable and degradable natural resources.

Third, decisions regarding target rates of growth have important implications for intergenerational equity. Conversely, decisions about intergenerational equity will affect the rate of growth.

3.5.2 Royalty Revenue Stability

State Governments (but not the Commonwealth Government), have typically nominated revenue stability as an additional criterion of royalty (and de facto royalty) policy. Moreover, they have given substantially greater weight to revenue stability
than to economic efficiency and equity criteria. Treasury officials in a number of States have justified this practice by arguing that it simplifies budgeting by State Governments. It is a serious indictment on the quality of advice provided to State Governments that such an extraordinarily weak argument has been allowed to decisively influence royalty policy for many decades.

Not only does the justification lack a solid analytical foundation, but also its proponents overlook the substantial adverse consequence of their blinkered pursuit of royalty revenue stability. The weaknesses of their position include the following.

First, revenue stability is not an accepted principle of public finance. Second, if it was such a principle, the normal approach would be apply it to the taxation or revenue raising system as a whole, not to individual components of that system.

Third, the States that are most reliant on royalty revenues should benefit from the favourable effects on overall variability of outcomes of a large, diverse portfolio. These States have large mining sectors involving multiple commodities and multiple projects in different stages of the life cycle of exploration and mining ventures.

Fourth, substantially increased variability of State royalty revenues would not greatly affect the variability of total State Government revenues from all sources. In the case of the Australian State that is most reliant of royalty revenues (Western Australia), even if variability of royalty revenue was 25 times its historical level, it would make total State revenues only 1.25% more variable.

Fifth, stability of royalty revenue can be achieved only by making the royalty regime inflexible to changing circumstances and insensitive to the differing economic circumstances of different mining operations. One consequence is that fluctuations in post-royalty cash flows of mining enterprises will be accentuated. A more serious consequence is that attempts to collect a substantial proportion of the nett imputed value of minerals will result in otherwise economic ore and deposits being rendered unprofitable and the frequency distribution of outcomes being negatively skewed. Then exploration, investment and output are reduced and part of the imputed nett value of minerals is destroyed. Therefore, increased revenue can be obtained only at the expense of inferior performance in terms of the economic efficiency criterion and lower returns to the community (royalty revenue) for extraction of mineral resources (inferior performance in respect of the equity criterion).

3.6 Policy Assessment Criteria and Sustainable Development

The emergence of sustainable development as a subject of policy analysis and strategy formulation has not necessitated the addition of a new criterion or criteria for analysis and formulation of policy for the mining sector. The established criteria, equity, economic efficiency and administrative efficiency, remain appropriate for assessing policy for managing mineral wealth for sustainable development.

However, current interest in sustainable development has increased the emphasis to be applied to:

- the intergenerational aspect of the equity criterion;
• the role of internalisation of environmental impacts in pursuing the economic efficiency objective; and
• intertemporal and dynamic aspects of economic efficiency.
4 AUSTRALIAN INSTITUTIONAL FRAMEWORK

4.1 Constitutional Powers and Constraints

In the second half of the nineteenth century, a wide range of powers was vested in Colonial (now State) legislatures by constitutions ratified by the British Parliament. The New South Wales and Victorian constitutions were ratified in 1855 and others followed over the next few decades.

On 1 January 2001, the Australian federation of six States and the enabling Constitution of the Commonwealth of Australia came into effect. The foundation of the scheme of that Australian Constitution is expressed in section 107 of the document as follows:

“Every power of the Parliament of a Colony which has become or becomes a State shall, unless it is by this Constitution exclusively vested in the Parliament of the Commonwealth or withdrawn from the parliament of the State, continue as at the establishment of the Commonwealth….”

Only a few of the specific powers vested in the Commonwealth Parliament are exclusive. Most of the powers vested in the Commonwealth are concurrent with the States. To avoid inconsistencies, section 109 of the Constitution provides:

“When a law of a State is inconsistent with a law of the Commonwealth, the latter shall prevail, and the former shall, to the extent of the inconsistency, be invalid.”

Powers that are not vested in the Commonwealth Parliament either exclusively or concurrently with the States and that are exercisable by the States, remain exclusively with the States.

The Constitution subjects the Commonwealth Parliament to specific constraints in the exercise of its powers. For example, the Commonwealth Parliament may not discriminate between States in exercising its power to tax or give preference to States or parts of States in matters of trade, commerce or revenue (sections 51[2], 99). Also, the Commonwealth Parliament may legislate to acquire only on just terms (section 51[35]).

A particularly important limitation on both State and Commonwealth powers is specified in section 92. It guarantees freedom of interstate trade, commerce, communication and other dealings.

The function of judicial review of the constitutional validity of legislation has been assumed and performed by the High Court of Australia since its establishment in 1903. Until 1920, the High Court adopted an approach to constitutional interpretation that became known as the doctrine of reserved powers. Under this approach, ambiguities in respect of the allocation of legislative powers were resolved in favour of the narrower interpretation of Commonwealth powers on the basis that section 107 of the Constitution reserved to the States all powers not withdrawn from them by the Constitution. This approach to constitutional interpretation tended to restrict the scope of legislative power of the Commonwealth Parliament.
The doctrine of reserved powers and the underlying philosophy were repudiated by the High Court in 1920. A majority decided that because the Constitution was an Act of Parliament, it should be interpreted in accordance with the ordinary rules of statutory interpretation. The basic principles expounded in that judgment are still followed. The practical effect has been a steady expansion of Commonwealth legislative power.41

4.2 Principle of Government Ownership of Minerals and Control of Mining

Prior to the decision of the High Court of Australia in Mabo v Queensland (No. 2) (the Mabo case) in June 1992, the established legal position was that beneficial ownership of all land, including minerals, in the Australian colonies was vested in the Crown from the time of first settlement by the English. Until the mid-nineteenth century, control of Crown lands, including minerals, in the Colonies was exercised by the British Government. Under the English common law, ownership of land included rights to minerals, and when land grants were made by the Crown, rights to all minerals, except gold and silver, passed to grantees or purchasers of land along with ownership of the surface rights. Ownership of gold and silver remained with the Crown by virtue of the Royal prerogative right to those minerals arising from the Case of Mines in 1567.

The Colonial administrations sought control of the “waste lands of the Crown”, recognising that they represented the main asset and potential source of revenues for the Colonies. This desire was realised when constitutions conferring these and other powers on Colonial legislatures were ratified by the British Parliament in the second half of the nineteenth century.

During the last quarter of the nineteenth century, Colonial legislatures used their powers in respect of land and minerals to depart from the earlier practice of not separating mineral rights (other than gold and silver) from surface rights when making grants of land. From that time, they reserved all minerals (except construction materials) for the Crown when making Crown grants of land.

Under the scheme of the Commonwealth Constitution, control of lands, minerals in situ, and mining in each State remains exclusively with the relevant State legislature. At various times during the late nineteenth and early twentieth centuries, Colonial and State legislatures, respectively, resumed most mineral rights that had fallen into private hands and re-asserted that all minerals (including petroleum but excluding construction materials) were the property of the Crown. As a result, in Australia, there are only a few minor remaining exceptions to government ownership of minerals, other than construction materials.

In 1973, the Commonwealth Government enacted the *Seas and Submerged Lands Act* asserting Commonwealth sovereignty in respect of the (3 nautical-mile) territorial sea and the continental shelf. The States challenged the legislation, but it was upheld by the High Court in 1975. As a result, the Commonwealth Government gained control and property rights in respect of mineral (including petroleum) resources beyond the ordinary low-water mark, except in the case of bodies of water within Colonial (now State) boundaries prior to Federation in 1901.

As a result of the States’ severe dissatisfaction with this result, an agreement between the Commonwealth and States was concluded in 1979 and subsequently ratified by legislation, most of which took effect from February 1983. The Commonwealth Government conferred legislative powers on the States and the Northern Territory in respect of the Territorial Sea. It also vested title to the corresponding sea-bed in the States and Northern Territory. This included all minerals other than uranium and other substances prescribed in the *Atomic Energy Act 1953*.

When the Commonwealth Government granted self-government to the Northern Territory of Australia by the *Northern Territory (Self Government) Act 1978*, nearly all interests of the Commonwealth in land and minerals in that Territory were vested in the Crown in right of the Northern Territory of Australia. The Legislative Assembly of the Territory was also granted powers in relation to land, minerals mining, and royalties on minerals. However, the Northern Territory was not given property rights and legislative powers in respect of uranium and other prescribed substances within the meaning of the *Atomic Energy Act 1953*. These remained with the Commonwealth.

### 4.3 Tenement Systems

Although government ownership of minerals *in situ* is almost uniform in Australia, governments have chosen not to exploit mineral resources themselves. Instead, they grant rights to explore and mine to business enterprises in return for a royalty. With very few exceptions, the business enterprises have been private sector entities.

Pursuant to legislative powers available to State, Territory and Commonwealth Parliaments and as a result of Crown ownership of minerals *in situ*, the relevant legislatures have established administrative arrangements to issue exploration and mining tenements. An exploration tenement authorises an enterprise to explore for minerals in the area covered by the tenement. A mining or production tenement permits extraction as well as exploration in the area that is subject to the tenement. Both categories of tenements provide a form of title to entities to which they have been granted.

The specific arrangements vary between legislatures, but there are many similarities in basic approaches. Some common features and notable differences have been briefly outlined below.
4.3.1 Exploration Tenements

Exploration tenements typically are subject to numerous conditions including the following:

- a relatively short life of two to six years;
- payment of tenement rental fees;
- periodic relinquishment of land;
- minimum periodic expenditure levels;
- periodic reporting on exploration activity and outcomes to the administering authority;
- environmental protection/rehabilitation obligations; and
- government approval of dealings.

In most States/Territories, an exploration tenement for minerals other than petroleum does not provide a right to obtain a mining tenement if a valuable discovery is made. It provides only priority in applying for a mining tenement. In contrast, Western Australian mineral exploration tenements provide a right to convert to a mining lease without any requirement of prior discovery, provided conditions of the former have been satisfied. Also, in most States, petroleum exploration tenements in Australia provide a right to convert to production licence.

The differences of greatest significance from an economic perspective relate to tenement allocation regimes.

In Western Australia, exploration tenements for minerals other than petroleum are allocated on a strict, conditional first-come-first-served basis. A ballot is used to determine the successful applicant if applications are deemed to have been lodged simultaneously. The legislation specifies the amount of expenditure per unit area that the tenement holder must meet. Other conditions such as those listed above also apply.

Elsewhere in Australia, exploration tenements for minerals other than petroleum are usually allocated on a discretionary, conditional first-come-first-served basis. The relevant authority has the discretion to accept a proposed exploration programme or specify an alternative that is considered to be satisfactory and to judge whether or not financial and technical capabilities of the applicant are adequate. As a result, expenditure and other programme conditions such as timing and content that are accepted or set by the administering authority will vary from case to case. Other conditions such as those listed above also apply. Conflicting applications are resolved by an assessment of proposed exploration programmes and technical and financial capabilities of proponents. If competition for an area is strong, the discretionary, conditional first-come-first-served method of allocation takes on the character of work programme bidding.

The standard allocation system for off-shore petroleum exploration tenements is work programme bidding. This system is also used in some States to allocate on-shore petroleum exploration tenements. Occasionally, it has been used to allocate highly prospective on-shore areas for minerals other than petroleum.
Under a work programme bidding system, the relevant authority invites applications to explore particular areas. The application must include a proposed programme of work, including proposed expenditure, and a description of the financial and technical capabilities of the applicant. Tenements are generally allocated to the proponent of the exploration programme that is judged to be the “best”, subject to the technical and financial capabilities of the proponent being considered adequate. The administering authority has considerable discretion in setting programme conditions and granting tenements. Other conditions along the lines of those listed above are also applied.

On rare occasions, exploration tenements for petroleum off-shore and coal have been allocated on the basis of competitive, lump-sum cash bidding. Under this system, the relevant administering authority invites applicants to bid up-front, lump-sum cash payments for the right to explore particular areas. Tenements are allocated on the basis of the magnitude of payments offered.

For a number of decades, competitive, lump-sum cash bidding has been used extensively in parts of the United States and Canada to allocate rights to explore and extract petroleum. From the mid-1970s, the system was extended to coal tenements on United States federal lands. Suggestions that the system be used extensively in Australia have been vehemently opposed by State/Territory bureaucrats and mining/petroleum sector representatives.

### 4.3.2 Intermediate Tenements

In most cases, a type of transition tenement – a retention or development lease - is available to provide relatively secure tenure over deposits that have been discovered but are not ready for development. Such tenements allow an enterprise to retain a discovery with lower work/expenditure and rental requirements than under a mining tenement. Western Australia is the most notable exception to provision of such transition tenements for minerals, but does so for petroleum.

### 4.3.3 Production Tenements

Mining or production leases/licences typically are issued and retained subject to the following conditions:

- a term of 15 to 30 years;
- payment of tenement rental fees;
- payment of royalty in respect of production;
- minimum periodic work/expenditure levels;
- submission of mine plans for approval;
- periodic reporting on activity to the administering authority;
- environmental assessment, protection, and rehabilitation obligations; and
- government approval of dealings.

Mining leases are usually issued to holders of exploration or retention tenements who have priority in respect of ground held under such tenements or a right to a lease in Western Australia or for petroleum production in most jurisdictions. However, they
may also be issued over ground not covered by exploration or retention tenements, usually on a conditional first-come-first-served basis.

4.4 Surface Rights and Access to Minerals

4.4.1 Implications of Native Title

The South Australian Government made the first government grant of land to Aborigines in Australia under the *Aboriginal Lands Trust Act 1966*. Large areas of land were transferred to Aboriginal Trusts under this and subsequent South Australian legislation. Mineral rights remained with the Crown, but the Government agreed to allocate all or most of its royalty revenue on Aboriginal land for the benefit of Aborigines. Also, relevant Aboriginal entities had considerable control over access for exploration and mining.

The Commonwealth Government’s *Aboriginal Land Rights (Northern Territory) Act 1976*, which preceded self-government in the Northern Territory, allowed Aboriginal trusts to gain inalienable freehold title to about 50% of the land area in the Northern Territory by the mid-1990s. The Act allowed “traditional owners” to veto exploration. Only the Commonwealth Cabinet could override the veto. Aborigines could not generally withdraw consent at the mining stage, but a right to negotiate terms and conditions of development applied. While the Act did not provide mineral rights with land rights, it provided that the Commonwealth Government pay to the Aboriginal Benefits Trust Account amounts equivalent to mineral royalties received by the Northern Territory or the Commonwealth in respect of a mining interest on Aboriginal land. The benefits were to be shared by local Aborigines, the Land Councils, and Northern Territory Aborigines generally.

Queensland legislation in the early and mid-1980s provided for deeds of grant in trust over Aboriginal reserves. Aboriginal landowners were not provided mineral rights. Also, they were not given a veto or right to negotiate in respect of exploration or mining.

Under the *New South Wales Aboriginal Land Rights Act 1983*, limited mineral rights were provided with limited land grants. The mineral rights provided with land grants to Aboriginal people in New South Wales did not apply in the case of land subject to an exploration or mining title at the time of the land grant or to gold, silver, coal and petroleum.

On 3 June 1992, a 6 to 1 majority of the High Court of Australia in *Mabo v Queensland (No. 2)* (the Mabo case) decreed that the common law now recognises a form of native title. The High Court ruled that, on colonisation, the Crown had asserted sovereignty and acquired only “radical title” (that is, ultimate title). This gave the Crown the power to confer rights of ownership on others, but did not involve acquisition by the Crown of absolute beneficial ownership of the land. Therefore, the
High Court accepted that antecedent rights and interests in land possessed by indigenous inhabitants survived the change of sovereignty.42

According to the High Court, the content of native title derived from, and should be ascertained from traditional laws and customs of the indigenous inhabitants of a territory. Native title ceased to exist if those traditional laws and customs were abandoned. This occurred when occupation of or connection with the land ceased. Therefore, continued existence of native title required that occupation of or connection with the land had been maintained from the time when the Crown established sovereignty until the present time.43

The High Court stated that native title could also be extinguished by a valid exercise of sovereign power. If a government lawfully appropriates land for its own use, makes a grant, or otherwise creates an interest in land that is wholly or partly inconsistent with the continued enjoyment of native title, to the extent of the inconsistency, native title is extinguished.44

The High Court specified that the power of a State Government to extinguish native title was subject to consistency with the laws of the Commonwealth as required by section 109 of the Constitution (see above). The judgment referred particularly to the Racial Discrimination Act 1975. This gave effect to the International Convention on the Elimination of All Forms of Racial Discrimination and was enacted under the Commonwealth’s external affairs power (section 51 (xxix)).

The High Court’s decision in the Mabo case made only one fleeting reference to mining. Justice Brennan commented:

“Where the Crown has validly alienated land by granting an interest that is wholly or partially inconsistent with a continuing right to enjoy native title, native title is extinguished to the extent of the inconsistency. Thus native title has been extinguished by grants of estates of freehold or of leases but not necessarily by the grant of lesser interests (eg authorities to prospect for minerals).”45

Also, the High Court did not clarify the extent to which native title extended to minerals and other natural resources such as water. These issues were among many that the High Court generated but did not resolve in pronouncements in respect of the Mabo case.

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43 Ibid
44 Ibid
45 Quoted in Hunt, Michael, op cit, 171.
The Commonwealth Government had a choice between multiple, ad hoc, protracted legal battles or a detailed legislative response to the issues. Because of the potential for severe economic disruption in key sectors, as a result of great and prolonged uncertainty, and because the Government desired to validate and protect native title, the legislative approach was preferred.

However, the Commonwealth Government does not have explicit powers to legislate in relation to real property, except in the case of Territories. That power resides with the States. Therefore, in enacting the *Native Title Act 1993*, the Commonwealth relied on its power under section 51(xxvi) of the Constitution to make laws with respect to “the people of any race for whom it is deemed necessary to make special laws.” The Commonwealth was able to make a special law with respect to the Aboriginal race because the words, “other than the Aboriginal race in any State” were deleted from section 51(xxvi) between the words “any race” and “for whom” by a referendum of eligible Australian voters in 1967.46

Unfortunately, the *Native Title Act 1993* failed to resolve speculation regarding ownership of minerals in situ arising from the rulings of the High Court in the Mabo case. The legislation merely stated that a State may confirm any existing ownership of natural resources provided that it does not thereby impair native title.47

Subsequently, the courts have considered the matter of ownership of minerals in respect of Queensland, the Northern Territory and Western Australia. Graeme Neate, President of the National Native Title Tribunal observed that the Federal Court has repeatedly ruled that any rights to use minerals (including petroleum) that might have existed under native have been extinguished by legislation vesting beneficial ownership of all minerals and petroleum in the Crown in right of the relevant jurisdiction. As a result, any remaining native title rights must exclude minerals and petroleum.48 However, William Jonas, Aboriginal and Torres Strait Islander Social Justice Commissioner has argued that other statements by judges in the Federal and High Courts indicate “the possibility of native title rights to minerals.” He argued that the position may vary from State to State according to the provisions of the relevant legislation relating to ownership of minerals. He commented that guidance on the issue of native title rights to minerals may be provided by the pending High Court decision on an appeal in respect of *Ward–v-Western Australia*, in which the Federal Court had ruled that native title rights in minerals had been extinguished by legislation asserting Crown ownership of minerals.49

The *Native Title Act 1993* also failed to clarify and resolve satisfactorily a range of other issues arising from the High Court’s rulings in the Mabo case. One particularly important issue was whether or not the grant of pastoral leases fully extinguished

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46 Ladbury, Rick and Chin, Jenny, op cit, pp. 211-212.
48 Neate, Graeme, op cit, pp 6-7; For these and other reasons, mining and petroleum law specialists had previously argued convincingly that the Crown owned minerals and petroleum under land to which native title applied. See Hunt, Michael, op cit, pp. 165-167 and Forbes, J.R.S., pp. 211-212.
native title. The Act was drafted on the assumption that native title had been fully extinguished by such grants. However, on 23 December 1996, in *Wik Peoples v Queensland* (the Wik case), the High Court ruled differently, by a majority of 4 to 3. Key elements of the decision were that:

- pastoral leases did not provide exclusive possession to lessees and did not necessarily extinguish all native title rights;
- the rights and obligations of each lessee depend on the terms of the grant of the pastoral lease and upon the statute that authorised it;
- the occurrence of any extinguishment of native title rights can only be determined by reference to such rights and interest as may be asserted and established;
- native title rights could continue while land was subject to a pastoral lease, but to the extent of any conflict in the exercise of rights, native title rights were subordinate to rights provided by the pastoral lease.

This meant that an additional 40% of the land area of Australia could become subject to native title claims. Proposals to grant an exploration or mining tenement over such land would then be subject to the “right to negotiate” provisions of the *Native Title Act 1993*.

The “right to negotiate” provisions had already been heavily criticised by mining sector representatives and mining law specialists. At best, they were perceived to involve long delays, considerable administration, legal and consent costs, and substantial uncertainty. At worst, they were perceived to be unworkable. 50 However, these claims were vigorously disputed by Aboriginal spokesmen and other commentators. 51

Another problem was that administrative procedures for screening, and registering and otherwise managing native title claims were rendered ineffective by High and Federal Court decisions. 52

In July 1998, following much emotion-charged controversy, debate, negotiations and political compromise, the Commonwealth Parliament ratified a large number of amendments to the *Native Title Act 1993*. They were supposed to resolve issues arising from the High Court’s decision in the Wik case and to deal with various other legal and practical problems and criticisms arising from the operation of the native title regime since commencement of the Act. However, none of the amendments addressed the issue of ownership of minerals *in situ*.

Unfortunately, modifications to the “right to negotiate” regime in 1998 have not stemmed the flow of allegations that the revised system is still severely inhibiting access to land for exploration and mining activities and remains unworkable. These have been met by counter-claims along the lines that that there is now a workable system in place, State Governments and mining companies have engaged in strategic


51 See Manning, Ian, op cit.

behaviour to make the regime appear unworkable, remaining difficulties are transitional in nature, and the problems will be resolved by patience, understanding and good will.

Key elements of the current “right to negotiate regime” can be summarised briefly as follows.53

- Registered holders or claimants of native title (native title parties) have a “right to negotiate” or an effective right to negotiate in respect of certain “future acts” of government affecting native title, including conferral of exploration and mining rights. The “right to negotiate” applies only in onshore areas.
- The “right to negotiate” regime is invoked by the relevant government giving notice of the proposed act, such as the grant of a mining lease, to the public and relevant parties.
- If the relevant government considers that a proposed “future act”, such as an exploration licence, is not likely to involve major disturbance to the land, interference with the community or social activities of, or sites of particular traditional significance to the native title holders, the relevant government may state in the notice of the proposed “future act” that it considers the act attracts the expedited procedure.
- Within 4 months of the notification date, registered holders or claimants of native title (including those who attain that status during the 4-month period) may object to the statement that the expedited procedure applies to the proposed “future act”. Then, the Native Title Tribunal is required to conduct an inquiry and make a determination on the matter. The arbitration process may include negotiations between the relevant parties. There is no statutory time limit for completion of the inquiry.
- Parties to the “right to negotiate” process include the relevant government, the beneficiary of the proposed “future act”, and any native title party.
- Parties to the “right to negotiate” process must negotiate in “good faith” with a view to obtaining the agreement of each native title party to the “future act”. That agreement may be subject to conditions to be met by any of the parties.
- The Native Title Tribunal may be asked to mediate by any relevant party.
- The subject of negotiations may be broad and could include conditions entitling native title parties to payments determined by reference to profits, income, or production generated as a result of the future act.
- If an agreement has not been reached by parties negotiating in “good faith” within 6 months of the date of notification of the proposed “future act”, any relevant party may request the Native Title Tribunal to make a determination in respect of the act.
- The Native Title Tribunal must take all reasonable steps to make the determination as “soon as practicable”, but the Native Title Act does not specify a time limit. After 4 months have passed without a determination, the relevant Commonwealth Government Minister may set a time limit greater than 6 months from the date of request for a determination.
- A determination made by the Native Title Tribunal must not include a condition that native title parties are to be entitled to payments based on profits, income or production as a result of the act.

53 Neate, Graeme, op cit, pp. 19-23, 44.
A determination by the Native Title Tribunal may be overruled by the relevant Commonwealth Government Minister in certain circumstances.

A State or Territory may enact alternative procedures to the “right to negotiate” provisions of the Native Title Act in respect of some or all “future acts” attributable to that State or Territory. However, those alternative arrangements must be approved by the Commonwealth Attorney-General and may be disallowed by either House of the Commonwealth Parliament. The Senate has disallowed some or all of the arrangements proposed for Queensland, the Northern Territory and Western Australia.

4.4.2 Implications of Other Privately Held Surface Rights

Access to land subject to privately held surface rights was a major issue before the Aboriginal Land Rights (Northern Territory) Act, the Mabo and Wik decisions and the Native Title Act. That issue remains contentious.

Land subject to privately held surface rights other than native title is, in principle, accessible for exploration and mining activity. However, State/Territory legislation relating to exploration and mining requires written consent from the holder of the surface rights in some cases. Typically, this includes land within a relatively short distance of buildings used for accommodation, business, community, worship or recreational purposes, or features such as water storages, stockyards, bores and cemeteries. In Western Australia, written consent is also required in respect of freehold land used for crops, pasture and grazing unless the tenement applies only 30 metres or more below the surface.

Compensation for disturbance to and loss of use of the land is invariably required, whether or not consent is required. Compensation may be determined by a warden’s court when negotiations break-down. The amount of compensation is not to include any allowance for minerals in the land.

Mining sector representatives have typically been critical of the consent provisions, claiming that they inhibit exploration and mining. The Western Australian provisions regarding freehold agricultural land have subjected to particularly strong criticism. The criticism includes claims that the consent provisions have allowed private holders of surface rights to obtain excessive compensation that captures some of the imputed nett value of minerals in situ.54

Representatives of the mining sector have also been particularly critical of statutory planning controls and legal and political complications in Victoria on the grounds that they have made it difficult historically to access land and therefore, have inhibited exploration and mining.55

55 Hunt, Michael, “Government Policy and Legislation…..”, op cit, p. 848
In contrast, representatives of private holders of surface rights have complained about lack of a power of veto, difficulties in receiving full compensation for disturbance and damage, and inadequate buffer zones.\footnote{Industry Commission, op cit, Volume 3, pp. 96-98.}

4.5 \textit{De Jure} and \textit{De Facto} Royalties and Control of Mining

Government ownership of minerals (other than construction materials) remains nearly universal in Australia, despite the recognition of native title by the High Court and its validation and protection by the \textit{Native Title Act 1993}. The vesting of ownership of minerals in the Crown in right of a State, Territory or Commonwealth Government allows the government of that jurisdiction to charge a \textit{price} for the right to exploit those minerals. That price is typically referred to as a royalty. It could take the form of a series of payments conditional on outcomes or an unconditional, up-front, lump sum payment.

The royalty systems most commonly used by State Governments both currently and historically have been \textit{ad valorem} and specific royalty regimes. An \textit{ad valorem} system charges a price calculated as a percentage of some concept of gross value, such as ex-mine, free-on-rail or free-on-board value. A specific system charges a price per unit of output.

In a few cases, the States have adopted royalty systems based on accounting profits either alone or as an alternative to or in conjunction with an \textit{ad valorem} royalty. Prominent examples of the application of accounting profits based royalty regimes include the following.

The Northern Territory Government has charged a price calculated as a percentage of accounting profits in excess of $50,000 for all mines (excluding petroleum extraction) established since 1 July 1982. The royalty rate is 18%.

A progressive accounting profits royalty regime applied to the Broken Hill Mines in New South Wales for many decades. The Argyle Diamond Mine in Western Australia was subjected to a royalty regime requiring payment of the greater of 7.5\% \textit{ad valorem} or 22.5\% of accounting profit. The system established for the Roxby Downs Mine in South Australia specified payment of 2.5\% to 3.5\% \textit{ad valorem} plus a percentage of accounting profits that increased with rate of return.

On 25 June 1984, the Commonwealth Government announced that a resource rent tax would apply to “greenfields” off-shore petroleum projects from 1 July 1984. This new \textit{de facto} royalty regime replaced an \textit{ad valorem} royalty of 10-12.5\% of well head value and a \textit{de facto} royalty in the form of an excise duty regime for crude oil involving marginal rates of tax that increased with production rates. The top marginal rate of excise duty was 87\% of the import parity price of crude oil.

The petroleum resource rent tax rate was 40\% of positive cash flows. Negative cash flows, including exploration and development outlays, were carried forward for future deduction at a rate of return (threshold rate) equal to the long term Commonwealth
Government rate plus 15% percentage points. Subsequently, the Commonwealth Government modified the petroleum resource rent tax by allowing company-wide deductibility of exploration costs in areas subject to the tax and by reducing the threshold rate for carrying forward development expenditures. It also extended application of the petroleum resource rent tax to the Bass Strait fields in place of the ad valorem royalty and ever-changing crude oil excise regimes.

In 1985, the Western Australian and Commonwealth Governments and the Western Australian Petroleum joint venture agreed to apply a resource rent royalty to the Barrow Island oil fields from 1 July 1995 to replace the State’s 10% ad valorem royalty and the Commonwealth’s excise duty on crude oil production. The resource rent royalty rate and threshold rate were the same as the relevant rates applying under the petroleum resource rent tax regime. Revenue was shared on a 25/75 basis between the State and Commonwealth Governments.

By imposing excise duties and later a petroleum resource rent tax on offshore production instead of increasing ad valorem royalty rates or applying the petroleum resource rent tax as a royalty, the Commonwealth Government avoided earlier royalty sharing arrangements with the States in respect of off-shore petroleum. These measures and the application of excise duties to onshore production amounted to an effective appropriation of a major part of pre-existing State petroleum royalty bases.

In addition, via the “right to negotiate” regime under the Native Title Act 1993, the Commonwealth Government has effectively appropriated some of the rights and benefits associated with ownership of minerals and control of mining by the States and Territories and transferred them to Aboriginal landowners and claimants. In particular, the “right to negotiate” regime has given registered holders or claimants of native title access to State royalty bases arising from minerals underlying land in respect of which any native title rights have not been extinguished. This applies even though any native title rights in minerals appear to have been extinguished by legislative acts of governments. It is ironic that the Commonwealth Government protected its own off-shore royalty base from the “right to negotiate” provisions, while providing native title holders with access to State royalty bases.

It should be noted that the effective access to State royalty bases provided by the “right to negotiate” regime has been constrained by arbitration provisions. The Aboriginal and Torres Strait Islander Social Justice Commissioner has claimed that this eliminates any access to State royalty bases by registered holders or claimants of native title. However, that is not correct. Such access will be constrained but not eliminated.

While some owners of cultivated or other improved land have been given a right of veto over mineral development on their property, in general, State mining legislation does not provide holders of surface rights to land with power to require that exploration and mining enterprises pay de facto royalties or payments in excess of reasonable compensation for loss of or interference with surface rights.
4.5 Environment

Under the scheme of the Constitution of the Commonwealth of Australia, control of lands, minerals in situ, and mining in each State remains exclusively with the relevant State legislature. As a result, one might expect that legislative control of environmental impacts of mining and processing would be exercised exclusively by the States. However, the Commonwealth Government has been able to exercise substantial control over environmental impacts through constitutional powers, unrelated to the environment, which have provided an interest in a project or activity. For example, the Commonwealth has been able to use powers in respect of exports to influence activities that export commodities, and has used its external affairs powers to enter into international treaties and agreements relating to environmental matters.

During the late 1960s and early 1970s, concerns about adverse environmental effects of human activity attracted substantial public and political attention. Significant environmental/political issues at that time included impacts of mineral sands mining on beaches and sand dunes, and proposals to drill for petroleum in the vicinity of the Great Barrier Reef. Images of past environmental disasters associated with mining and processing, such as Queenstown in Tasmania, also received renewed attention.


Subsequently, State Parliaments passed environmental assessment legislation. Also, Commonwealth-State agreements were made on joint assessment of development proposals that might be subject to Commonwealth powers.

The end result of the assessment process is either rejection of the development proposal or approval to proceed subject to conditions designed to ameliorate impacts on the environment.

During the initial five years of operation of the Commonwealth environmental assessment legislation, the inquiry provisions were used on only two occasions. In both cases, mining was involved and the issues were highly politically sensitive. The inquiries related to mineral sands mining on Fraser Island in south-east Queensland and uranium mining at Ranger in the vicinity of the East Alligator River in the Northern Territory.

The Fraser Island inquiry recommended that the Commonwealth Government not issue export licences. The recommendation was accepted by the Commonwealth Government. Subsequently, the Commonwealth Government refused to issue export licences for products of mineral sands mining from Moreton Island in south-east Queensland. The Ranger inquiry recommended that uranium mining be allowed to proceed with various safeguards to protect the natural environment and Aboriginal

57 Parts of this section rely heavily on Commonwealth of Australia, Industry Commission, op cit, Volume 3, chapters 7, 9 and 21.
communities in the area. That approach was accepted and the mine commenced operations in 1981.

The Commonwealth Parliament legislated to ban mining in Commonwealth national parks through the *National Parks and Wildlife Conservation Act 1975*. However, the provision for “conservation zones”, in areas where there is a likelihood of mineral prospectivity, allowed the Ranger Mine area to be excised from Kakadu National Park in the Northern Territory.

In 1991, a proposed mine at Coronation Hill and other highly prospective ground in the same mineralised province in the Northern Territory became a victim of this Commonwealth environmental regime. Mining was blocked by the Commonwealth Government following:

- more than 7 years of exploration and assessment;
- inclusion of the mineralised province in a “conservation zone” in 1986 rather than a proposed stage 3 extension to Kakadu National Park to allow development;
- preparation of an Environmental Impact Assessment for the Coronation Hill project that was satisfactory to the Commonwealth Department responsible for environmental matters;
- recommendation of approval of a mining operation by that Department, subject to some conditions.

In 1989, the Commonwealth reduced the “conservation zone” to 2% of its original size, covering the 47 square kilometre strip of leases from Coronation Hill to El Sherana. The remainder was added to the stage 3 extension of Kakadu National Park. The Commonwealth Government also commissioned two inquiries:

- an investigation of a request from the Northern Land Council for protection of “Sickness Country”, which included the leases, under the Commonwealth’s *Aboriginal and Torres Strait Islanders Heritage Protection Act 1984*; and
- an investigation by the Resource Assessment Commission of environmental values of the “conservation zone” and environmental and economic effects of mining in that area.

After receiving the report of the Resource Assessment Commission, which was based on analysis that was suspect in a number of respects, the Commonwealth Government “killed-off” future mining in the area. The Commonwealth Government’s behaviour was widely criticised at the time as being based on a desire to pander to environmental and Aboriginal interests for political reasons, rather than on a full, rational assessment of the costs and benefits of alternative courses of action.

The Commonwealth Parliament’s power to intervene in respect of environmental issues was extended by the High Court’s decision in the Franklin Dam case. The Commonwealth Government blocked the proposed dam in Tasmania after proclaiming the region a World Heritage Area and referring to its obligations to uphold treaties entered into by the Commonwealth under its external affairs powers. The Commonwealth’s action was upheld by the High Court. A majority decided that the Commonwealth had power to legislate to control acts affecting the environment by reference to Commonwealth powers.
In the late 1990s, the Commonwealth Government revamped its environmental legislation. The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), which came into force on 16 July 2000, replaced five statutes:

- *National Parks and Wildlife Conservation Act 1975*;
- *Whale Protection Act 1980*;
- *World Heritage Properties Conservation Act 1983*; and

Under the EPBC Act, actions that have or are likely to have a significant impact on a matter of national environment significance require approval from the Commonwealth Environment Minister. Actions that are likely to have a significant impact on the environment of Commonwealth land and actions taken by the Commonwealth Government that will significantly affect the environment anywhere in the world also require the Environment Minister’s approval.

Exploration, mining and processing activities are “actions” for the purposes of the EPBC Act.

Six matters of national environmental significance have been specified in the EPBC Act:

- World Heritage Properties;
- Ramsar wetlands of international significance;
- listed threatened species and ecological communities;
- migratory species protected under international agreements;
- the Commonwealth marine environment; and
- nuclear actions, including uranium mining.

These triggers for Commonwealth environmental assessment and approval processes replace the old system of *ad hoc* triggers by matters such as a developer’s need for export or foreign investment approval. The role of the Commonwealth Environment Minister has been substantially upgraded from provision of advice to granting or refusing approvals. The Minister has wide discretion. An instrument of approval will specify the action that may be undertaken, the term of the approval, controlling provisions, and conditions of the approval.

The EPBC Act provides for bilateral agreements between the Commonwealth and States/ Territories to accredit environmental impact assessment processes of a State/Territory as a basis for approvals by the Commonwealth Minister or to delegate authority to approve to a State/Territory. The Commonwealth is negotiating accreditation agreements with States and Territories.

If a processing and/or mining proposal survives the environmental impact assessment or inquiry process, development and operation will typically be subject to compliance with mining lease conditions specific to the project, as well as to more general statutory requirements. Although action by State and local government authorities in Australia to protect the natural environment has attracted much less public attention than intervention by the Commonwealth Government, State and local governments have established substantial bodies of legislation dealing with environmental matters.
Such legislation has proliferated greatly since the natural environment became a major political issue in the early 1970s. For example, the Industry Commission cited examples of mining operations having to comply with 15-35 State statutes relating to the environment, as well as Commonwealth and local government environmental requirements.58

4.6 Taxation Powers

Under section 90 of the Commonwealth Constitution, exclusive power has been vested in the Commonwealth Parliament:

“….to impose duties of customs and excise and to grant bounties on the production of export goods.”

The States have effectively been excluded from most taxes on commodities (but not services) because of High Court rulings that such taxes are excise duties. As a result, there may be a danger that State royalty regimes could be construed as excise taxes by the High Court. This danger should recede to the extent that a royalty represents the sale price of rights to extract and acquire minerals.

As from 1 July 2000, the Commonwealth Government pre-empted the services tax base as well as extending its coverage of commodities or goods by introducing a broadly-based value added tax applying to services as well as goods at a rate of 10%. This tax, which has been called the Goods and Services Tax or GST, replaces the Wholesale Sales Tax, which applied to a much smaller range of goods at various rates.

Although the Commonwealth Constitution gave Commonwealth and States concurrent powers in respect of taxes other than duties of customs and excise, the Commonwealth Government has completely monopolised income taxation since 1 July 1942 after legislating to give effect to a uniform income tax scheme from that date. Although Victoria, Queensland, South Australia and Western Australia challenged the validity of the legislation, the High Court ruled that essential parts of the legislative package were valid not only under the Commonwealth’s defence powers for the duration of the war, but also under the Commonwealth’s normal peace time powers. The Commonwealth continued with the uniform income taxation arrangement after the war and it still prevails.

In August 1957, Victoria initiated a further challenge to the uniform income taxation regime with support from New South Wales. The High Court invalidated a provision of the income taxation legislation that Commonwealth income tax must be paid before any income tax due to a State. However, it reaffirmed an earlier key ruling that under section 96 of the Constitution, the Commonwealth could make tax reimbursement grants conditional on the States not levying income tax.

While the constitutional right of any State to impose income tax remains unimpaired, the States have been effectively excluded from accessing this tax base by three factors. They are the conditional nature of tax reimbursement grants, the magnitude

of Commonwealth income tax rates, and the Commonwealth’s unwillingness to reduce rates to make room for State income taxes.

Although the Commonwealth Government has attained clear dominance of taxation bases in Australia, the Constitution has placed some specific limitations on the Commonwealth’s taxation powers. For example, section 51(2) specifies that Commonwealth taxation laws are “….not to discriminate between States or parts of States.” Another pertinent example is the apparent protection afforded by section 114 against Commonwealth taxation of property of any kind belonging to a State. The latter section may have discouraged the Commonwealth from applying its petroleum resource rent tax to on-shore petroleum, which is the property of the States. That tax applies only to off-shore petroleum, which is owned by the Commonwealth. The base for the resource rent tax is meant to approximate to the realised nett value of petroleum resources.
5 IMPUTED NETT VALUE OF MINERALS IN SITU

5.1 Central Role of Imputed Nett Value in Managing Mineral Wealth

For more than 200 years, the imputed nett value of minerals in the ground (in situ) has been a primary focus of the economics literature relating to the mining sector. In those writings, particular attention has been given to role of the imputed nett value of minerals as the price of a resource, a source of income and wealth, and a base for taxation.

In the economics literature, the imputed nett value of minerals has usually been referred to as rent of mines, mineral rent or resource rent. The focus on rent of mines and adoption of this terminology by economists can be traced back to 1776 when Adam Smith:

- defined rent as the “price paid for the use of land”;
- regarded mineral deposits as a type of land;
- perceived rent to be a surplus above payments necessary to induce productive activity;
- argued that a proportional tax on land rent would not interfere with investment and operating decisions.59

The imputed nett value of mineral resources in the ground is central to the task of managing Australian mineral wealth for sustainable development. Indeed, if Australian mineral resources have no imputed nett value in situ, there is no mineral wealth to manage.

To the extent that imputed nett value of minerals is positive and significant, it is important that governments ensure that it is maximised. If imputed nett value is not maximised, part of the nation’s natural capital will be wasted. To maximise imputed nett value, governments must ensure that policy action or inaction by them does not result in destruction or dissipation of imputed nett value. Put another way, they must deal effectively with any instances of “market failure” or past “government failure” that interfere with the efficient realisation of imputed nett value by distorting otherwise efficient exploration, development, mining and processing decisions.

Maximising imputed nett value of minerals does not justify neglect of social costs arising from adverse effects of exploitation on the natural environment or local residents. If these social costs are not fully internalised, nett value of minerals will be overstated and the value of other forms of natural capital or other types of capital will be diminished.

When imputed nett value is realised, it can be saved and invested, consumed, or remitted overseas. If it is saved and invested, natural capital is replaced by constructed/manufactured or intellectual capital. The effect will be the same if

consumption of imputed nett value results in an offsetting increase in saving and investment elsewhere in the economy. Maximising and realising imputed nett value maximises capacity or potential to transform natural capital into other forms of capital as a basis for sustainable development. However, it does not mean that the actual extent of the transformation that does take place is consistent with an efficient allocation of resources and its dynamic extension, a high rate of economic growth. Saving and investment can fall short of socially desirable levels because of “market failure” and “government failure”, just as imputed nett value may not be maximised because of policy flaws.

Governments also have a responsibility to ensure that income and wealth are distributed in ways considered to be fair or equitable by their constituents. Mineral resources contribute part of that wealth and income. Therefore, the distribution of income and wealth from imputed nett value of minerals must be considered within the context of the overall distribution of income and wealth, rather than in isolation.

The task of determining the distribution of imputed nett value of minerals involves difficult policy decisions by governments regarding the satisfaction of competing political interests and objectives. Prospectors and mining enterprises vie with each other to obtain secure tenure over mineral resources so that they can appropriate the imputed nett value of those resources. Owners or claimants of Native Title also seek to appropriate a slice of the imputed nett value of mineral resources in return for approval to access land for mining purposes. Employees and their labour union representatives seek special conditions for working in mines, not only because of isolated locations, but also to take advantage of the imputed nett value of the minerals they are helping to extract. Governments attempt to capture a portion of the imputed nett value of minerals through royalties, other charges, and taxes, proceeds of which are used to fund government expenditure programmes. Sometimes, governments divert part of the imputed nett value of minerals to subsidise processing or other activity by imposing processing or other requirements on mining companies as a condition of mining leases and/or by offering royalty reductions for undertaking such activity.

These distributional conflicts relate to the problem of equitably distributing income and wealth within generations. However, acceptance of the concept of sustainable development indicates that governments are also concerned about intergenerational equity. That adds another distributional tension to those listed above.

Unfortunately, efforts by various special interest groups to capture a portion of the imputed nett value of minerals can result in partial or total destruction of that value. Therefore, the fundamental issue that governments face in managing mineral wealth is how to maximise imputed nett value while simultaneously distributing it fairly. This challenge applies regardless of whether governments target longstanding equity, economic efficiency and administrative efficiency objectives or seek to achieve sustainable (economic) development.

Four challenging, interrelated tasks must be tackled:
- guiding the distribution of the imputed nett value of minerals among the various competing interests in a manner that is judged to be fair by the relevant government(s);
ensuring that the magnitude of the imputed nett value of minerals is not diminished or partly destroyed (that is, wasted) by efforts to appropriate it and/or as result of poor design of government policy instruments;  
- making corrections for the effects of market imperfections, including the existence of externalities, which will ensure that imputed nett value is not overstated or understated;  
- keeping administration (including enforcement and compliance) costs associated with government intervention to a minimum.

The equity criterion is relevant to the first task. The economic efficiency criterion is applicable to the second and third tasks. The administrative efficiency criterion relates to the fourth task.

5.2 Bases of Imputed Nett Value

The imputed nett value of minerals derives from demand for mineral products and from supply characteristics of mineral resources. The key characteristics are exhaustibility, variability (heterogeneity) and scarcity.

Mineral deposits are natural resources that can be depleted by mining. They become exhausted in an economic sense when all economically recoverable material has been extracted. Because sub-marginal material will remain when the deposit is abandoned, exhaustion in economic terms does not imply that every tonne of the targeted material in a deposit has been mined.

Ultimately, the total amount of minerals in the ground \textit{(in situ)} is fixed. Information will be available in respect of only a small portion of that mineralisation. Part of that will be deemed to be economically recoverable, while the remainder will not yet be considered economic. However, the location, extent and aspects of quality of most of the mineralisation in the ground will not yet be known. In these circumstances, currently known, economically recoverable mineral resources can be augmented or replaced by:

- exploration activity and other investigations that add to reserves in known deposits or locate new economically exploitable deposits;

- technological advances that lower real costs of mining, processing and transporting minerals, allowing previously uneconomic material to be profitably exploited;

- activities by governments and private sector entities, such as infrastructure enhancements, that lower real costs of mining and associated activities in particular areas; and

- higher real prices that permit profitable extraction of previously uneconomic material.
Mineral deposits are not homogeneous. There are multiple differences of varying degrees between deposits. Also, there are variations of many different types between units of material within individual deposits.

Differences between deposits include variations in factors such as:

- ease of discovery and assessment;
- type, grade and chemical or metallurgical properties of the mineral;
- size of the deposit;
- depth and shape of the deposit;
- mining conditions, such as degree of ground stability and hardness of overburden and other waste material;
- topographical, climatic and other locational considerations;
- availability of pre-existing infrastructure of various types;
- ease of access to providers of other relevant services; and
- distance to markets.

Deposits possessing a commercially favourable combination of such characteristics are relatively scarce. The more commercially favourable is the combination of relevant characteristics of a deposit (summarised as “quality”), the greater is its relative scarcity.

Exploitation of these relatively scarce deposits can yield a positive nett present value after covering the full costs of discovery, assessment, development, mining, processing and transportation, including the relevant cost(s) of capital, which is (are) the discount rate(s) used in the present value calculation. Because minimum required returns to inputs to exploration and exploitation, other than minerals in situ, are deducted in this nett present value calculation, the resulting figure is a value directly attributable or imputable to the in situ mineral deposit itself.

The nett present value of a particular deposit will obviously vary with the configuration and efficiency of the exploitation process, as well as the “quality” of the deposit. However, nett present value will also vary with the timing of key events, such as exploration, other assessment activities, commencement of exploitation, speed of extraction, and exhaustion of the deposit. Some important timing issues have been discussed briefly in subsequent sections of this chapter.

The maximum nett present value at a particular point of time that can be realised by discovering, assessing and exploiting each mineral deposit in an appropriate future time period is the value that should be imputed to the mineral deposit in situ at the particular point time. In this report, it will be referred to as imputed nett value of a deposit or minerals in situ.
The heterogeneity of deposits includes differences within deposits as well as differences between deposits. Variations within a deposit may include:

- variable grades;
- changes in chemical or metallurgical properties;
- variable distances from shafts and beneficiation facilities;
- differing waste to ore ratios; and
- variations in proximity to lucrative blocks of ore or access paths to such ore.

Commercial attractiveness of units of material within a deposit will vary with factors such as these. Therefore, different unit nett values can be imputed to different units of ore within a deposit. Those with a negative unit nett value when considered for extraction will be left behind or discarded as waste because extracting and/or processing them will cost more than the return and reduce the overall surplus.

At any particular point of time, incremental supplies of mineral products from known deposits will be available only at increasing incremental costs and therefore increasing product supply prices. The reasons for this include:

- an incentive to exploit first the known deposits and units of material with the highest imputed values to maximise the present value of the realised surplus;
- increasing depth and haulage distances and sometimes falling grades as extraction proceeds in existing mines;
- emergence of short term capacity constraints associated with existing plant, equipment and other facilities;
- higher costs associated with less attractive known deposits that have not yet been exploited.

Although supply prices will tend to increase with output at a particular point of time, technological advances that lower costs of exploration and exploitation, and discoveries of additional low-cost reserves can cause the supply price schedule to shift down from time to time. This means that each quantity is offered at a lower price or larger quantities offered at each price.

Small cost-reducing technical advances are being made continuously and major technical breakthroughs are made from time to time. Historically, technological progress and consequent discoveries of low-cost deposits have more than offset the short-term tendency towards higher incremental costs and real market prices as production expands to meet increased demand. There is no reason to believe that this long-term trend will be reversed in the foreseeable future.
This phenomenon does not imply that minerals in situ cannot have an imputed nett value. At any particular point of time, there will still be only a limited number of deposits that can be exploited economically. The relative scarcity of these deposits and the nett present values they can generate (the maximum in each case being the imputed nett value) will increase with their “quality”.

The analysis in this sub-section indicates that at any particular time, the variability of mineral deposits means that superior deposits and superior material in all deposits will be relatively scarce. Exhaustibility exacerbates the scarcity because mining reduces the capacity of an ore-body to generate future returns. The ability of superior deposits and units of ore to yield larger returns than required to compensate providers of inputs, other than minerals in situ, means that they will have an imputed value that increases with quality of the material in situ.

5.3 Risk, Uncertainty and Imputed Nett Value

When imputing nett value to minerals in situ, allowance must be made for risk and uncertainty. In exploration and mining ventures, there can be “failures” as well as “successes”, poor results as well as outstanding outcomes.

If the imputed nett value of minerals is being estimated in advance of exploration and mine development (on an ex ante basis), allowance needs to be made for the variability of potential outcomes in the exploration, development and mining phases of projects. If a nett value is imputed to minerals on the basis of realised revenues and costs (on an ex post basis), allowance will need to be made for the bad as well as the good outcomes that eventuated. An ex post estimate of imputed nett value that ignores unsuccessful ventures will be unrealistically high.

An estimate of imputed nett value in advance of variable outcomes will be influenced by the extent of risk and uncertainty, attitudes to risk and uncertainty, and mechanisms available to ameliorate them. This applies to estimates made prior to extraction, but after exploration and assessment, as well as to estimates made in advance of exploration. Risk and uncertainty still prevail after a deposit has been assessed to be economically exploitable, although the extent of risk and uncertainty will be substantially lower than prior to exploration and assessment.

An estimate of imputed nett value in advance of variable outcomes will be inversely related to the extent of both risk and uncertainty. If the probability distribution of possible outcomes is known, the variability of outcomes may be referred to as pure risk. The degree of pure risk will depend on the shape of the probability distribution of possible outcomes. The degree of uncertainty increases as knowledge of the probability distribution of outcomes declines. When knowledge of the probability distribution is completely unknown, pure uncertainty prevails. Exploration and mining enterprises have to operate in the context of a mixture of risk and uncertainty.

Attitudes to risk will affect estimates of imputed nett value in advance of variable outcomes. A risk-neutral investor will be indifferent between a safe outcome and risky/uncertain (variable) outcome with an expected (average) value equal to the certain outcome. A risk-loving investor will reject a certain outcome in favour of a
risky/uncertain opportunity with a lower expected value but offering possibilities of high returns. A risk-averse investor will prefer a safe outcome to a risky/uncertain (variable) outcome with an expected value equal to the certain outcome. A risk-averse investor would choose a risky/uncertain opportunity ahead of a safe outcome only if the expected value of the former exceeded the certain value of the latter by a sufficiently large margin. The more risk-averse the investor is, the larger the margin would need to be.

Risk-averse behaviour is generally considered to be the norm among exploration and mining enterprises. However, the degree of risk-aversion varies between enterprises. Also, there have been some examples of risk-loving behaviour in the exploration and mining sector.

*Ex ante* estimates of imputed nett value will be affected by the arrangements available for ameliorating risk and uncertainty borne by investors. The better and more comprehensive are the risk management mechanisms available to an investor, the smaller will be the adverse impact of risk and uncertainty on an estimate of imputed nett value from the perspective of that investor. Commonly used mechanisms for ameliorating risk and uncertainty include:

- exploration and production joint ventures;
- large, diverse portfolios of exploration ventures;
- thorough investigation and analysis of potential projects;
- corporate entities with numerous shareholders;
- long term sales contracts and other commodity price hedging arrangements; and
- insurance instruments.

Unfortunately, these mechanisms fall short of the ideal of a complete set of perfect contingency claims (risk and insurance) markets. In the context of this “market failure”, investment in exploration and mining will fall short of the quantum associated with an efficient allocation of resources in the economy (economic efficiency). This will result in some loss of imputed nett value of minerals. While exploration tenure that induces pre-emptive exploration would tend to have a countervailing effect on the amount of exploration, it would do so in a way that destroys imputed nett value. This last point is explained in section 12.3 of chapter 12.

Various *ex post* and *ex ante* payment regimes for the right to explore and mine may have significantly different effects on the distribution of risk and uncertainty between government resource owners and exploration and mining enterprises. This results in estimates of imputed nett value that differ according to payment regimes. Indeed, such estimates are meaningful only in the context of the pertinent risk sharing arrangements between owners of mineral rights and exploration and mining enterprises. Further analysis of these issues has been undertaken in section 13.84 of chapter 13.

At first glance, imputing a nett value to minerals on an *ex post* basis (on the basis of realised revenues and costs), might appear to be a simple exercise that avoids the problem of allowing for risk and uncertainty. However, an estimate that does not make allowance for the bad as well as the good outcomes would be misleading. For example, one enterprise’s exploration programme in a mineralised province might be highly successful, while another entity might be unsuccessful in the same area. A
realistic *ex post* assessment of the imputed nett value of minerals in the province would offset the unsuccessful exploration expenditures in the area against the surpluses of derived from successful ventures in the area.
6 ECONOMIC FUNCTIONS OF IMPUTED NETT VALUE

Returns to factors of production may be explicit (actually paid) or implicit (imputed). Regardless of the form of these returns, they perform important functions in respect of the allocation of resources in the economy:

It is understood that returns to capital and labour perform two economic functions:
- eliciting or inducing supply; and
- rationing or allocating supply.

It is widely accepted that returns to land perform the function of allocating supply between uses and users, but are not required to elicit supply. Returns to land are not required to elicit supply as the amount of land available within the economy is fixed.

The return to mineral resources, the imputed nett value in situ, has a role to play in allocating supply, not only between uses and users, but also over time. The intertemporal allocation function is important because known mineral resources are depletable through extraction and replenishable through exploration.

The role of the imputed nett value of mineral resources in eliciting supply of mineral resources is a controversial issue. Most economists claim that, in principle, the imputed nett value of minerals does not need to be appropriated, wholly or partly, by exploration and mining enterprises to induce an efficient supply of exploration and extraction activities. Others assert that the imputed nett value of minerals is zero or trivial, because all or most of the revenues from mining must be available to exploration and mining enterprises to ensure that exploration and mining are not discouraged in the long term.

6.1 Allocation of Supply

The nett value imputable to minerals in situ performs two important economic functions in respect of the allocation or rationing of supply:
- the rationing or allocation of supply between competing uses and users; and
- the allocation of an exhaustible supply over time.

The first of these functions is well understood. Therefore, it is discussed only briefly below.

The imputed nett value of minerals also provides an economic basis for allocating or rationing an exhaustible supply over time. There are three elements of this intertemporal allocation function:
- the optimal timing of extraction after commencement of mining;
- deciding the ideal time to commence development and mining;
- determining the best time to undertake exploration.

There is a well-established economics literature on the first of these intertemporal allocation issues. However, the second and third issues have received relatively little
attention. This is unfortunate, because decisions concerning commencement of
exploration and development are also important for maximising imputed nett value.

Government policy instruments interfering with otherwise efficient decisions relating
to allocation of supply will tend to destroy the imputed nett value of minerals and not
comply with the economic efficiency criterion. This has important implications for
tenement and royalty policies, as explained below and in Chapters 12 and 13.

6.1.1 Allocation between Uses and Users

Imputed nett value provides a basis for a market-(price system-) based allocation of
supply between competing uses and users. The price could be based on an *ex ante* or
*ex post* estimate of imputed nett value of minerals *in situ*.

The price for the right to access minerals *in situ* could be paid to either a government
or private owner of mineral rights. Payment of that price to a government, rather than
to a private sector entity, need not detract from the important function that imputed
nett value of minerals can perform in allocating supply between uses and users.

6.1.2 Timing of Extraction

At the time a decision is made to develop a mine, discovery and assessment costs are
“sunk costs”. Then, the logical objective of the mine planning process is to maximise
the present value of expected future cash flows from the mine.

Because the deposit is exhaustible, there will be a trade-off between economies of
scale and economies of longevity. The entire deposit might be mined and processed
in one period if the mining company is prepared to invest in sufficient capacity. That
could provide substantial economies of scale for one period, but diseconomies of
scale might also be encountered at very high rates of production and plant and
equipment that cannot be used to serve another mine thereafter will be redundant.
Reducing capacity sacrifices nett economies of scale, but allows plant and equipment
to be used over a longer period, providing economies of longevity. However,
lengthening mine life will eventually result in rising maintenance costs and increasing
technical obsolescence of plant and equipment as time passes.

The task of the mine planner is to find the balance between economies of scale and
economies of longevity that maximises the present value of expected future cash
flows from the mine at the prevailing discount rate (cost of capital). The iterative
process can be illustrated briefly as follows. 60

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60 The first clear exposition of these concepts can be found in Gray, Lewis, “Rent Under the
Assumption of Exhaustibility”, reprinted from Quarterly Journal of Economics, May 1914 in Gaffney,
423-446, and Hotelling, Harold, op cit, pp. 137-175. Gray relied on comparative static analysis, while
Hotelling used mathematics to provide a dynamic treatment of the subject. For more modern
expositions, see Solow, Robert, “The Economics of Resources or the Resources of Economics”,
American Economic Review, Papers & Proceedings, Vol. 64, No. 2, May 1974, pp. 1-14, and
If an additional unit of ore is mined now, it cannot be mined at a future time. To justify mining it now, the current incremental revenue (marginal revenue) less current incremental extraction cost (marginal cost) will need to exceed or least match the present value of the incremental surplus foregone in any subsequent period of mining of the deposit (marginal depletion cost). If this condition is not met, the present value of the mine can be increased by deferring incremental production to a later period. As a result, marginal cost falls in the current period and rises in the later period (and marginal revenue might do the opposite) so that the present value of the incremental surplus rises in the former and falls in the latter.

When all such gains from shifting production between periods have been exhausted, the present value of the mine will be maximised. Then, supply is allocated over time so that, in each period until exhaustion, marginal depletion cost will be equalised between periods and will equal the difference between marginal revenue and marginal cost in each period. Put another way, the difference between marginal revenue and marginal cost rises over time at a rate equal to the discount rate.

Marginal depletion cost is the “shadow price” of (price imputable to) incremental reserves in situ. The optimal exploration programme will be such that marginal discovery/assessment cost equates to marginal depletion cost. Additional (or less) exploration would result in incremental discovery/assessment costs exceeding (being less than) the value of the increment to reserves.

6.1.3 Timing of Exploration

While the economics literature on the timing of extraction is substantial, only a relatively small amount of material on the timing of exploration has been published. This is anomalous because commencement of exploration and development are non-repeatable events, just as the process of extraction over time is. Indeed, decisions regarding timing of commencement of exploration are as important for maximising imputed nett value of minerals as the decision relating to the scheduling of extraction of ore from the deposit over time.

This section focuses on the role of decisions regarding timing of exploration in maximising imputed nett value of minerals in situ. The analytical approach is based on the pioneering work of Mason Gaffney and extensions of that work in an Australian context by the author of this report.


In this analysis, “immediate exploitation value” at each point of time refers to the nett present value of future cash flows expected to be realised if the exploration-assessment-planning-development-extraction sequence of activities (the exploitation sequence) commences and is expeditiously pursued as from that point of time. Changes in immediate exploitation value over time are depicted by the curve with this label in Figure 1 below.

Immediate exploitation value is nett of exploration, other assessment, design/planning, development and operating costs. It is also nett of the risk-adjusted opportunity cost(s) of capital, which is (are) represented by the discount rate(s) in the nett present value calculation.

If “immediate exploitation value” is positive, and its rate of increase is less than the discount rate, it will be advantageous to commence the exploitation sequence as soon as possible. Then, the expected periodic surpluses, can be realised and invested to yield a better rate of return elsewhere (after adjusting for differential risk). These circumstances are diagrammatically depicted after time B in Figure 1 below.

If “immediate exploitation value” is increasing at a rate higher than the discount rate, it will be economically appropriate to defer commencement of the exploitation sequence. It will also be commercially appropriate provided that exploration tenure is secure and not conditional on undertaking earlier activities on the tenement. If this proviso is satisfied, the exploration and mining enterprise can earn more by waiting than it can by acting. In Figure 1, this applies before time B. The incentive to wait is applicable even if “immediate exploitation value” is positive at the time in question, as shown between times A and B in Figure 1.
In principle, the ideal time to commence exploration activities in a particular area is when “immediate exploitation value” stops rising at a faster rate than the relevant risk-adjusted opportunity cost of capital. This is depicted in Figure 1 by point M, where the “immediate exploitation value” curve touches the compound interest curve. Then, the nett present value in the base year that can be realised by proving and exploiting a mineral deposit in a future time period will be maximised.\(^63\) That maximum is represented by present value amount X-0, which is the maximum of the Base Year NPV curve and the present value at which the “compound interest at cost of capital” curve intersects the present value axis in Figure 1. It is the value that should be imputed now (in the base year) to the right to exploit a prospect or expected mineralisation in situ, as explained in chapter 5. It will be referred to as imputed nett value of a deposit or mineralisation or right to exploit.

The imputed nett value of the right to exploit increases at a rate equal to the discount rate until the rate of increase of “immediate exploitation value” drops below the discount rate. In Figure 1, this is depicted by the compound interest curve between time C and time B (between point P and point M on that curve).

However, if commencement of exploitation is deferred until the rate of increase in “immediate exploitation value” drops below the discount rate (beyond time B in Figure 1), the value of the right to exploit can no longer rise as fast as the discount rate or faster than “immediate exploitation value”. Also, the base year value of the right to exploit will be lower if such a deferment of development and extraction occurs. This is depicted by the decline in the Base Year NPV curve from its maximum (at L) beyond time B.

If the “immediate exploitation value” of a deposit is negative currently (depicted by the base year, time 0), it does not mean that a right to exploit the deposit has a negative or zero value now. If it is expected that exploitation will generate a positive “immediate exploitation value” at some future date(s) (after time A in Figure 1), and if exploitation is deferred to such time(s), the right to exploit the deposit will have a positive nett present value in the base year. This is depicted by the positive segment of the Base Year NPV curve after time A in Figure 1.

The “immediate exploitation value” might increase at a higher rate than the cost of capital (before time B in Figure 1) if the relevant product price is rising and/or exploitation costs are falling sufficiently quickly in real terms. While mineral commodity prices, in general, have exhibited long-term downward trends in real terms, they have also experienced periodical cyclical up-turns in response to demand surges and increasing short term costs at existing mines. Exploitation costs have tended to move downwards in real terms on a long-term basis. The causes are:

- continuous, small, and occasional large advances in technology and techniques applicable to mining, processing and transportation; and
- improved access to infrastructure and other goods and services as economic activity expands in quantitative and geographical terms.

\(^{63}\) Gaffney, “Editor’s Conclusions”, op cit, pp. 382, 385, 387.
It is important to consider the implications of relaxing two important assumptions underlying the preceding analysis in this sub-section. The assumptions were that:
- exploration uncertainty can be ignored; and
- exploration and mining enterprises can acquire secure, unconditional tenure over exploration prospects.

It is widely accepted that a substantial proportion of individual exploration ventures will be characterised by a high degree of exploration risk and uncertainty. Exploration risk and uncertainty will mean that the ideal timing of exploration can rarely be achieved in practice. However, if pre-discovery tenure is secure and unconditional, risk and uncertainty will not interfere with the incentive to keep exploration outlays to a minimum and to incur them as late as possible without jeopardising the ideal time for commencement of development and extraction.

Indeed, exploration risk and uncertainty may delay the commencement of exploration when pre-discovery tenure is secure and unconditional. Risk-averse enterprises under no pressure to explore early may be induced to wait for better exploration techniques. Also, they may tend to wait for others to undertake activity on nearby ground, thereby reducing uncertainty regarding their own ground. When enterprises undertake detailed exploration programmes, announced results provide valuable free information to nearby tenement-holders. When formulating their exploration programmes, firms ignore the external benefits conferred on others. The consequences of risk and uncertainty and informational externalities associated with exploration may be too little exploration, too late.

In contrast, if exploration tenure is conditional on the quantity and timing of exploration and discovery of a deposit, exploration/mining enterprises are encouraged to undertake too much exploration, too soon to pre-empt acquisition by other enterprises. The imputed nett value of minerals in situ is dissipated or destroyed by a combination of exploration in excess of the efficient quantum at that time and foregone returns on early exploration expenditures. Risk and uncertainty are likely to exacerbate the problem of pre-emptive exploration, not offset it, particularly in less attractive areas. This applies even when enterprises exhibit risk-averse behaviour. These important, perhaps surprising results have been analytically derived in section 12.3 of chapter 12 in the context of conditional first-come first-served and work programme bidding systems applying in Australia. That analysis utilised an extension of the diagrammatic model in figure 1 above.

### 6.1.4 Timing of Development

A rational mining enterprise will want to commence development of a mine when the sum of “immediate exploitation value” and exploration/assessment costs:
- is positive; and
- stops rising faster than the relevant risk-adjusted opportunity cost of capital.

These requirements would be met after time B in Figure 1 if pre-and post-discovery tenure are secure and unconditional. The ideal time gap between commencement of exploration and initiation of development would be the minimum commercially practical period. The larger is the time gap, the greater will be the portion of the
potential imputed nett value of the deposit that will be destroyed by the opportunity cost of capital (foregone returns) on exploration/assessment outlays.\textsuperscript{64}

In the context of risk and uncertainty, when it may not be easy to distinguish good prospects from poor prospects and to determine the best time to explore, deposits may be discovered long before the ideal time to develop them. Then, the opportunity cost of capital on early exploration outlays will consume some of the imputed nett value of the deposit. However, that is a cost associated with risk and uncertainty, rather than poorly designed tenure arrangements.

If exploration is undertaken prematurely because of risk/uncertainty or tenure imperfections or both, development could commence before time B in Figure 1, because the sum of “immediate exploitation value” and exploration/assessment costs can be expected to increase at a slower rate than “immediate exploitation value”. However, this effect may be offset to some extent by the tendency of extraction risk and uncertainty to induce deferment of commencement of development while risk/uncertainty assessments and management strategies are formulated. The nett effect will vary from case to case.

Therefore, a rational mining enterprise would want to commence development not too long after time B in Figure 1, whether or not pre-discovery tenure is conditional and insecure and exploration is pulled forward. That would also approximate to the ideal time to commence development from a social/economic perspective.

Various government policy requirements may cause deferment of development. For example, development tenure may be subject to unreasonably protracted environmental assessment and approvals processes (see chapter 14) or unreasonably prolonged mandatory negotiation and arbitration procedures with Native Title claimants (see chapter 12). Then, development may be deferred far beyond the time when the sum of “immediate exploitation value” and exploration/assessment costs no longer rises faster than the relevant discount rate. In such circumstances, part of the imputed nett value of the deposit will be dissipated by foregone interest on capital invested in prior exploration, assessment and planning. That social loss adds to those arising from excessive costs of negotiating environmental approvals and land access, and any deadweight losses arising from the form of environmental and other land access conditions.

\textbf{6.2 Eliciting Supply}

The definition of imputed nett value of minerals \textit{in situ} in section 5.2, “Bases of Imputed Nett Value”, indicates that it is an amount in excess of payments necessary to elicit supply of all inputs, including capital, required to explore for, develop and extract mineral deposits. This means that, in principle, none of it needs to be appropriated by prospectors and/or mining enterprises to induce exploration and extraction activities.

\textsuperscript{64} Ibid, pp. 385-386, 387 and 389.
However, it is often argued that the imputed nett value of minerals does not exist or is only a trivial amount. It is claimed that all or nearly all of the revenues from mining must be available to exploration and mining enterprises to ensure that exploration and mining are not discouraged in the long term. The chance of capturing bonanza returns, despite a low probability of success, is regarded as a necessary incentive for exploration and for research to identify more effective exploration and exploitation techniques. Therefore, it is asserted that above-normal returns, including occasional bonanza returns, serve the economic function of eliciting supply. In other words, all or nearly all income from mining is deemed to be imputable to inputs other than minerals in situ. Thereafter, the line of argument follows two divergent paths.

One strand is that bonanza and other superior returns will be temporary, being competed away in the long term. The rationale is that resources will continue to be attracted into exploration and research until returns in excess of normal risk-adjusted rates of return on capital have been eliminated by falling commodity prices and increasing costs associated with increased output.

The other line of argument conceives that superior deposits will yield superior returns in the long-run, but to the extent that exploration and mining enterprises are not permitted to appropriate those above-normal returns, the possibility of a substantial reward to offset risk and uncertainty will be removed. Consequently, exploration will decline in areas that are not highly prospective or are considered to provide only a very remote chance of a bonanza discovery.

Both lines of argument have been bolstered by reference to analyses of profitability of Australian companies. These analyses indicate that average and median rates of return on capital in the mining sector over the long-term tend to be no better than rates of return in all sectors of the economy combined. However, some other results of these analyses do not support the first line of argument, but may be consistent with the second. They indicate that the top 5% of mining companies earn substantially higher rates of return than the top 5% of all companies in the economy.

The assumptions and analysis underlying the argument that the imputed nett value of minerals is non-existent or trivial have major shortcomings. These deficiencies are briefly discussed below.

First, the argument ignores the logic of analysis of the type in section 5.2, “Bases of Imputed Nett Value”, which indicates that at any particular time, the variability of mineral deposits means that superior deposits and superior material in all deposits will be relatively scarce. Exhaustibility exacerbates the scarcity because mining reduces the capacity of an ore-body to generate future returns. The ability of superior deposits and units of ore to yield larger returns than required to compensate providers of inputs, other than minerals in situ, means that they will have an imputed value that increases with quality of the material in situ.

Second, minerals in situ are available in their natural state and location prior to discovery and exploitation, regardless of the activities of prospectors and mining enterprises. While those activities add value to mineral deposits, they do not add more than the opportunity cost of those services.
Third, the assumptions and reasoning overlook the historical fact that exploration and mining properties around the world are purchased by enterprises from governments and other entities for prices in the form of lump sum payments, royalty arrangements or a combination of the two.

Fourth, arguments that nett value does not exist or is trivial imply that all activity to locate, assess and extract minerals from the ground is targeting materials that have zero or trivial inherent value. This begs the question as to why prospectors and mining enterprises have continued to engage in such supposedly futile activity in the long term, and to pursue vigorously rights to explore and mine.

Fifth, the arguments that all returns from mining should accrue to prospectors and mining enterprises implicitly assumes that the pattern of exploration activity associated with existing tenement regimes is consistent with economic efficiency. This assumption is incorrect. As demonstrated in section 12.3 of chapter 12, the main exploration tenement regimes applying in Australia tend to destroy the imputed nett value of minerals by inducing too much exploration, too soon. The imputed nett value of minerals in situ is destroyed by a combination of exploration in excess of the efficient quantum at that time and foregone returns on early exploration. The existence of imputed nett value is masked by the tendency of these poorly designed tenement systems to destroy it.

Sixth, to the extent that governments effectively siphon-off the nett value of minerals through royalty and de facto royalty regimes, such action will tend to reduce inefficiencies in the allocation of resources caused by imperfect tenure of the type described above. Therefore, in that context, keeping at least part of imputed nett value from exploration and mining enterprises may have a beneficial effect, rather than an adverse effect on the economically efficient supply of exploration effort. This matter is discussed in more detail in section 12.5 of chapter 12.

Seventh, as discussed in Chapters 9 and 10, numerous artificial impediments to exploration, mining and minerals processing activity have been created or permitted and left uncorrected by governments in Australia. The various artificial impediments have tended to dissipate or destroy potential imputed nett value. Once again, the existence of imputed nett value is masked by the tendency of poorly designed government policies to destroy it.

Eighth, profitability analyses indicating that median and average rates of return after company income tax in the mining sector are lower or no better than in the economy do not necessarily support the contention that imputed nett value is nonexistent. They involve serious errors by not:

- adding-back the royalty and de facto royalty payments to public and private sector entities, which appropriate part of imputed nett value;
- adjusting for the portion of imputed nett value that is dissipated or destroyed by imperfections in tenement systems as discussed above;
- allowing for the destruction of imputed nett value by numerous other artificial impediments to exploration, mining and minerals processing activity that have been created or permitted and left uncorrected by governments in Australia; and
recognising the tendency of most of the royalty and de facto royalty mechanisms and various artificial impediments in Australia tend to capture or destroy a greater proportion of imputed nett value the lower is the amount of imputed nett value.

A balanced assessment of the various assumptions and arguments leads to the conclusion that imputed nett value of minerals, as defined above, does exist at a level greater than zero, and is a differential, pure economic surplus that increases with the quality of deposits and individual units of ore in situ. The imputed nett value of minerals, which by definition excludes the risk-adjusted opportunity cost of all inputs other than minerals in situ, does not need to be captured by prospectors and mining enterprises to elicit an economically efficient supply of inputs to exploration and mining activity.

Over the past 225 years, many prominent economists have reached a similar conclusion. On that basis, they have argued that, at least in principle, a proportional government impost that has been carefully and competently designed to fall only on imputed nett value of a deposit or individual units of mineralisation within a deposit will not distort exploration, investment and operating decisions. Therefore, it will not interfere with an efficient allocation of resources.65

However, the controversy regarding this matter has highlighted an extremely important point. Policy instruments (such as royalty systems, government charges and taxes) used by governments to appropriate a portion of the imputed nett value of minerals must be designed to discriminate between returns required to elicit supply and surpluses above those returns. To the extent that such instruments fail to do so, and thereby impose a tax on returns required to elicit supply, they will interfere with an otherwise efficient supply of exploration and mining activity and fail to comply with the economic efficiency criterion.

Unfortunately, the practical task of designing a practical royalty or tax system that can capture a substantial proportion of the imputed nett value of minerals without interfering with an efficient allocation of resources involves a number of difficult problems. These problems have been addressed in chapter 13.

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7 DEPLETION AND SUSTAINABLE DEVELOPMENT

7.1 Mineral Resources – Platforms or Pitfalls for Sustainable Development?

Historically, State and Commonwealth Governments in Australia have perceived the mining sector to be a platform for or engine of economic growth. The source of this growth was considered to be linkages with other industries or potential industries and investment of economic surpluses arising from realisation of the imputed nett value of minerals.

Over the past 25 years, the role of the mining sector as an engine of growth in the Australian economy has been challenged on two fronts:

- There was concern in the late 1970s and early 1980s that a booming mining sector will result in shrinking agricultural and manufacturing sectors (“Dutch Disease”). Over the past decade, it has been argued that relative natural resource abundance predisposes economies to poor performance relative to resource-poor countries in terms of sustainable growth. (“Resource Curse” hypothesis). This has been attributed to a wide range of factors.
- Depletion of mineral resources has been portrayed by some conservationists and scientists as a constraint to sustainable development in Australia.

The applicability of Dutch Disease and Resource Curse arguments to Australia is scrutinised in chapter 8. The relationship between depletion of mineral resources and sustainable development is discussed below in this chapter.

Depletion may have negative economic consequences on a regional basis. Declining output ending with closure of a mine, will result in a downturn in economic activity, unless a replacement operation is opened. If mining was a major activity in the region, the local economic effects can be devastating. Historically, this problem has been experienced in some parts of Australia and will occur in future.

The probability of this problem occurring is likely to reduce as geographical area and the range of geological environments increase. Therefore, it is less likely at the State level than the regional level, less likely on an Australia-wide basis than for a State, and less likely globally than nationally.

The historical evidence in respect of Australia and the rest of the world indicates that depletion of known resources has not constrained growth. New discoveries and cost-reducing technological progress have generally more than offset depletion, and reserve to consumption ratios have been maintained at high levels on a very long term basis, both globally and in Australia. Globally, mineral prices have exhibited general long-term downward trends over the past century.

After reviewing, a range of indicators of global mineral resource availability/scarcity on a global basis, Jeffrey Krautkraemer concluded:

“Economic indicators of renewable resource scarcity do not provide evidence that non-renewable resources are becoming significantly more scarce. Instead, they suggest that other factors of non-renewable resource supply, particularly
the discovery of new deposits, technological progress in extraction technology, and the development of resource substitutes, have mitigated the scarcity effects of depleting existing deposits. It is an open question as to whether or not these factors will continue to keep pace with depletion, particularly with growing population and economic development in much of the world.\textsuperscript{66}

This open question is at the heart of the strong disagreement on the meaning and policy implications of sustainable development.

7.2 Assessment of Narrow and Broad Concepts of Sustainable Development

In chapter 2, it was explained that the multitude of views on the meaning of sustainable development in the context of mining activity tend to fall into two basic categories: a narrow concept and broad concept. Proponents of the narrow view tend to be pessimistic about new discoveries and technological advance offsetting depletion of mineral resources in the very long-run. The broad concept is generally supported by those who are optimistic about the effects of new discoveries and technological innovation.

Acceptance of the narrow concept of sustainable development as an objective of government policy would require extensive government intervention. It would indicate that governments should intervene to protect the natural environment from any adverse effects. Also, because of an inherent pessimism about the ability of market forces to induce sufficient exploration and research, it implies that governments should take action to constrain extraction of mineral resources and/or stimulate exploration and research so that mined resources are completely replaced in both qualitative and quantitative terms.

The inherent pessimism in relation to future supplies of mineral resources that underlies the narrow concept is not consistent with the historical record over the past 200 hundred years as documented in chapter 2. Perhaps history will not provide a useful guide to the future, but proponents of the narrow view have not provided any convincing evidence to support rejection of the lessons of history.\textsuperscript{67}

The narrow concept appears to go far beyond the reasonable requirements of intergenerational equity, by seeking to severely constrain the composition of the accumulated capital made available to future generations to ensure that quality of life is not diminished. While this has been supported by arguments about a low elasticity of substitution between reproducible capital and natural capital, there does not appear to have been any systematic effort to provide quantitative support for this position.


Government action based on the narrow concept will interfere with an efficient allocation of resources because that concept effectively places an infinite price on environmental resources, leaving no room for trade-offs that are in the interests of society. As a result investment and operational decisions will be interfered with to an extent greater than necessary to ensure social costs of adverse environmental effects are fully accounted for or internalised. These distortions will cause economic waste.

Constraining output of minerals deemed to be relatively scarce will discourage investment in production of, and exploration for those minerals. Attempts to ration supply over time in this way will simply reduce the supply in the long term, making it a self-defeating and economically inefficient policy.

Alternatively, if exploration for particular minerals is subsidised, additional deposits may be discovered before the ideal time to develop them. The results may be foregone interest on premature exploration outlays or an increase in capacity that drives down the price, offsetting the effect of the subsidy. Also, research in relation to substitutes and more economical usage would be inhibited. Moreover, resources would be drawn away from other activities. Once again the result of this distortion of the allocation of resources will be economic waste.

On the other hand, subsidising research into substitutes may discourage exploration and induce accelerated production of known resources. Resources will be misallocated again.

Pursuit of the narrow concept of sustainable development will hinder development rather than sustain it. This will occur because the rate of economic growth is a dynamic consequence of the extent to which resources are allocated efficiently.

Acceptance of the broad concept of sustainable development implies substantially less intervention by governments than the narrow concept. However, it indicates that governments still have a responsibility to ensure that:

- the ecological processes on which life depends are maintained or restored;
- mining, minerals processing and all other enterprises and governments are fully accountable for the social costs of adverse environmental and other effects of their activities.

As long as new discoveries and technological progress continue to offset the effects of depletion on known mineral resources and constrain mineral commodity prices, such action should satisfy reasonable requirements in respect of intergenerational equity. In any event, government intervention to properly internalise social costs of adverse environmental and other effects is an important requirement for an efficient allocation of resources, as explained in chapter 3.

The key issue is the optimistic view of new discoveries and technological progress that is used to justify the broad concept. The historical record over the past 200 years strongly supports this view. Periodic false “cries of wolf” during this period discredited the pessimistic view. However, that does not prove that the “cries of wolf” are wrong again. Logic based on current knowledge dictates that exhaustible resources may not be replenished by exploration and technical progress and used ever more economically through innovation, forever. But, current knowledge of future
events is limited, and forever is a very long time. Technical progress is proceeding at a rapid rate, renewable substitutes offer great possibilities, the world is a big place, and the universe is virtually limitless. Unfortunately, glib optimism is no better than brooding pessimism as a foundation for policy in respect of sustainable development. Like the pessimists, the optimists have not provided adequate data to support their position, although history is on the side of the optimists.\textsuperscript{68}

It seems that proponents of the narrow and broad concepts of sustainable development will continue to be separated by an enormous ideological chasm.

### 7.3 Depletion without Replenishment

Because of recurring bouts of pessimism about new discoveries and technological advances being able to offset depletion, economists have considered conditions for sustaining a constant level of consumption in an economy dependent on mineral resources without the benefit of new discoveries and technological progress to replace depleted reserves. The idea of maintaining a constant level of consumption has been proposed on grounds of intergenerational equity.\textsuperscript{69} It has also been suggested that a rational mineral resource owner would pursue the same target, indicating that this focus also has intragenerational relevance.\textsuperscript{70}

The fundamental requirement for sustaining the level of consumption is to maintain the aggregate productive capacity of the stock of capital. Depletion of mineral resources through mining reduces the natural component of that capital stock, while other components depreciate with usage and time. Investment is required to restore the productive capacity of the capital stock. In the absence of successful exploration and research to replenish mineral reserves, investment in other assets is required to compensate for depletion of natural capital.

To the extent that reproducible capital can be substituted for natural capital, the required compensatory investment in the former is equal to the reduction in the imputed nett value of the resource. That reduction is not the nett cash flow realised by mining in the current period. Instead, it is the nett present value of cash flows in respect of the relevant amount of production foregone in a later period or periods. The future output foregone could be incremental additions to production in a number of later periods or production during an additional period of operation.

In the discussion of “Timing of Extraction” (section 6.1.2), in chapter 6, it was explained that the present value of a mine will be maximised when production is allocated over time so that, in each period until exhaustion, marginal depletion cost is:

\textsuperscript{68} Ibid.
equal to the difference between marginal revenue and marginal cost; and
equalised between periods.

Marginal depletion cost was defined as the present value of the incremental surplus foregone by mining an additional unit in the current period rather than in the next best alternative period. Therefore, when the present value of a mine is maximised, the difference between marginal revenue and marginal cost rises over time at a rate equal to the discount rate.

Two important deductions follow from the analysis above. First, the reduction in the imputed nett value of the resource from mining in a particular year is the quantity of production in that year multiplied by the difference between marginal revenue and marginal cost (marginal depletion cost). Second, the closer (more distant) is the time of exhaustion of the resource, the larger (smaller) will be the reduction in the imputed nett value of the resource as a result of mining in the current period. In the case of a superior resource with a long remaining life, the reduction in the imputed nett value of the resource as a result of mining in the current period will be small relative to the imputed nett value of the resource realised in that period.

If an amount equal to the reduction of the imputed nett value of the resource in each period is invested in other forms of capital, consumption can be sustained at a constant level. It would be financed by the risk-adjusted returns on those investments plus the periodic realised nett cash flows that are not invested. As depletion proceeds, the former increase and the latter decrease.71

The investment rule for sustaining consumption needs to be adjusted in the event of exogenous shocks to mineral prices. Then, an adjustment needs to be made for capital gains or losses in respect of the remaining resources. In the event of the former (latter), less (more) investment in reproducible capital is required to sustain the aggregate capital stock in response to depletion of natural capital and thereby maintain consumption at a constant level.72

There are a number of obvious criticisms of the concept of sustaining a constant level of consumption by investing in reproducible capital to replace mineral resources not replenished by exploration and technical advances. These include criticisms advanced by proponents of both optimistic and pessimistic views concerning the capacity of new discoveries of minerals and technological advances to underpin sustainable development.

The task of calculating the portion of realised imputed nett value of minerals that needs to be invested to maintain consumption in the economy is difficult, because it

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72 Vincent, Jeffrey, and others, op cit, pp.277-279.
requires estimates of marginal costs, rather than average costs. However, estimates have been prepared, which indicate that indicate it is not impractical to do so.  

The focus on a constant level of consumption has been criticised as unrealistic, because the goal of most governments and their constituents is growing consumption. However, it is recognised that in the context of an exhaustible resource that is not replaced, a rising level of consumption will require a greater sacrifice of current consumption so that investment can be increased. Obviously, selection of an intergenerational equity criterion cannot be separated from the context provided by assumptions regarding new discoveries and technological progress.

Critics in the optimistic category have emphasised that, historically, discoveries and technological advance have more than offset the effects of depletion on. Therefore, they argue it is pointless to determine investment rules for the highly unrealistic case of zero new discoveries and technological advance.

Pessimists have criticised the assumption that the elasticity of substitution of man-made capital for natural capital is unity. They argue that it is lower and in some cases may approach zero. An elasticity of substitution less than unity will mean that each dollar’s worth of natural capital will need to be replaced by more than a dollar’s worth of reproducible capital to maintain consumption. Moreover, the marginal productivity of reproducible capital will fall as substitution proceeds.

Unfortunately, participants in the controversy regarding substitutability of reproducible capital for natural capital have addressed the issue only superficially. However, it is important to note that the significance of the issue is dependent upon the relevance of assumptions regarding the effectiveness of future exploration and technological advance in offsetting depletion.

Robert Solow has argued that the concept of sustaining consumption by investing in reproducible capital to replace natural capital could be extended to include the natural environment as well as mineral resources. However, he noted that it would be much more difficult to apply the concept to environmental assets for several reasons. A particularly important problem is that substitutability may be limited in some cases for technical reasons. Also, political limitations may apply in a larger number of cases because of the emotion that surrounds interference with some environmental assets. Another important problem is the greater uncertainty associated with environmental benefits and costs than those associated with mineral resources.

7.4 Depletion, Environmental Degradation and Genuine Saving

In the context of strong world-wide interest in sustainable development and underlying anxieties regarding depletion and degradation of natural resources, economists in The World Bank extended the concept of investing in reproducible capital to compensate for depletion or degradation of natural resources and to maintain the level of consumption. They explained that positive “genuine saving” is

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the key to sustainable development, because it adds to wealth or the value of the stock of capital, which in turn adds to capacity to provide future flows of benefits.

“Genuine saving” is the nett result of saving (additions to wealth) and dissaving (reductions to wealth) involving natural resources, human capital and built capital. “Genuine saving” is a more comprehensive concept of saving than that used in conventional national accounts. Just as investment in or depreciation of plant, equipment and buildings represents saving or dissaving, respectively, in respect of built capital, an addition to or depletion of mineral resources represents saving or dissaving in respect of natural capital. Degradation or improvement of the natural environment also represents dissaving or saving, respectively, involving natural capital. Expenditures on education and health outlays that lead to long term improvements in health represent saving and investment in respect of human capital, but have been recorded as consumption in conventional national accounts. Departure from the workforce as a result of aging, health problems or death is a form of dissaving in respect of human resources.75

In 1998, The World Bank released indicators of “genuine saving” in 1994 for 22 countries in the Caribbean and Latin America.76 In 1998, indicators of “genuine saving” in 1997 for more than 100 countries were provided.77 More recently, the World Bank published indicators of “genuine saving” in 1998 and 1999 for these countries.78

These indicators should not be construed as precise estimates of “genuine saving”, because there are some important gaps in respect of natural resource degradation and depletion, mainly because of unavailability or inadequacy of data. The only environmental degradation included was an imprecise estimate of costs associated with carbon dioxide (a “greenhouse” gas) emissions. Other important pollutants and land degradation were not covered. Also, nett depletion of fish stocks and subterranean water were excluded. Estimates of mineral resource depletion tended to be too high because they were based on average costs, rather than marginal costs, and because additions to resources did not seem to have been taken into account. However, estimates of mineral resource depletion tended to be too low because some mining and quarry products were not included.

There are also gaps in the indicators of “genuine saving” in respect of human capital. The pertinent portion of health expenditure and research and development outlays were excluded. These have been recorded as consumption in conventional accounts. However, Kirk Hamilton of The World Bank recently included estimates of these elements of “genuine saving” in extended indicators. Unfortunately, the issue of depreciation of human capital still requires consideration.79

75 Hamilton, Kirk, op cit.
79 Hamilton, Kirk, op cit.
After reviewing various imperfections in the indicators of “genuine saving”, Kirk Hamilton concluded, “On balance, genuine saving may be overestimated by several percent of GDP in many countries.”80

Kirk Hamilton also adjusted these “genuine saving” indicators to a per capita basis. Increasing aggregate wealth arising from positive “genuine saving” may be partially, fully or more than offset by the rate of change of population. Therefore, “genuine saving” per capita provides a much more meaningful guide as to whether or not an economy is on a sustainable development path.81

If “genuine saving” per capita is persistently positive, the capacity to provide per capita well-being should be rising continuously. The economy will be on a sustainable development path. If “genuine saving” per capita remains static, per capita income should be sustainable, but growth is not. Persistently negative per capita “genuine saving” indicates that per capita well-being will not be sustainable and will eventually exhibit a declining trend.

While the indicators of “genuine saving” per capita are incomplete, they still provide very important insights as to whether or not economies are on sustainable development paths. Analysis of these indicators yields disturbing results. In the majority of countries with per capita income below the median level, the indicator of per capita “genuine saving” is negative. While high income, developed countries generally achieved positive per capita “genuine saving” or change in wealth per capita, Australia was a notable exception. To the extent that the indicators overestimate “genuine saving”, improving the accuracy of the indicators will make the results more disturbing.

During the three-year period, 1997-1999, for which indicators of “genuine saving” are available for Australia, it appears that “genuine saving” per capita in Australia was negative and therefore, per capita wealth was declining. Although Australia’s rate of growth of GDP has been relatively high in the 1990s compared to most other developed countries, its rate of “genuine saving” per capita in the period 1997-1999 has been at the bottom end of the range for developed countries. It appears that Australia’s relatively strong rate of growth of GDP has been aided by relatively high population growth (at the top end of the range for developed countries), depletion and degradation of natural resources, and capital inflows.

If Australia’s weak “genuine savings” effort persists, development or economic growth and per capita well-being will not be sustainable. Obviously, this raises important policy issues that need to be addressed by Commonwealth and State Governments in Australia.

7.5 Policy Implications

Despite the controversy regarding the extent of future replenishment of depleted mineral resources by exploration and technological advance and substitutability of

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80 Ibid, p. 10.
81 Ibid.
reproducible capital for natural capital, it is feasible and necessary to derive principles for policy formulation from the preceding discussion in this chapter.

Doubts about the ability of explorers and researchers to produce the new discoveries and technological advances required to offset depletion of mineral resources, do not provide a case for constraining mining. Instead, they highlight the importance of not consuming all of the realised imputed nett value of minerals. As Robert Solow emphasised, mining is not the cardinal sin. It is consuming the rents from mining.82 In other words, it is important to ensure that sufficient of the realised resource rents are saved and invested to achieve objectives regarding economic development.

It is also important to ensure that the imputed nett value of minerals is not destroyed or dissipated as a result of poorly designed policies. To the extent that the resource rents are destroyed, the capacity to invest to sustain or increase future consumption is reduced. Chapters 9, 10 and 12 focus on policies that destroy resource rent. Additional examples of such policies have been included in chapters 11, 13 and 14.

If governments have doubts about exploration and technological progress continuing to mitigate the effects of depletion, the minimum prudent requirement is obvious from the analysis in section 7.3. It is appropriate that governments ensure that sufficient of the realised imputed nett value of minerals is invested in productive, reproducible capital to maintain society’s broadly defined aggregate capital stock intact and preferably increase it. However, in view of concerns about the elasticity of substitution of reproducible capital for natural resources and the inadequacy of simply maintaining consumption, governments will want to ensure that a larger portion of the realised resource rents is invested than indicated by the investment rule discussed in section 7.3 (the product of marginal depletion cost and current production with adjustments for capital gains/losses).

In a major report in 1991 on Mining and Minerals Processing in Australia, the Commonwealth Government’s Industry Commission proposed that all government mineral royalty revenue should be used to retire government debt or invested for purposes for which governments would otherwise be prepared to borrow. The Industry Commission emphasised that governments should not use such revenue to finance current government consumption expenditures. In 1998, the Productivity Commission, the successor to the Industry Commission, reiterated this advice in another major report on The Australian Black Coal Industry.83

The Industry Commission argued that governments should adopt royalty systems based on imputed nett value of minerals. However, the Commission did not explicitly address the issue of the proportion of resource rent that should be captured by such systems. However, the Commission preferred a combined royalty regime consisting of an ex ante payment in the form of a winning bid at a competitive auction and ex post payments based on economic profits or realised nett value.84 As explained in chapter 13, such a combined system should effectively capture 100% of the imputed

82 Ibid, p. 171.
nett value of minerals. Therefore, the Industry Commission’s proposal that all
government royalty revenues be invested implies that all of the resource rents should
be invested rather than consumed.

It has been suggested that such a policy would not be equitable between generations
because the present generation would not gain any benefit from resource rents realised
currently. However, that assumes that the present generation is not able to consume
services or interest from the resource rents invested. Such an assumption is not
correct. Investments generally yield benefits within generations as well providing
benefits to future generations.

Transitory price increases arising from exogenous circumstances mean that the
aggregate stock of capital and therefore consumption can be maintained by investing
less than the product of marginal depletion cost and current production. Similarly,
growth could be maintained by investing a smaller proportion of resource rents.
However, it does not follow that it would be sensible policy to reduce the proportion
of realised imputed nett value of minerals that is invested to support maintenance or
growth of future consumption. Indeed, in practical terms, a transitory price increase
provides an opportunity to increase investment without having to cut consumption.
The failure of governments in various countries to take advantage of such
opportunities has been identified as a factor probably contributing to the relatively
poor growth performance of natural resource-rich countries. This failure to take
advantage of commodity price windfalls has exacerbated the consequences of the
decline in investment in such countries that has generally followed mineral price
decreases.

The policies discussed above exhibit a strong, precautionary bias towards saving and
investment of realised resource rents from mining, especially if exploration and
technological advance continue to maintain resources and constrain mineral
commodity prices. If remaining superior resources have a long life, the reduction in
the imputed nett value of the resource as a result of mining in the current period will
be small relative to the imputed nett value of the resource realised in that period.
Then, most of the future consumption yielded by saving and investing all of the
realised resource rent from current production will serve the purpose of sustaining
growth of consumption, rather than just a constant level of consumption.

However, there are a number of reasons why a bias towards saving and investment of
resource rents appears to be prudent in the Australian context. These relate to general
economic circumstances as well as the mining sector.

First, the “genuine savings” rate in Australia appears to be negative and is at the
bottom end of the range for developed economies. That rate is clearly sub-optimal.
Australia’s weak saving performance appears to be related to disincentives to save
created by the tax-transfer regime in Australia, as well as to under-saving of resource
rents by governments. Second, there is uncertainty regarding how long new
discoveries and technological improvements can continue to offset depletion. Third,
exploration has fallen substantially because of land access uncertainties and other

85 Mikesell, Raymond, “Sustainable Development and Mineral Resources”, op cit, p. 84.
86 Vincent, Jeffrey, and others, op cit, p. 282; Solow, Robert, “An Almost Practical Step Toward
Sustainability”, op cit, p171.
difficulties arising from the native title regime. Fourth, there are existing biases against investment in Australia. These derive from the absence of a full set of contingency (risk/insurance) markets (a species of market failure), and distortionary aspects of the income tax regime. The latter include an element of double taxation of retained earnings, the absence of full loss-offsets, and arbitrary rather than economic depreciation provisions under the Australian income tax system.

While a bias towards saving and investment of realised resource rents from mining would be prudent, that should not absolve governments in Australia from action to correct existing government created (artificial) impediments to saving and investment. Australia’s negative per capita “genuine savings” rate means the economy has departed from a sustainable development path. This problem needs to be rectified by directly addressing the causes.
8 “RESOURCE CURSE” AND SUSTAINABLE DEVELOPMENT

8.1 Australian Mineral Wealth and “Resource Curse Thesis”

About 25 years ago, the traditional perception of the mining sector as an engine of economic growth in Australia was challenged by the argument that a booming mining sector will result in shrinking agricultural and manufacturing sectors. This became known as the “Gregory Thesis” or “Gregory Effect”, after being raised in the Australian context by Robert Gregory.87 Elsewhere it became known as “Dutch Disease” or “de-industrialisation”, a reference to Holland’s experience with a lagging manufacturing sector following booming natural gas exports.88

During the past decade, the challenge to the perception of the mining sector as a catalyst for economic growth has been broadened and intensified. This followed the formulation of the ‘Resource Curse Thesis” and suggestions that it applies to Australia. This theory effectively portrays mineral wealth as an obstacle to, rather than a foundation for sustainable economic development.

The gist of the “Resource Curse Thesis” is that relative abundance of natural resources predisposes countries to sub-standard performance in terms of sustainable development relative to resource-poor economies. Another aspect of this Thesis is that per capita growth rates after natural resource booms remain below pre-boom levels. In contrast, it is said that the star performers among developing countries from 1960 to the mid-1990s were typically natural resource-poor economies. According to the “Resource Curse Thesis”, relative natural resource-abundance is the common trigger for various social, political and economic factors contributing to poor performance. “Dutch Disease” is perceived to be just one of these factors.

While most of the discussion relating to the “Resource Curse Thesis” has focused on developing economies, it has been pointed out that, until recently, the long-term growth performance of natural resource-rich Australia has been disappointing compared to other advanced economies that are natural resource-poor. For example, in December 1995, in an article providing a succinct summary of the arguments supporting the “Resource Curse Thesis”, The Economist magazine noted that Australia:

- had one of the highest levels of wealth per head in the world as a result of its natural resources, according to a World Bank study;
- “…though still rich, has slipped relative to others for most of this (twentieth) century”; and
- “…..(had) blown the proceeds of …(its) wealth in competitive rent-seeking.”89

Another example was Kym Anderson’s consideration in 1998 of the applicability of the “Resource Curse Thesis” to Australia. He pointed out that Australia was well

endowed with natural resources relative to labour and capital, and that the Australian economy had performed relatively poorly over the long-term. After investigating a range of possible explanations, he suggested that the most likely reason was distortionary government policy regimes, such as protection of manufacturing industry. He commented that attempts since the late 1980s to dismantle such policies had resulted in Australia becoming one of the better performing instead one of the poorer-performing developed economies.  

8.2 Empirical Basis for “Resource Curse Thesis”

The “Resource Curse Thesis” has been based on generalisations derived from the results of several studies comparing the economic growth performance of developing countries. In general, these indicated that countries that are relatively rich in natural resources exhibited relatively low rates of growth of Gross Domestic Product (GDP) per capita. In contrast, the data indicated that the star performers among developing countries from 1960 to the mid-1990s were typically natural resource-poor economies such as Singapore, Hong Kong, Taiwan, South Korea and Thailand.  

The most influential of the studies underpinning the “Resource Curse Thesis” was a substantial econometric investigation by Jeffrey Sachs and Andrew Warner in 1995. They concluded:

“In our view this paper has documented a statistically significant, inverse, and robust association between natural resource intensity (measured by the ratio of primary commodity exports to GDP) and growth (measured by growth of GDP per capita) over the past twenty years. It is robust in the sense that it remains significant in cross-country growth regressions after controlling for a large number of additional variables that other countries have claimed to be important in explaining cross-country growth. The list of additional variables includes initial GDP, trade policy, investment rates, terms of trade volatility, inequality and the effectiveness of the bureaucracy. We also find that the effect remains when we add regional dummy variables and introduce alternative measures of natural resource abundance.”

Other empirical studies indicated that per capita growth rates in developing mineral exporting countries 1980-1993, following the boom in oil and mineral commodity prices in the 1970-1980 period, were generally a long way below those during the pre-boom period, 1960-1970. However, another important result was that, in the 1960-1970 period, the developing mineral exporting countries performed significantly better than the average of all developing countries.  

93 See Mikesell, Raymond, “Explaining the Resource Curse……”, op cit,
The generalisations regarding the sub-standard economic growth performance of mineral economies have been criticised by a number of economists, who concluded that these generalisations are contestable and dangerous. Criticisms of these generalisations have included the following. First, it has been pointed out that the growth records of these economies are actually very diverse. Mineral economies are included among the fastest and slowest growing economies in the world measured by in terms of GDP growth per capita. Second, the relative performance of natural resource-rich and natural resource poor economies varies with the period of study. Third, changes in social performance indicators provide a different picture to changes in per capita GDP. They tend to indicate a better performance by mineral economies as a group than per growth of GDP per capita.  

Empirical work by William Easterly and Ross Levine and subsequent analysis by Graham Davis indicate that internal strife resulting from ethnic divisions (ethnic fragmentation) may provide a better explanation of poor government policy making and resulting under-performance of mineral economies than relative abundance of natural resources. About 74% of the 23 mineral economies among the 109 countries included in this work exhibited greater ethnic fragmentation than the median country (50% were more fragmented and 50% less fragmented than the median) in the study group of 109. The mineral economies that performed relatively badly generally had a high degree of ethnic fragmentation and the good performers among mineral economies tended to exhibit relatively little ethnic diversity and fragmentation. According to Graham Davis, this indicates an “Ethnicity Curse”, rather than a “Resource Curse”, may plague mineral economies that perform poorly.

In a recent econometric study, Osmel Manzano and Roberto Rigobon re-visited Sachs’ and Warner’s conclusion that there was a statistically significant, robust, negative relationship between natural resource abundance and economic growth during the period 1971 to 1989. They systematically re-analysed the data, analysed alternative data sets, and investigated influences such as the degree of development, institutional settings (quality of the bureaucracy and ethnic fragmentation), the differential effects of agricultural and mineral exports, and debt burden. They found that:

- the negative relationship between natural resource abundance and economic growth was driven by mineral rather than agricultural exports;
- adjustments needed to be made for declining production of minerals per capita in the sample of countries;
- previous results of regressions were due to exclusion of variables correlated with mineral exports;
- the degree of development and institutional settings were important determinants of growth, but were not the cause of the “Curse” (relatively low growth);

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the cause of the “Curse” appeared to be related to “debt overhang” and when the econometric model was adjusted and re-run the effect of natural resource abundance disappeared.\(^{96}\)

Manzano and Rigobon concluded that the so called “Resource Curse” was due to the fact that these mineral exporting countries used high commodity prices in the 70’s as implicit collateral for increased foreign debt and experienced difficulties servicing the debt when commodity prices fell in the 80’s. Contractionary measures in response to the debt crisis exacerbated other effects of the decline in commodity prices.\(^ {97}\)

### 8.3 Effect of Natural Resource Abundance on Government Performance

A number of political scientists have formed the view that natural resource abundance per se is the basic cause of the “Resource Curse”. They concede that government mismanagement of the mining sector, government revenues from mining, and microeconomic and macroeconomic aspects of the economy have contributed to poor performance. However, they have argued that poor policy selection and implementation are not independent causes of sub-standard economic performance exhibited by natural resource-rich economies. They blame natural resource abundance per se for government mismanagement.

These political scientists have argued that economic development requires strong government, but natural resource abundance leads to weak government in one of two ways. First, politicians and bureaucrats could be subject to political capture by alliances of entities involved in large scale mining and agricultural activities and beneficiaries of a strong exchange rate who resist the implementation of microeconomic and macroeconomic measures that would facilitate sustainable economic growth. Second, substantial revenues flowing to the government from exploitation of natural resources facilitate loose macroeconomic policies, avoidance of microeconomic reforms and profligate spending programmes to satisfy various political interests seeking to benefit from the resource rent windfall.\(^ {98}\)

The natural resource abundance adversely influences government performance effectively absolves governments from responsibility and blame for poor management of natural resources and the economy. However, proponents of this view do not excuse poor performance in one area. They still insist that governments intervene extensively to induce diversification out of natural resource based industries and into export orientated manufacturing, to avoid the “Resource Curse”. However, it is not explained how governments that are supposedly weakened by natural resource abundance and incapable of effectively managing its consequences will be strong enough to direct government led diversification out of mining.


\(^ {97}\) Ibid, pp. 4, 25.

\(^ {98}\) For a more comprehensive summary of the arguments of the political scientists in relation to the cause of the “Resource Curse”, see Davis, Graham, op cit.,..
The theory that natural resource abundance *per se* is indirectly the single, basic cause of under-performance in natural resource-rich economies is severely undermined by statistical and econometric evidence to the contrary, which was discussed in the preceding section. It is clear from that evidence that:

- the theory that natural resource abundance causes poor economic growth performance by causing weak government is highly simplistic and suspect;
- other factors must have causative roles; and
- governments can produce positive as well as negative results in the context of natural resource abundance.

It is not clear why political scientists who promote the “Resource Curse Thesis” have tried so hard to portray under-performance of natural resource-rich economies as a condition with a single basic cause and universal application. Two possible answers are that:

- government behaviour is treated as endogenous rather than exogenous, which may be academically satisfying to political scientists;
- the theory supports a pre-existing ideological bias towards extensive government intervention to force diversification into sectors deemed to be “winners”, which in the case of developing countries they believe to be export orientated manufacturing industry following the success of Taiwan and Korea.

Other political scientists and some economists have argued that government performance is affected by economic performance rather than the reverse. The work by Easterley and Levine and Manzano and Rigobon discussed above indicates that government performance and therefore growth are affected by the institutional factors including the degree of ethnic fragmentation. Other economists perceive government performance to be an exogenous factor affecting economic growth. These views are inconsistent with the argument that natural resource abundance leads to poor government which, in turn, leads to poor economic growth. It seems much more plausible that poor or good governments will manage mineral wealth and economies badly or effectively, respectively, than that mineral wealth transforms effective governments into bad performers.

### 8.4 “Resource Curse” Mechanisms

Economists, political scientists and geographers have suggested several characteristics of natural resource based industries and economic mechanisms that may impart “Resource Curse” effects to economies that are relatively rich in mineral resources. Some of these factors had been discussed in the relevant literature long before the “Resource Curse Thesis” was popularised in the 1990s. Key characteristics and mechanisms are addressed briefly below.

#### 8.4.1 Declining Terms of Trade

Raul Prebisch popularised the view that economies heavily dependent on natural resources such as minerals and agricultural and grazing land face long-term

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99 Davis, Graham, op cit, pp. 223, 226.
deterioration in their terms of trade as prices of primary commodities decline relative to prices of manufactured goods. This was expected to result in sub-standard economic growth in countries relatively rich in natural resources.\textsuperscript{100}

This view relies on continuation of the downward long-term trend of primary commodity prices relative to prices of manufactured goods that has been evident for the past 100 years. Adjustments for the improving quality of manufactured goods have modified the downward trend, but have not eliminated it.

At the global level, Prebisch’s argument is consistent with the broad concept of sustainable development discussed in chapters 2 and 7. That concept is based on the optimistic view that technological progress and new discoveries of mineral resources will continue to more than offset depletion and other aspects of natural resource scarcity in the long term. At the country level, Prebisch’s hypothesis paints a negative picture of natural resource abundance as a basis for sustainable development, because of the effects of global natural resource abundance on international commodity prices.

It is ironic that proponents of the narrow concept of sustainable development (discussed in chapters 2 and 7) perceive that an increasing degree of natural resource scarcity, rather than abundance, is a constraint to sustainable development on a global basis. However, a natural resource-rich country in a world characterised by increasing scarcity of natural resources would benefit from increasing commodity prices and improving terms of trade. Such a country should be able to grow faster than other economies during the life of its exhaustible natural resources and, with a programme of sensible investment of resource rents, could sustain growth in the long-term.

Kym Anderson has challenged Prebisch’s hypothesis on the basis of an optimistic view of technological progress and new discoveries. He has argued that although demand for primary products has tended to increase at a slower rate than demand for manufactured goods, mining and agricultural sectors have experienced more rapid rates of technological progress and higher rates of total factor productivity growth than manufacturing. This has increased the relative importance of capital and reduced the relative importance of natural resources in production of these commodities, offsetting the scarcity of natural resources. The higher increase in supply relative to demand for primary commodities than for manufactured goods has caused prices of the former to fall relative to the latter. But, the effects of cost reductions and output growth have offset the effects of relative price reductions on incomes of natural resource rich economies.\textsuperscript{101} Raymond Mikesell has reached a similar conclusion.\textsuperscript{102}

It seems that declining terms of trade may not detract significantly, if at all, from the growth of countries relatively abundant in natural resources.


\textsuperscript{101} Anderson, Kym, op cit, pp.4-8.

\textsuperscript{102} Mikesell, Raymond, “Explaining the Resource Curse……”, op cit, pp. 192-193.
8.4.2 Growth Inducing Externalities

It has been argued by proponents of the “Resource Curse Thesis” that there are substantially many more growth inducing externalities associated with manufacturing than agricultural and mining activities. This view has also appeared from time to time in the economics literature. Indeed it can be traced back 225 years through Alfred Marshall and David Ricardo to Adam Smith. In discussions of the “Dutch Disease” and “Resource Curse Thesis” attention has focused on externalities in the form of industry “linkages” and technology demonstration effects.

Albert Hirschman’s influential treatise on economic development, which was published in 1958, promoted the importance of backward and forward linkage effects between industries for stimulating development. Hirschman argued that agriculture was characterised by low backward and forward linkages, mining by low backward linkages and high forward linkages, manufacturing of intermediate products by high backward and high forward linkages and manufacturing of final products by high backward and low forward linkages. Backward linkage was considered to be the most important, but an industry offering a combination of high backward and forward linkage effects was a highly prized opportunity. On this basis, Hirschman claimed that the superiority of manufacturing over agriculture, and to a lesser extent mining, was “….crushing. This may yet be the most important reason militating against any complete specialisation of underdeveloped countries in primary production.”

However, Hirschman noted that the case against reliance on agricultural and mining activities becomes weaker, the more advanced are the technology and techniques that are utilised. Also, production of ferrous and non-ferrous metals and petroleum products were included in the industrial category, characterised by a combination of high backward and forward linkages, which Albert Hirschman described as highly prized opportunities from an economic development perspective.

The concept of externalities in the form of technology demonstration effects is based on the idea that seeing others successfully apply technological advances encourages the adoption of new, better techniques. These technology demonstration effects have been referred to as “learning by doing” induced technological progress, but “learning by seeing others doing” would be more accurate terminology.

Technology demonstration effects external to enterprises and internal to industries were originally assumed to characterise manufacturing. However, it has been widely acknowledged that government attempts in Australia and many natural resource-rich developing countries to promote diversification into import competing manufacturing industry by erecting import tariff and quota barriers were dismal failures. As a result, proponents of the “Resource Curse Thesis” now assume that export orientated manufacturing is characterised by technology demonstration externalities not matched

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105 Ibid, p. 110.
in other sectors. Indeed, they advocate diversification from mining into this activity on the basis of that assumption.

It must be emphasised that this assumption is only an ideological supposition that has not yet been proven empirically. Given the role of technological progress in driving down real prices of mineral commodities relative to manufactured goods, as discussed in the previous section, the assumption must be open to serious question.

Anthony Scott and Peter Pearse have criticised proposals that natural resource-rich countries, including developed economies like Australia and Canada, should diversify into so called “sophisticated” or “high-tech” industries to overcome excessive dependence on “old economy” natural resource-based industries. Scott and Pearse pointed out that these arguments have ignored the history of technological advances in the natural resource-based industries. They also mistakenly assumed that modern exploration, development, production, processing and management activities in respect of natural resources rely on low-level technology. According to Scott and Pearse, “….the opportunities today for further applications of high technology to the resources sectors are limitless.”

In addition, the preoccupation of Resource Curse Thesis proponents with export orientated manufacturing overlooks the rapid rate of development and introduction of new technology applicable to service sectors. This must raise further doubts about the assumed superiority of technology demonstration externalities in the export orientated manufacturing sector. Indeed, the share of service sectors has been growing and the share of manufacturing has been contracting inexorably as developed economies have grown.

8.4.3 Protectionism

It is widely acknowledged that protectionism is a particularly important mechanism imparting “Resource Curse” effects to economies that are relatively rich in mineral resources. This has been stressed by both proponents and critics of the “Resource Curse Thesis”.

Australia provides a sad example of how protectionism can undermine economic performance in a relatively natural resource-rich, high-income country. Early in the twentieth century, when Australians enjoyed the highest standard of living in the world, the Government of the Commonwealth of Australia made the serious error of adopting a policy of protecting selected manufacturing industries with import tariffs. The policy supported judicially determined and government sanctioned wages that were too high for Australian manufacturers to be internationally competitive. However, at various times, the protectionist policy was justified on economic development grounds. Between the early 1900s and the 1990s, these misguided, interlinked wages and protectionist policies seriously undermined the performance of the agricultural, mining and processing sectors in which Australia had a comparative advantage and upon which its prosperity had been based.

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107 Scott, Anthony, and Pearse, Peter, op cit, pp. 165-166.
Australia’s protection policy was not seriously challenged at the political level until a one-off tariff cut was made in 1973. After considerable political criticism of that decision, the highly protectionist policy remained intact for another decade and a half before a substantial programme of tariff cuts recommenced.

In the meantime, in the 1950s and 1960s, developing countries were urged by various “authorities” to eschew dependency on natural resource exports in favour of government-led industrialisation. This advice was based on Prebisch’s hypothesis regarding declining terms of trade for countries reliant on natural resource exports, and claims that manufacturing offered far more growth inducing externalities. The recommended approach was import-substitution behind trade barriers in the form of import tariffs and quotas. Over the next 20 years this approach failed almost everywhere.¹⁰⁹

In 1995, Jeffrey Sachs and Andrew Warner published results of an important econometric investigation of the effects of trade policy on economic growth. They found:

- strong evidence that protectionist trade policies reduce overall growth when controlling for other variables;
- that accelerated growth was evident in countries that had recently undertaken reforms;
- that open economies adjusted at a significantly faster rate than protectionist economies from being primary-intensive to manufactures-intensive exporters;
- strong evidence of upward convergence of rates of growth among open economies; and
- that open economies successfully avoid balance of payments crises, while many closed economies eventually succumb to such crises.¹¹⁰

Subsequent econometric work by Xavier Sala-i-Martin confirmed the importance of openness for economic growth.¹¹¹

Consistent with these findings, Kym Anderson pointed out that Australia’s growth performance was relatively poor for most of the twentieth century, but following the commencement of programmes of dismantling import barriers and increasing domestic competition, Australia has been performing much better than the OECD average.¹¹²

These results are not surprising. Protection interferes with an efficient allocation of resources and undermines comparative advantage. In the process, it penalises exporters and unprotected import competing industries by raising their costs, which they cannot generally pass on in world markets, and sustaining the exchange rate at a

¹¹² Anderson, Kym, op cit, pp. 1, 11.
higher rate than it otherwise would be. This destroys resource rents. Inevitably, economic growth suffers.

Unfortunately, despite the evidence against protectionism, it keeps re-emerging in old or new guises. Two pertinent examples are provided below.

In the late 1990s, because of political pressure, the Commonwealth Government effectively halted, at least temporarily, the import tariff reduction programme that had been underway for a decade. The future of protection policy in Australia remains unclear.

With regard to natural resource-rich countries generally, many proponents of the view that relative natural resource abundance causes under-performance have criticised protectionism. However, they have recommended government-led diversification into export-orientated manufacturing, apparently funded by the government share of resource rents. Their supporting arguments are similar to those used to support protectionist development policies for resource-rich countries in the 1950s and 1960s, except that they also point to the success of natural resource-poor Korea and Taiwan in export-orientated manufacturing. This is protectionism in disguise. It is subject to the same criticisms and is likely to have similar effects. The only difference is that, rather than destroying resource rents, it wastes them.

### 8.4.4 Destruction of Resource Rents

Sustainable development based on natural resources is undermined to the extent that resource rents are destroyed. Obviously, destruction of imputed nett value reduces capacity to save and invest resource rents. Destruction of resource rents also reduces or defers investment in mining and processing.

The literature on the “Resource Curse” has usually discussed destruction of resource rent in terms of the concept of “competitive rent seeking” or “rent seeking”. This concept relates to circumstances in which rents are dissipated or destroyed by allocating resources to capture rents in competition with others. That is, realised rents are reduced by competition to capture them. The size of the pie is reduced by competition to carve it up or share it. The result is social or economic waste.

In this section, the waste under scrutiny occurs during the process of appropriating rents. Wastage of rent after it is captured, is a separate problem. The latter is discussed in the next section.

Unfortunately, the term, “competitive rent seeking”, has been applied to both of these types of waste in discussions of the “Resource Curse Thesis”. For example, in an article on the “Resource Curse Thesis” in 1995, *The Economist* magazine asserted that Australia and Brazil were outstanding examples of natural resource-rich countries that “…..have blown the proceeds of their wealth in competitive rent-seeking.”

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Economist did not define “competitive rent seeking”, but the context indicates that the author was referring to a combination of destruction and wastage of resource rents through poor government policy influenced by special interest groups.  

Also, some discussions of “rent seeking” have not adequately distinguished between destruction and re-distribution of rents. Another problem is that the term “rent seeking” tends to focus attention on the activities of self-interested entities in the economy, rather than highlighting the importance of formulating government policies to minimise opportunities for destruction of rent.

To avoid confusion about the meaning of “(competitive) rent seeking”, discussion in this report will focus directly on destruction or dissipation of resource rent and on poor design of government policy instruments that lead to such economic waste or misallocation of resources. These various policy flaws are referred to as artificial impediments to sustainable economic development based on mineral wealth or just artificial impediments.

In the “Resource Curse” literature, competitive rent seeking or, in our terminology, destruction of rents, is perceived to be a very important mechanism explaining relatively low growth in natural resource-rich countries. In subsequent chapters, it will be demonstrated that it is certainly important in Australia. In this country, Commonwealth and State Governments, by intervention and inaction, have created a plethora of artificial impediments to sustainable economic development based on mineral wealth. These cause production inefficiencies in the economy. In the case of the mining sector, this misallocation of resources is manifested by at least partial destruction of imputed nett value of minerals or resource rents.

These effects reduce the potential contribution of mineral wealth to sustainable economic growth in two ways. First, the destruction of imputed nett value reduces capacity to transform natural capital into man-made capital by means of saving and investment of realised resource rents. Second, investment in mining and processing is reduced or deferred.

### 8.4.5 Wastage of Resource Rents

Wastage of realised resource rents is widely acknowledged as a very important mechanism contributing to under-performance of countries relatively rich in mineral resources. Both proponents and critics of the “Resource Curse Thesis” have been critical of policies that waste the share of resource rents collected by governments.

All too often, governments of resource-rich countries have allocated their share of resource rents to fund lavish government expenditure programmes. In addition, some governments have used their resources and booming prices as collateral to support foreign borrowing to fund these government programmes. While sound public investments can be important facilitating mechanisms for economic growth, the focus

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115 Anonymous, The Economist, op cit, p. 103.
of expenditure programmes prompted by natural resource booms has often been on
government consumption and investments with low or negative yields.\footnote{Anonymous, \textit{The Economist}, op cit, pp. 102-103; Mikesell, Raymond, “Explaining the Resource Curse……”, op cit, p. 194.}

This behaviour has not been confined to resource-rich developing economies. In an
article on the “Resource Curse Thesis”, \textit{The Economist} suggested that Australia had consumed too much, invested too little and had misallocated investment of the realised resource rents.\footnote{Anonymous, \textit{The Economist}, op cit, pp. 102-103.}

While many proponents of the view that relative natural resource abundance causes
under-performance have criticised wastage of the government share of resource rents, they have devised a new way of wasting this revenue. They have advocated
government funding of diversification into export-orientated manufacturing. Some proponents of the “Resource Curse Thesis” have also advocated suppression of
natural resource based industries.\footnote{See the summary of these views in Davis, Graham, op cit.} That is another way of destroying resource rents.

It has not been demonstrated that the benefits of government funded diversification
into export-orientated manufacturing exceed the costs. Richard Auty and Alyson
Warhurst attempted to justify the approach on the basis that investment of resource rents in export orientated manufacturing compensated for resource depletion (see chapter 7). Indeed, Auty argued that investment to compensate for depletion implies
diversification.\footnote{Ibid, p. 22; Auty, Richard, “Mineral Wealth and the Economic Transition: Kazakhstan”, \textit{Resources Policy}, Vol. 24, No. 4, p. 247.} However, such investment has an opportunity cost. The resource rents allocated to subsidising manufacturing activity could have been invested elsewhere. Also, labour and capital will be diverted or bid away from industries in which the country has a comparative advantage, raising their costs and reducing the
resource rents yielded.

The proponents of extensive, government-led diversification from mining into export-orientated manufacturing do not explain how constraints on mining and subsidies to manufacturing can be justified in terms of the economic efficiency objective. Such policies will distort the allocation of resources. Because economic growth is the
dynamic extension of the degree to which economic efficiency is achieved, these policies will also be inimical to sustainable economic development.

In natural resource-poor Korea and Taiwan, examples commonly cited to justify this policy approach, drawing resources into export-orientated manufacturing was more likely to be consistent with their comparative advantage than contrary to it. That comparative advantage certainly was not based on natural resource abundance.

In any event, the diversification argument is not supported by the empirical evidence.
On the basis of a review of the data on comparative growth performances, Raymond
Mikesell concluded that variations in growth of economies heavily dependent on
mineral exports were not closely related to differences in economic structure, such as
the degree of diversification.\footnote{Mikesell, Raymond, “Explaining the Resource Curse……”, p. 197.}
8.4.6 “Gregory Effect” or “Dutch Disease”

The “Gregory Effect” or “Dutch Disease” is widely regarded as an important explanatory factor of “Resource Curse” symptoms. The essence of this model can be summarised as follows.\textsuperscript{121}

A major mineral development or substantial mineral commodity price increase creates a surge in foreign exchange sales. This causes the nominal exchange rate to appreciate and an increase in domestic income and the money supply. The former reduces the magnitude of the mineral commodity price increase and reduces the price of other tradeable commodities in terms of local currency. The increase in domestic money supply and income leads to an increase in demand for goods and services. Imports increase, ameliorating the rise in the nominal exchange rate, and the prices of non-tradeable goods rise. The combination of an increase in the nominal exchange rate and higher domestic prices results in an increase in the real exchange rate (defined as an increase in the price index of non-tradeable goods to the price index of tradeable goods).

The appreciation in the real exchange rate disadvantages (through lower prices and higher costs) industries producing tradeable products that do not benefit from any substantial increase in mineral commodity price(s) that triggered the surge in foreign exchange earnings. These industries contract. Capital and labour are drawn into the expanding mining sector and non-tradeables sectors from the contracting industries.

The success of the mineral development or anticipated persistence of the mineral commodity price increase may attract foreign capital for further exploration and development activities. Also, governments and/or holders of titles to resources may borrow abroad on the strength of those resources and high mineral commodity prices. These events strengthen the effects described above.

The contraction of the manufacturing sector and other industries producing tradeables that do not benefit from a commodity price surge has been referred to as the “Disease” or “de-industrialisation”. But, the outcome described above should not be construed as a “disease”. It is simply the result of economic adjustment to a change in economic circumstances or comparative advantage.

Unfortunately, the adjustment problem is complicated by the highly cyclical nature of prices of mineral and agricultural commodities. The process of adjusting to a price boom is inevitably followed by adjustment to falling prices. The severity of the latter problem will depend not only on the nature of the downturn in prices, but also on the effectiveness of management of the boom. Mismanagement of the boom exacerbates the problem of managing the bust.

There are two reasons why adjustment problems may translate into a real “disease”. One was alluded to in sub-section 8.4.2. The other was identified in the previous paragraph. That is, a real disease could emerge if:

- there are growth inducing externalities that are reduced as a result of the adjustment process; and
- governments mismanage the adjustment process.

The issue of growth inducing externalities was addressed in the context of the “Dutch Disease” by Sweder van Wijnbergen and Jeffrey Sachs and Andrew Warner.\(^\text{122}\) The former discussed demonstration effect (learning by doing) externalities and the latter discussed both these and linkage effects. Both forms of externalities are discussed in sub-section 8.4.2. They considered such externalities in respect of the manufacturing sector, which they assumed would be the sector contracting in response to a boom in a natural resource based industry.

On the assumption that the demonstration effect and linkage externalities are much greater in the contracting sector, assumed to be manufacturing, than in the expanding sectors, there will be a decline in growth that is not consistent with economic efficiency. If the assumption is correct, there is a case for a subsidy to manufacturing to internalise the externalities even without the mineral boom, and for an increase in the subsidy in the event of such a boom.\(^\text{123}\)

However, as discussed in the preceding section, the assumption is contestable and has not been empirically substantiated. Sachs and Warner concluded:

“The links of these Dutch Disease Effects to the loss of production externalities, however, remains speculative and as yet unproven.”\(^\text{124}\)

There are a number of ways in which governments in various countries have created a genuine economic “Disease” by mismanaging the adjustment process. Some of these are summarised briefly below.

- Import barriers may have been increased or subsidies provided in response to contraction of tradeable goods industries. This would have tended to reinforce the appreciation of the nominal exchange rate and increase costs in unprotected sectors. The comparative advantage of the booming minerals sector would thereby have been undermined.
- After subsidence of the boom, protective measures may have been retained, supporting the nominal exchange rate at an artificially high level.
- Central bank intervention may have maintained the nominal and/or real exchange rate at an artificially high level. This would have made interfered with the adjustment process for minerals and other tradeable goods sectors.
- Governments may have allocated increased revenues from natural resource based industries to fund government consumption programmes and low yield

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\(^\text{123}\) Ibid.

investments. When mineral prices fell substantially, consumption could not be maintained.

- Governments may have borrowed overseas in expectation of continuing increased revenues and have spent the proceeds on government consumption and low yield investments. When mineral prices declined substantially, consumption could not be maintained and debt servicing problems arose.

All of these problems would have impeded sustainable economic growth. None of them should be blamed on the good fortune of natural resource abundance or an export boom. They all reflect mismanagement of the process of adjustment to realisation of natural resource wealth and spikes in commodity prices. They are symptoms of the curse of poor government, not a “Resource Curse”.

### 8.5 Policy Implications

It follows from preceding sections of this chapter that any symptoms of the so-called “Resource Curse” are really symptoms of inappropriate government policies, rather than natural resource abundance. Such policies result in destruction, over-consumption, and inappropriate investment of resource rents, and mismanagement of economic adjustment processes associated with resource booms and the cyclical nature of commodity prices.

The solution to under-performance in natural resource-rich economies is to correct existing policy flaws. A strategy of suppressing and/or exiting natural resource-based industries in which a nation has a comparative advantage would not correct a policy flaw. Instead, it would add another monumental policy mistake to those that have already been made.

The problems discussed in preceding sections of this chapter can be effectively managed so that natural resource abundance and commodity price booms can be turned into good fortune rather than bad luck. A few basic guiding principles for governments have been briefly specified below. Some of these principles will be discussed in more detail in subsequent chapters.

- As recommended in the “Policy Implications” section of chapter 7, it is important to ensure that sufficient of the realised resource rents are saved and invested to achieve objectives regarding economic development. In this regard, there is a strong case for a bias towards saving and investment rather than consumption of the resource rents.

- Governments should not treat realised natural resource revenue windfalls as permanent income gains, particularly in the case of spikes in commodity prices. The revenues accruing to governments should be allocated to an investment and stabilisation fund, which initially would hold foreign currency assets and repay government foreign debt to reduce the impact of the surge in foreign exchange earnings on domestic demand and the real exchange rate. Subsequently, interest and some of the capital in the fund can be invested cautiously and productively in essential infrastructure and in enhancing human capital. These domestic and
foreign investments can be used to help maintain domestic consumption and investment when revenues from the booming sector decline.

- Use fiscal and monetary policy to maintain a low inflation rate. That will help to maintain competitiveness of export and import competing sectors.

- It is important to avoid interference with international flows of goods and capital. Such interference will impose handicaps on industries in which Australia has a comparative advantage lead to an inefficient allocation of resources and reduced economic growth.

- The exploration and mining tenement system needs to be re-designed and other artificial impediments relating to land access need to be addressed to avoid destruction of resource rent. These matters are discussed in detail in chapters 11 and 12.

- Governments need to ensure that providers of infrastructure services, such as electricity, natural gas, water, and transport, are not able to exercise monopoly power when providing services to the mining, processing or any other sector. Chapter 10 includes further discussion of this issue.

- Subsidies, incentives or special deals for particular sectors should be avoided. Such arrangements will create artificial impediments to sectors exposed to international competition and interfere with efficient resource allocation. Further discussion of artificial impediments has been presented in chapters 9 and 10.

- Taxation and mineral royalty regimes should be designed to minimise inefficiencies in resource use/allocation and avoid creating artificial impediments. Adverse effects of taxation on economic efficiency have been discussed briefly in chapter 10. Royalty policy has been discussed in detail in chapter 13.

Incidentally, following these policy guidelines would ensure that governments:
- do not destroy the resource rent windfall; and
- do not waste their revenue windfall.
9 ARTIFICIAL IMPEDIMENTS TO SUSTAINABLE DEVELOPMENT BASED ON MINERAL WEALTH

9.1 Concept of Artificial Impediments

Government intervention has created artificial impediments to sustainable economic development and particular sectors of the economy through poor design of policy instruments, causing unintended distortions of otherwise preferred economic decisions and consequent misallocation of resources. The offending policy instruments may have been intended to correct “market failure”, appropriate resources for government use, re-distribute income or serve some other purpose of government, but performed the intended functions imperfectly, causing collateral damage. This has sometimes been described as “government failure” to complement the term “market failure”, which is commonly used by economists to refer to circumstances in which markets or the price system have failed to allocate resources efficiently. In a sense, “market failure” that persists could also be described as “government failure”, because government has failed to take appropriate corrective action.

Governments cause artificial impediments. Governments that are responsible for artificial impediments, can eliminate them, and have a responsibility to do so.

It is important to distinguish between natural impediments and artificial impediments. Natural impediments include remote geographical locations, harsh climatic conditions, difficult topography, geological and metallurgical constraints, conflicts with use or conservation of other natural resources, constrained access to complementary natural resources, etc. Governments cannot eliminate natural impediments. Governments and business enterprises have to surmount or otherwise cope with them.

Artificial impediments are typically unintended side-effects of government intervention. Quite often, artificial impediments are not recognised as impediments to sustainable economic development, because their effects are not adequately perceived or understood. For example, historically, governments perceived import tariffs and quotas to be devices to provide incentives to particular manufacturing industries and to generate jobs. They often failed to recognise that import barriers adversely affect the level of activity and jobs in unprotected export and import competing industries through their impact on the nominal exchange rate, the wage structure and other operating costs.

Policy measures described as “incentives” are often artificial impediments in disguise. Unfortunately, someone always has to pay. “There is no such thing as a free lunch” in economic affairs. “Special incentives” to some industries are other industries’ artificial impediments. For example, a special tax break, grant or other form of subsidy for one industry means higher tax burdens, fewer benefits and/or more inflation for other entities in the economy. Similarly, protection of some industries

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125 The analysis in this section draws heavily on earlier work by the author, specifically, Willett, Ken, Clipping the Wings of Eagles: Artificial Impediments to Mining and Minerals Processing in Australia, Perth: Institute of Public Affairs, 1992, pp. 5-10.
through import barriers imposes burdens on other activities competing in world markets via higher costs and a higher exchange rate.

In general, artificial impediments cause production inefficiencies in the economy by inducing producers to alter otherwise efficient economic decisions. In the case of mining and processing, they may distort economic decisions concerning:

- industries or activities in which to participate;
- the amount, timing and location of exploration;
- the timing and magnitude of investment in mining and processing activities;
- the extent of recovery in mining and processing;
- production methods;
- input mixes; and
- location of activities.

The consequences will be:

- at least partial destruction of imputed nett value of minerals or resource rent;
- lower investment and output in adversely affected industries and the economy than would otherwise be the case.

Artificial impediments involve government intervention that discriminates against particular types of economic activity, locations or ways of operating without valid economic reasons. Well-designed government measures that discriminate in order to improve efficiency by correcting “market failure”, such as under-provision of public goods, excessive pollution, or abuse of monopoly power, are not artificial impediments.

### 9.2 Significance of Artificial Impediments Affecting Mining and Processing

Governments in Australia have created a plethora of artificial impediments to sustainable economic development. Many of these adversely affect the mining sector and associated processing activities. There is no doubt that numerous artificial impediments have combined to destroy at least part of the imputed nett value of minerals or resource rent, to cause substantial under-exploitation of mining and processing opportunities in Australia, and as a result, to impose substantial costs on the Australian economy.

A decade ago, the Industry Commission attempted to quantify the impacts of some, but not all, of the artificial impediments affecting mining and processing in Australia. A special version of the ORANI econometric model of the Australian economy, known as ORANI-MINE, was used. This version allowed detailed attention to be given to matters affecting mining and processing.

The Industry Commission modelled the elimination of a limited range of government induced impediments to the mining and minerals processing sectors. The reforms in the assessment included:

- the complete removal of assistance to manufacturing industries;
- a 25% reduction in 1987 levels of agricultural assistance;
- removal of rail and sea transport impediments; and
- improved efficiency in electricity supply.

Such a reform package is far from complete. Indeed, it excludes many important artificial impediments described elsewhere in this report. However, the estimated gains were still substantial.

The results were included in an extensive report on *Mining and Minerals Processing in Australia*, which was published in 1991. It was estimated that mining output would expand by 14.2% on average in the long-run. The estimated increases for various mining and processing activities included:
- black coal mining, 35.4%;
- alumina refining, 16.5% and aluminium smelting, 6.3%;
- nickel smelting and refining, 12.6%;
- silver, lead and zinc processing, 11.8%;
- other non-ferrous metals processing, 7.3%; and
- basic iron and steel, 1.3%.

The positive effects of the reform package were not confined to the mining and processing sectors. The estimated nett effect of the reduction of impediments considered in the econometric modelling was an expansion of Australia’s Gross Domestic Product (GDP) by over $A11,000 million per year.\(^{126}\)

Unfortunately, the Industry Commission was not able to quantify the effects of removing many other artificial impediments affecting mining and processing activities. It considered that such additional reforms could lead to further substantial benefits to the mining and processing sectors and to the economy as a whole.

The Industry Commission summarised its conclusions as follows:

“….the Commission is convinced that the potential of mineral resource based industries – in terms of the contribution they could make to the Australian economy – has yet to be realised. This is despite the fact that the activities under reference already account for almost a tenth of Gross Domestic Product, half of merchandise exports and commonly up to a fifth of annual investment spending. A major reason for this underperformance is that mining and early-stage mineral processing activities are hindered by numerous impediments. The Commonwealth and State/Territory and local governments are largely to blame for this sorry state of affairs, however well meaning and apparently justified the intent of their myriad interventions. But this conclusion should not be interpreted as merely pro-mining. Rather, the Commission would wish to see a situation emerge as quickly as possible in which mining and processing activities shoulder properly attributable costs – but only those costs. Stripping away unnecessary regulation and simplifying the remainder, combined with successfully addressing impediments in other parts of the economy which restrain mining, would dramatically improve the cost competitiveness of these industries. This would be partially offset by the

imposition of any necessary additional costs associated with maintaining an acceptable environment. Importantly, acceptance of the recommendations contained in this report should lead to more ‘value adding’ activity being undertaken in this country…………..Current government policies toward mining and minerals processing are not ‘clever’. It is not clever to erect a whole array of impediments to one of the few activities in which Australia enjoys a clear comparative advantage.”

Indeed, government policies in Australia have been so extraordinarily “unclever” that the rate of return on aggregate exploration and mining investment for a number of decades has been no better than the average for all industries. This implies that the aggregate resource rent from mining, in excess of the portion captured by royalty regimes, de facto royalty schemes and other taxes, has been completely destroyed.

A number of distinguished economic commentators have noted that the Australian economy performed poorly relative to other developed/advanced economies for most of the twentieth century. This was attributed to matters described as artificial impediments in this report. Examples have been discussed briefly below.

In 1991, John Stone, a former Secretary of the Commonwealth Treasury pointed out that Australians enjoyed the highest standard of living in the world in the early years of the twentieth century. This was based on strong agricultural, pastoral and mining industries and associated processing and manufacturing industries, which he described as “the industrial eagles of that day.” He attributed Australia’s slide down the standard of living rankings during the next 80 years to government created impediments to these “industrial eagles”. Those artificial impediments were judicially determined, government sanctioned wages in excess of those that could be afforded by internationally competing manufacturers, and import barriers to protect those manufacturers from being put out of business. Costs in pastoral, agricultural, mining and processing industries rose despite relatively superior performances in raising productivity. As a result, these industries underperformed relative to their potential. He described government wages and protection policies as the twin blades of shears that “steadily shore away the wings of our internationally competitive eagles”. He argued that everyone was worse-off as a result of these policies, including employees in protected industries.

As explained in chapter 8, The Economist magazine argued in December 1995 that although Australia is still rich partly because of its natural resources, it slipped relative to others for most of the twentieth century. The Economist argued that Australia had blown the proceeds of its wealth in competitive rent-seeking. The relevant mechanisms included faulty policies described as artificial impediments in this report.

Chapter 8 also referred to analytical work by Kym Anderson in 1998. Anderson pointed out that the Australian economy had performed relatively poorly over the long-term. After investigating a range of possible explanations, he suggested that the most likely reason was distortionary government policy regimes. In other words, the

127 Ibid, Volume 1, p. 169.
128 Stone, John, op cit, pp. 13-14.
cause was considered to be artificial impediments. Anderson commented that attempts since the late 1980s to dismantle such policies had resulted in Australia becoming one of the better performing instead one of the poorer-performing developed economies.130

9.3 Why Processing Appears Inhibited More Than Mining131

For decades, politicians, senior public servants, and business leaders have complained that the amount of minerals/energy processing in Australia has been disappointing, having regard to Australia’s abundant world-class natural resources, its infrastructure base, and political and social stability. These complaints stand in stark contrast to a widespread smugness regarding the performance of the mining sector. Governments and others whose views mould public opinion have become complacent about the mining sector, because Australia is a low cost producer by world standards of many products of mining.

Are the complaints about inadequate processing and complacency regarding mining justified? In both cases, the answer is, “no”.

While it is apparent that Australia’s potential comparative advantage in minerals/energy processing has not been fully exploited, underperformance of the mining sector has been masked by the existence of some outstanding mines. Yet, the return on aggregate exploration and mining investment in Australia has been no better than the average for all industries. Australia’s potential comparative advantage in mining has been substantially frittered away, just as it has in processing. Mining faces most of the natural and artificial barriers affecting mineral processing. However, superior mining sites are better able to carry the burden of artificial impediments than potentially good processing sites. Therefore, underperformance of the mining sector has simply not been as noticeable.

Outstanding mineral deposits are very scarce. Superior mineral processing sites are much more plentiful. Also, the reproducible, man-made element is relatively much more important in determining a superior processing site than an outstanding mineral deposit. Consequently, superior mineral deposits, such as the best of the Pilbara iron ore mines and Central Queensland coal deposits yield much larger long-term scarcity values than good processing sites.

Artificial impediments tend to destroy scarcity values of mineral deposits and processing sites by raising costs and/or the real exchange rate. If a deposit or processing site does not have substantial advantages over the competition, artificial impediments may render it uneconomic. If a deposit or processing site is particularly outstanding, artificial impediments will reduce the magnitude of the economic surplus attributable to it, without completely eliminating that return. Outstanding mineral deposits are much more likely to survive the impact of artificial impediments than superior processing sites, because the differential scarcity value or economic rents can

130 Anderson, Kym, op cit, pp. 1, 10-12, 20.
131 The analysis in this section relies on earlier work by the author, specifically, Willett, Ken (1992), Clipping the Wings of Eagles: Artificial Impediments to Mining and Minerals Processing in Australia, op cit, pp. 10-12.
be so much larger in the former case. That helps explain why State Government visions of large iron and steel complexes based on world class iron and coking coal deposits in Western Australia and Queensland, respectively, and petrochemical complexes based on major North-West Shelf gas reserves have not eventuated.

If artificial impediments do not render mineral deposits uneconomic, their effects are manifested in higher cut-off grades, reduced mining depths, smaller reserves, shorter mine lives, lower outputs per period and reduced profitability. The survival of superior mineral deposits despite these effects has tended to mask the magnitude of the economic damage caused by artificial impediments.

9.4 Policy Implications

When there are numerous inefficiencies arising from “government failure” and “market failure”, as in Australia, the theory of the “economics of second-best” (see section 3.3.2 of chapter 3) has shown that piecemeal action to remove inefficiencies may result in an overall reduction in economic welfare rather than an improvement. However, this does not justify government inaction. Instead, it means that:

- any piecemeal reform should be undertaken only when it is clear that the social benefits exceed the social costs; and
- the ideal approach is comprehensive economic reform to remove all of the numerous existing artificial impediments and to deal with uncorrected “market failure”.

In section 9.2, it was explained that wide-ranging reform to remove artificial impediments adversely affecting the mining and processing sectors would yield very substantial benefits to the economy as a whole. However, a common political obstacle to removal of artificial impediments is the issue of painful short-term adjustments in sectors that lose special deals representing artificial impediments to others. This is a genuine problem that may need to be managed through provision of short-term adjustment assistance. Such assistance should not be construed as another artificial impediment because its purpose is to deal with market imperfections leading to imperfect mobility of factors of production in the short-term.

Some commentators on public affairs have proposed compensatory assistance for economic sectors that are disadvantaged by artificial impediments. This is supposed to lift the burden of artificial impediments from disadvantaged sectors without inflicting short-term adjustment pain on sectors benefiting from artificial impediments.

The compensatory assistance concept is seriously flawed. It involves long term assistance that will have to be paid for by others. That creates artificial impediments to those other sectors. This approach treats symptoms of economic malaise rather than causes. It does so in a way that spreads the malaise.

The recommended approach is to identify and remove all artificial impediments. This should be undertaken decisively and quickly to minimise sovereign risk and opportunities for rent seeking lobbying activity. Adjustment problems can be
addressed through temporary assistance to facilitate mobility of resources and reduce hardship.
10 EXAMPLES OF ARTIFICIAL IMPEDIMENTS

10.1 Prevalence and Categories of Artificial Impediments

Government intervention has created a plethora of artificial impediments to sustainable economic development in Australia. Many of these have adversely affected the mining and processing sectors, destroying at least part of the imputed nett value of minerals (resource rent), causing substantial under-exploitation of mining and processing opportunities, and imposing substantial resultant costs on the Australian economy.

Because artificial impediments in Australia are so numerous, it was not practical to discuss all of them in any depth in this report. Instead, attention has been focussed on just a few examples to illustrate how artificial impediments operate and to indicate the extent of the range of artificial impediments impacting on the mining and processing sectors. Some of these artificial impediments and others have previously been identified and analysed by the Industry Commission and/or the author.\(^\text{132}\)

The Australian income tax regime is an important source of artificial impediments to sustainable development and to the mining and processing sectors. Some of these were documented by the author in 1992.\(^\text{133}\) In the late 1990s, relevant aspects of the income tax regime were subjected to detailed scrutiny by the Review of Business Taxation, which was commissioned by the Commonwealth Government. A number of substantial reports detailing major deficiencies of the system were published. The Review described the existing regime as “….a drag on the economy and its performance.”\(^\text{134}\) It was just nor feasible to review the issues in this report because of time and budget constraints.

The artificial impediments discussed in this report can be divided into two categories:

- burdens caused by government intervention that is not directly related to managing of mineral wealth; and
- inefficiencies created by misguided or poorly designed government intervention in the mining and processing sectors.

Examples of artificial impediments in the former category include import barriers to protect manufacturing industries, government sanctioned inefficiencies in infrastructure sectors and labour markets, taxation of intermediate inputs and sovereign risk. These examples are discussed in subsequent sections of this chapter.

Artificial impediments arising from direct government intervention in the mining and processing sectors include existing exploration tenement systems and existing royalty instruments. These artificial impediments are discussed in chapters 12 and 13, respectively, in the context of more general discussions of the appropriate design of land access regimes and royalty policy.

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\(^\text{132}\) Ibid; Commonwealth of Australia, Industry Commission, op cit.

\(^\text{133}\) Willett, Ken (1992), *Clipping the Wings of Eagles* ….., op cit, pp. 17-25.

Some artificial impediments may fall into both categories. They include some aspects of the current native title regime and poorly designed environmental policies. These artificial impediments are discussed in chapters 11 and 14, respectively, in the context of more general discussions of the appropriate design of land access regimes and mechanisms for internalising adverse environmental externalities.

10.2 Barriers to Imports

In section 8.4.3 of chapter 8 on the “Resource Curse Thesis”, it was explained that it is now widely acknowledged that protectionism has been a particularly important cause of underperformance of economies that are relatively rich in mineral resources. That section also briefly discussed the history of Australia’s protectionist policies from the early 1900s and partial reform of those policies from the late 1980s to late 1990s.

Historically, barriers to imports such as tariffs and quotas have severely burdened mining and processing industries in Australia. These barriers directly and indirectly raised the cost structure of the economy. They also supported the exchange rate at an artificially high level. Exporters and producers of unprotected import-competing goods, such as mining and minerals processing enterprises, carry the burden because they:

- cannot pass on the costs to the extent that they are price takers competing in world markets; and
- receive lower Australian dollar prices for their products because of the over-valued exchange rate.\(^{135}\)

Before the Commonwealth Government commenced an import tariff reduction programme in the late 1980s, it was estimated that import barriers in Australia were equivalent to an ad valorem tax of about 9% on all exports.\(^{136}\) That placed a very substantial effective cost burden on mining and minerals processing and other sector competing in international markets.

The effect was to encourage inefficient manufacturing industries and discourage efficient mining and processing activities, knocking-out some potential projects and otherwise artificially constraining the size of these sectors. Expansion of mining and processing was impeded, while protected manufacturing activities expanded and then stagnated behind substantial barriers to imports. Resources were misallocated and growth was stifled in the Australian economy.

In 1991, the Industry Commission released results of econometric modelling of the effects of removing import tariff and other assistance to manufacturing industry in Australia. It was estimated that copper mining would expand by 2.5%, other mining industries would expand by 5.1% to 8.8%, and non-ferrous metals smelting and refining industries would expand by 4.7% to 7.5% in the long-term. The nett effect

\(^{135}\) A more detailed explanation of this impediment can be found in Willett, Ken (1992), “Clipping the Wings of Eagles...”, op cit, pp. 25-29.

and expansion of sectors handicapped by the artificial impediment of manufacturing assistance and the contraction of manufacturing sectors with positive effective rates of protection was estimated to be an expansion of annual Gross Domestic Product by about $3,000 million in the long-term.\textsuperscript{137}

Fortunately, import barriers were significantly reduced during a phased reduction of tariffs, which commenced in the late 1980s, but the Commonwealth Government effectively halted that programme for political reasons in the late 1990s. Consequently, mining and processing industries and economic development in Australia are still significantly impeded by remaining import barriers.

### 10.3 Government Sanctioned Inefficiencies in Infrastructure Sectors

Historically, government sanctioned inefficiencies in infrastructure sectors raised the price of inputs to other sectors. Enterprises competing in world markets, such as mining and processing companies, could not pass on these increased costs to customers to the extent that they were price takers. The consequences were destruction of resource rents and reduced investment, output and employment in the mining and processing sectors. These effects were substantial because infrastructure sectors such as railways, ports, shipping, electricity suppliers and pipelines were important providers of services to mining and processing sectors.

Results of econometric modelling by the Industry Commission released in 1991 indicated that elimination of various inefficiencies in the provision of transport and electricity infrastructure services sanctioned or caused by governments in Australia would lead to long-run increases in output as follows:\textsuperscript{138}

- black coal mining, 26.2%;
- alumina refining, 7.8%
- mining of nickel ores, 6.1%;
- mining of copper ores, 6.0%;
- silver-lead-zinc smelting and refining, 5.9%
- nickel smelting and refining, 5.1%;
- bauxite mining, 4.9%;
- mining of lead-zinc-silver ores, 3.3%;
- basic iron and steel, 1.9%.

Microeconomic reform programmes in respect of infrastructure sectors dominated by government monopoly enterprises commenced in the early- to mid-1990s under the banner of “National Competition Policy and Related Reforms” agreed by the Council of Australian Governments. Unfortunately, the microeconomic reform process has lost momentum in recent years, just as the tariff reform process did, because of “reform fatigue” or loss of political will.

The remaining inefficiencies have continued to inflate the cost structure of mining and minerals processing activities, destroying resource rents and reducing investment, output and employment in the mining and processing sectors.

\textsuperscript{137} Commonwealth of Australia, Industry Commission, op cit, Volume2, pp. 201-203.
\textsuperscript{138} Ibid, pp. 195-201.
10.4 Government Created Labour Market Imperfections

Historically, there has been substantial government intervention in labour markets in Australia. Until relatively recently, this intervention has inhibited the efficient operation of labour markets rather than improving it.

Early in the twentieth century, a judicially-based, centralised system of determining wages and conditions of employment was established. The basic features of the system were maintained by governments until the late 1980s.

Deficiencies of the judicially-based, centralised regime included the following.\[139\]
- Changes to terms and conditions of employment were influenced more by judicial concepts of equity than market forces.
- The system reduced incentives to improve skills and to improve performance by providing improvements in pay and conditions based on averages rather than case by case performance.
- Legalistic and philosophical (as distinct from substantive) debate about economic stabilisation policy and the relative merits of cost of living and productivity based adjustments to wages received much more attention than critically important microeconomic issues.
- The judicially-based regime tended to reinforce the exploitation of market power, rather than curb it by adopting a “squeaky wheel gets the oil approach” and by imposing judicial solutions rather than proposing economically sensible policies that would inhibit the exercise of market power.
- The amount of industrial disputation was increased by the judicially-based dispute settling mechanism because it could be relied on to come up with a compromise settlement if things became bad enough. This reduced incentives to avoid industrial disputes or to settle them quickly.
- Governments facilitated and validated these mistakes from time to time by increases in barriers to imports and other forms of protection to particular industries and by loose economic stabilisation policies.

Section 9.2 of chapter 9 included a summary of former Commonwealth Treasury Secretary John Stone’s account of how judicially determined, government sanctioned wage determination processes, supported by protectionist policies towards manufacturing, artificially inflated labour and other costs borne by Australia’s agricultural, mining and processing industries for most of the twentieth century. To the extent that mining and processing enterprises were price takers in world markets, artificially costs arising from these policies could not be shifted forward to customers. The potential competitive advantage of these industries was undermined. Investment, employment and output in mining and processing sectors were reduced and resource rents were destroyed.

It should not be assumed that resource rents were simply redistributed to labour rather than destroyed. Apparent gains to labour from higher nominal wages were stripped away by a higher price level, reduced employment levels in potentially efficient,

\[139\] Willett, Ken, “Clipping the Wings of Eagles……”, op cit, pp. 34-38.
handicapped industries, and lower productivity growth in an economy characterised by numerous distortions.

In the early-to mid-1980s, the judicially based, centralised system was partly overridden by an more centralised regime run by the Commonwealth Government and the Australian Council of Trade Unions under a Prices and Incomes Accord. This change was made to restrain real unit labour costs for macroeconomic stabilisation purposes, rather than to improve the efficient operation of the labour market as part of a programme of microeconomic reform.

Since the late 1980s, a number of important steps towards reform of labour markets in Australia have been implemented by legislative action. The trend has been away from a highly centralised, judicially based system and towards negotiations at the enterprise level. Elements of the former regime remain, but they now play a far less pivotal role.

While the effects of reforms have been significant, they have not matched the intent and superficial appearance of the reform process. Specialists in labour markets have observed that the effects of reforms have tended to emerge incrementally. As a result, the process has been evolutionary rather than revolutionary.140

The benefits of completing the transition to a decentralised, market orientated, productivity focused system of determining remuneration and other conditions of employment are as follows:
- elimination of work practices that inhibit productivity improvements;
- increased capacity to adjust to shocks or cycles in product markets;
- smaller economic losses from industrial disputations;
- higher investment, output and employment in the mining and processing sectors;
- larger resource rents available for distribution; and
- higher real wages in the Australian economy

A major focus of the Productivity Commission’s 1998 report on The Australian Black Coal Industry was the matter of work arrangements, including remuneration.141 The Productivity Commission argued that, compared to other parts of the mining sector and other sectors, the black coal industry was characterised by:
- high levels of strike activity and industrial disputation;
- high wages;
- high rates of union membership;
- a high degree of inflexibility of work arrangements to changing circumstances.

The Productivity Commission claimed that work arrangements in the black coal industry unnecessarily:
- restricted productivity and productivity improvements;
- raised unit labour costs; and
- reduced competitiveness.

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The Productivity Commission engaged the Centre of Policy Studies at Monash University to model the effects of changes in work and management practices in coal mining, coal preparation and mine administration activities. Relatively rapid changes (compared to past trends) leading to productivity improvements of 5% per year were estimated to yield the following results in 2009-10 relative to a scenario based on historical trends:

- exports of coking coal and thermal coal that are 46% and 80% higher, respectively;
- employment numbers in coking coal and thermal coal production that are 12% and 18% higher, respectively;
- real annual GDP that is 0.4% or about $3,000 million higher and real private consumption that is 0.9% higher, assuming that all additional real income is consumed; and
- economy wide real wages that are 0.6% higher or to the extent that real wage increases are moderated, higher aggregate employment in the Australian economy.\(^{142}\)

The sectoral and economy-wide gains from labour market reforms only in the coal mining industry are substantial, notwithstanding the fact that labour costs in this and other parts of the mining sector represent a much lower proportion of total input costs than in manufacturing, construction and services sectors. Gains from labour market reforms covering all sectors of the economy should lead to very much larger economy-wide gains. Such reform should benefit the mining sectors indirectly through lower costs of inputs provided by other sectors, as well as directly through lower unit labour costs relative to productivity.

### 10.5 Special Deals and Incentives

Governments in Australia have provided a large range of “special deals” for selected sectors or groups within the community. Some have been described as “incentives”.

In an economy, “There is no such thing as a free lunch.” “Special deals” gained by some groups or sectors have to be paid for by others. The manner in which others are required to pay will depend on the nature of the “special deal”.

If the “special deal” is in the form of a tax-break, grant or subsidy, the consequences for others are higher tax burdens, fewer benefits or a larger/smaller government deficit/surplus. The latter, in turn may mean more inflation or higher interest rates. The ultimate effect is higher costs. Enterprises that cannot shift these higher costs to others will be handicapped.

If the “special deal” takes the form of import barriers to protect domestic industry, others pay through higher costs to the extent that they cannot shift those additional costs to others, as discussed in section 10.2. If markets are regulated to confer benefits on particular participants, in excess of any arising from correction of “market

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\(^{142}\) Ibid, Volume 1, chapter 11, pp. 304-308.
failure”, others are burdened to the extent that they cannot shift resulting higher costs to others. Examples were discussed in sections 10.3 and 10.4.

The cumulative effects of artificial impediments created by the many special deals provided by governments in Australia are expected to be substantial.

10.6 Taxes on Intermediate Inputs

Intermediate inputs are produced goods and services that are used to produce other goods and services. They should not be confused with primary inputs or factors of production, such as land, mineral deposits, other natural resources, labour/intellect, and capital.

Sub-section 3.3.2 of chapter 3 included an explanation of the mechanisms by which taxes on intermediate inputs cause production inefficiencies in the economy. As a result of inefficient use of primary and intermediate inputs, aggregate output is lower than its potential. Clearly, taxes on intermediate inputs are artificial impediments to sustainable development.

Taxes on intermediate inputs are also artificial impediments to mining and minerals processing activities. Unprotected import competing (such as limestone mining and cement production) and export industries (such as most mining and processing activities), which tend to be price takers in world markets have very limited prospects of shifting taxes on intermediate inputs forward to customers through higher prices. Therefore, primary inputs to these industries will bear most of the burden of taxes applying directly to their intermediate inputs or indirectly through taxes on the intermediate inputs of their suppliers. The artificial burden imposed on such industries by taxes on intermediate inputs will increase with the relative importance of inputs carrying or incorporating taxes on intermediate inputs.

Historically, the Commonwealth Government has taxed intermediate inputs through a hotchpotch of wholesale sales taxes (WST) and excise and customs duties. The States and Commonwealth have also done so through taxes on transactions, such as stamp duty, financial institutions duties and debits taxes. Some inputs to mining and processing were taxed, but others were not.

Examples of the patchy nature of intermediate taxation in the mining and processing sectors include the following.

- Mining machinery and equipment and particular “aids to manufacture” were exempt from WST, but electricity generation equipment, road vehicles and office equipment were not.
- Under an off-road Diesel Fuel Rebate Scheme (DFRS), defined aspects of mining, agriculture, forestry, fishing, residential and health activities were eligible for a rebate of excise and customs duty applying to diesel fuels amounting to 100% for agriculture, 93% for mining and 76% for other activities.
- Notable exclusions from the application of DFRS to mining were the extraction of rock, sand, gravel, most clays and limestone.
Beneficiation was included among the definitions of eligible mining activities for DFRS but beneficiation or processing of any minerals beyond the concentration stage was deemed to be excluded.

DFRS was an off-road scheme and did not apply to any use of diesel fuel in vehicles using or constructing public roads even if the activities were for mining purposes. Although railway operations were off-road and important for transporting mined commodities such as iron ore, bauxite and coal, they did not benefit from DFRS.

Some mining and processing enterprises were granted exemptions from State stamp duties for transactions and agreements associated with projects, but others were not.

Mining and processing operations, like other business activities, bore Commonwealth and State taxes applying to financial transactions, but Queensland did not levy such an impost.

The issue of taxation of intermediate inputs was addressed in the Commonwealth Government’s white paper on taxation reform (Tax Reform White Paper), which was released in August 1998. The Tax Reform White Paper detailed proposals for sweeping reform of the Australian taxation system. These included major changes to both the direct and indirect tax regimes, particularly the latter.

A major strategic objective of reforms to the indirect tax regime was to minimise taxation of produced inputs to avoid distorting production decisions. The purpose of this was to enhance the efficiency of allocation of resources (economic efficiency) in the Australian economy. Another strategic thrust was to remove anomalies and complexity from indirect taxation.

These key strategic objectives were to be achieved by:

- replacing the Commonwealth’s wholesale sales tax and various State transaction taxes and ‘bed taxes’ with a comprehensive value-added tax to be called a Goods and Services Tax or GST, which, through input tax credits, was to avoid taxing produced business inputs;
- adjustments to excise/customs duties on petroleum fuels so that the pump price of petrol and diesel “need not rise” as a result of introduction of GST, while the cost of these commodities to business enterprises would fall because of GST input tax credits;
- introducing a new “comprehensive diesel fuel credit” scheme to reduce taxation of business inputs by -
  - replacing the Diesel Fuel Rebate Scheme (DFRS),
  - effectively reducing excise and customs duties on diesel fuel used in heavy on-road transport with a gross vehicle mass in excess of 3.5 tonnes and railway operations from around 43 cents per litre to 18 cents per litre, and
  - providing a full credit of excise/customs duties for all off-road business use of diesel and like fuels, except in the case of rail;
- continuing to exempt “alternative fuels” from excise/customs duty.

145 Ibid, pp. 21-23.
As a result of a political compromise with the Australian Democrats to gain their support for legislation to enable tax reforms, modifications were made to proposals in the Tax Reform White Paper. The revised tax reform package, which was implemented as from 1 July 2000, incorporated the following major and/or pertinent changes to the proposals in the Tax Reform White Paper.\(^\text{146}\)

- GST concessions were provided for “basic food” and educational and health items.
- Replacement of most State transactions taxes was deferred.
- Compensation arrangements were adjusted in favour of low-income persons.
- The off-road component of the proposed “comprehensive diesel fuel credit” scheme was substantially modified by maintaining the Diesel Fuel Rebate Scheme (DFRS) and extending it only to a limited extent to:
  - include rail and marine transport;
  - apply to “like fuels” as well as diesel; and
  - provide a full rebate for excise and customs duty on diesel and “like fuels” used for all of the very limited list of eligible off-road purposes.
- The “comprehensive diesel fuel credit” scheme’s on-road component, subsequently called the Diesel and Alternative Fuels Grants Scheme (DAFGS), was modified by:
  - reducing the effective excise on diesel fuel for heavy on-road transport to 20 cents per litre rather than 18 cents per litre;
  - applying a more restrictive definition of eligible heavy on-road transport, particularly in major urban areas\(^\text{147}\), for the purpose of “addressing concerns relating to the environmental impact of diesel use in large cities”\(^\text{148}\); and
  - providing subsidies described as “clean fuel credits” for use of “alternative fuels” such as LPG, CNG, ethanol, recycled waste oil and canola, in eligible heavy on-road transport to preserve previous price relativities with diesel fuel to maintain incentives to use “alternative fuels” and thereby “improve air quality and greenhouse gas emissions”\(^\text{149}\).
- A package of “measures for a better environment” (including “clean fuel credits”) which consisted of a number of subsidy/expenditure, taxation and regulatory measures to reduce greenhouse gas emissions and other air pollution.

\(^{146}\) Commonwealth of Australia, Prime Minister, Changes to the Goods and Services Tax (GST), attachment to Letter to Meg Lees on Taxation Reform and Measures for a Better Environment, Media Release, 31 May 1999.

\(^{147}\) DAFGS applies to vehicles used on public roads with a gross vehicle mass of 4.5 tonnes or more in the case of transport activities for primary production, or 20 tonnes or more in the case of transport and non-transport activities for all enterprises, or transport vehicles between 4.5 and 20 tonnes for activities other than primary production in the case of trips not wholly within a broadly defined metropolitan area.

\(^{148}\) Prime Minister, Changes to the Goods and Services Tax (GST), op cit, p. 6.

\(^{149}\) Ibid, p. 9.
The environmental package and part of the GST concessions were funded by:
- abandoning full exemption of all off-road business uses of diesel fuel and like fuels in favour of a very limited extension of DFRS;
- restricting the scope of the diesel grants component of DAFGS.

The taxation reform package introduced as from 1 July 2000 substantially reduced taxation of intermediate inputs in the Australian economy. Further reduction of taxation of intermediate inputs will occur as State transactions taxes are phased-out.

**Eligible** mining activities under DFRS gained from a small increase in the rebate of diesel fuel excise/customs duty. Mining and processing activities that are heavily dependent on rail and heavy road transport gained from the extension of DFRS to rail and DAFGS to heavy road transport.

However, heavy taxation of fuel used **off-road** as an intermediate input remains for:
- extraction of rock, sand, gravel, clay and limestone;
- other gaps in the definition of eligible mining activities; and
- most processing, exceptions for liquefaction of natural gas and early stage beneficiation of minerals.

These activities bear both the proxy road user charge and general consumption tax components of excise/customs duty on diesel fuel.

Also, heavy taxation remains in place for fuel used as an intermediate input in vehicles engaged in the mining and processing sectors that do not meet the restrictive definition of heavy on-road vehicles. Only a portion of the excise/customs duty applicable to fuel used by such vehicles could be deemed a proxy road user charge or a levy to internalise social costs of air pollution. The remainder is a tax on an intermediate input.

Savings from denying access to DFRS in respect of some mining activities, most processing and other sectors, and from restricting access to DAFGS were used to fund the package of “measures for a better environment”. As indicated by the economic theory of the “second best”, which is discussed in chapter 3, it would seem appropriate to weigh any economic efficiency gains from these measures against the economic efficiency losses from retention of significant of intermediate taxation. However, the elements of the “measures for a better environment” were poorly designed to meet the economic efficiency objective. Moreover, those measures could have been funded in much less distorting ways. In addition, the funding approach was highly inequitable and inconsistent with the Prime Minister’s November 1997 statement in *Safeguarding the Future: Australia’s Response to Climate Change* that the Commonwealth Government intended “fairly spreading the burden of action across our economy”.

A much more detailed discussion of the above issues and a detailed assessment of DFRS, DAFGS and fuel/tax subsidy elements of “measures for a better environment” have been provided in another report by the author. That report was provided to the Commonwealth Government’s Fuel Taxation Inquiry in September 2001 and is available on the Inquiry’s web-site.
To rectify the residual problem of taxation of intermediate inputs in the form of liquid fuels, the Commonwealth Government would need to increase revenue from other sources, cut expenditure or increase/decrease the size of the budget deficit/surplus. Once again, the lessons of the economic theory of “second-best” need to be taken into account. It is important to ensure that these measures do not lead to greater inefficiencies than those caused by the remaining taxation of intermediate inputs. It is also important that the funding measures are consistent with equity and administrative criteria. These issues were considered in detail in the author’s report to the Fuel Taxation Inquiry. A number of recommendations were formulated on the basis of that analysis. Specifically, the report “….recommended that:

1. all off-road business and government uses of diesel, ‘like fuels’ and motor spirit be granted full credits for all elements of excise/ customs duty representing a proxy road charge, a road externality charge, and a general tax impost;

2. all on-road business and government uses of diesel and ‘like fuels’ be granted full credits for the general tax component of excise/customs duty, leaving them to bear proxy road-user charge, road externality charge, and environmental levy components of excise/customs duty;

3. on-road business and government uses of ‘alternative fuels’ be required to pay a proxy road-user charge, a road externality charge, and a smaller environmental levy than diesel users reflecting lower emissions;

4. all on-road business and government uses of motor spirit be exempted from the general tax component of excise/customs duty, leaving them to bear proxy road-user charge, road externality and environmental levy components of excise/customs duty;

5. the proxy road-user charge for all heavy vehicles (say, with a gross vehicle mass in excess of 3.5 tonnes) be based on the notional road user charge for heavy transport vehicles estimated by the National Road Transport Commission;

6. a separate proxy road-user charge be formulated for light vehicles;

7. Commonwealth, State and Local Governments formulate and implement a system of electronically based, location- and time-specific pricing to reduce road congestion, a major road externality of concern to governments;

8. the strong discrimination against off-road use of ‘alternative fuels’ and in favour of on-road use of those fuels by business and government activities be corrected;

9. fiscal incentives to internalise externalities in the form of perceived social costs of greenhouse gas emissions be re-oriented from subsidies to taxes or compulsory purchase of permits to emit (The latter could substitute for the environmental levy component of excise customs duty in 1-4.);

10. any nett funding requirements remaining after measures 1 to 9 be met by adjustments to the income tax and GST regimes that are consistent with equity and economic efficiency criteria;
11. if political/funding constraints do not permit full implementation of the above 
measures in the short term, an incremental approach should be adopted, 
commencing with the immediate expansion of mining eligibility including 
extension to extractive industry as proposed by the Industry Commission in 
1994.”

10.7 Sovereign Risk

“Sovereign risk” refers to government-induced risk and uncertainty. “Sovereign risk” 
discourages investment, distorting the allocation of resources and causing national 
income and economic growth to fall short of their potential.

Two categories of “sovereign risk” can be distinguished:
• uncertainties arising from the possibility of governments changing the rules 
relating to an activity after capital has been invested in that activity; and
• uncertainties arising from failure by governments to specify clearly the long term 
rules in advance.

“Sovereign risk” arises from fears relating to possible future actions by governments. 
Past and present actions by governments create “sovereign risk” only if they induce 
fears of future changes.

When governments dither, tinker, and undertake short-term patch up jobs in respect of 
policy matters, such as those identified as artificial impediments, they inadvertently 
add another artificial impediment to those already existing. That new impediment is 
increased uncertainty about future government action.

In contrast, sensible, swift, decisive action with a long term focus to eliminate 
artificial impediments not only yields direct economic benefits, but also can provide 
bonus benefits from reduced “sovereign risk”. This occurs because dealing with 
policy flaws once-and-for-all reduces uncertainty regarding future government action.

All industries can be adversely affected by “sovereign risk”, but mining and 
processing appear to have been impeded more than most. After taking submissions 
and holding discussions with numerous companies in these sectors in Australia, the 
Industry Commission concluded:

“Sovereign risk represents a serious impediment to the efficient development 
of mining and mineral processing industries in this country, and one which 
diminishes the value of the mineral estate owned collectively by all 
Australians.”

In other words, “sovereign risk” is a serious artificial impediment to sustainable 
development based on mineral wealth and destroys part of the imputed nett value of 
minerals.

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Insecure tenure is a major source of government-induced uncertainty affecting exploration and mining investment in Australia. There have been several cases in which companies have spent large sums of money to explore and otherwise assess project only to be denied the right to exploit discoveries. Prominent examples have been the Jabiluka uranium and gold deposit and Koongarra uranium deposit in the Northern Territory, the Hill River Coal deposit in Western Australia, and the Coronation Hill gold-platinum-palladium deposit and nearby El Sherana prospect in the Northern Territory. Development of Jabiluka was delayed for more than 20 years. The other projects have not been developed after being blocked between 10 and 18 years ago. In each of these cases, the government decision to block mining was based on a desire to pander to special interest groups rather than on a rational assessment of benefits and costs of a range of alternative scenarios.

Australia's native title regime has generated considerable uncertainty in respect of various matters relating to access to Crown land and pastoral for exploration and mining. It is now a major source of government-induced uncertainty impacting on exploration and mining investment in Australia. That matter has been discussed in detail in chapter 11.

Over the past 30 years, successive Commonwealth Governments have tinkered at frequent intervals with capital write-off arrangements under the income tax law. Both mining and processing have been affected, but the tinkering has been more significant in the case of mining. Usually, this fiddling with the tax system has been more closely related to counter-cyclical macroeconomic policies than genuine efforts to reform the income tax regime. This has added to “sovereign risk” in Australia.

The States have tinkered with their de jure and de facto royalty systems or some elements of them from time to time. Economically sound improvements have been the exception rather than the rule. Sometimes, project-specific royalty arrangements have been negotiated after discovery and assessment of deposits. Occasionally, ad hoc relief has been provided for mines experiencing difficulties. In some cases, excessive infrastructure requirements have been stipulated, representing de facto royalty imposts, while other projects have benefited from generous government provision of infrastructure, representing effective royalty reductions. In other cases, excess rail freight charges were imposed as de facto royalty systems, often without any clear logical basis.

The lack of logical foundations for most of the royalty systems and rates in Australia, the frequent tinkering with royalty regimes, striking of special deals, and frequent reviewing of royalty arrangements are examples of precisely the types of government behaviour that create “sovereign risk”. There is little doubt that participants in the mining sector would feel much more secure with a once-and-for-all change to a tough, but fair, logically based system than with the uncertain hotchpotch of arrangements to which it has been subjected.

The key to minimising “sovereign risk” as an artificial impediment to exploration, mining, processing and sustainable development in Australia is to move swiftly and decisively to establish clear, fair and economically sensible long-term “rules of the game” that produce predictable outcomes and will stand the test of time.
11 LAND ACCESS ISSUES

11.1 Conflicting Interests in Land and Minerals

In 1991, the Industry Commission commented that the issue of access to land for exploration and mining purposes was perceived to be the single most important issue facing the mining industry.151 That statement preceded the High Court decisions in the Mabo and Wik cases regarding native title. Those decisions meant that the common law now recognises a form of native title, and that pastoral leases did not provide exclusive possession to lessees and did not necessarily extinguish all native title rights. In that context, access to land has become a much bigger issue than it was in 1991.

The issue of access to land is greatly complicated by separate ownership of surface rights (held under native, freehold or leasehold title) and mineral rights (generally vested in the Crown in right of the relevant government) over much of the Australian continent. In some cases, land access is complicated further by native title and pastoral leases over the same land surface. When an enterprise seeks access to land to explore and mine, there is a need to reconcile various competing interests. These include holders of surface rights, owners of minerals in situ (governments), exploration/mining enterprises, and members of the community, who may be interested in the natural environment as well as benefits from mining.

In principle, the task of reconciling these competing interests falls to State Governments, which have constitutional powers to legislate in relation to the relevant matters and an overriding responsibility to act in the best interests of all members of the community. The task is complicated by the fact that State Governments have a direct interest in realisation of the imputed nett value of minerals.

The Commonwealth Government is also expected to act in the best interests of all members of the community. To that end, the Commonwealth Government involved itself in environmental protection and native title matters, relying on constitutional powers relating to exports, foreign treaties, and race.

In trying to reconcile conflicting interests in land and minerals, State/Territory Governments have come into substantial conflict with the Commonwealth Government. This has been particularly evident in relation to competition for petroleum revenues, environmental issues and native title matters.

This chapter focuses on assessing:
- arrangements for reconciling conflicts in respect of access to minerals in private land not subject to native title; and
- the regime for reconciling conflicts relating to access to minerals in land subject to registered native title or claims to native title.

151 Industry Commission, op cit, Volume3, p. 3.
11.2 Access to Private Land Not Subject to Native Title

Access to land subject to privately held surface rights was a contentious issue before the *Aboriginal Land Rights (Northern Territory) Act*, the Mabo and Wik decisions and the *Native Title Act*. It remains a controversial, emotion-charged issue, but has received only a minute amount of political and public attention compared to that given to issues relating to native title.

Existing consent and compensation arrangements for accessing privately held land were outlined in sub-section 4.4.2 of chapter 4. Briefly, such land is, in principle, accessible for exploration and mining activity, but written consent is required to access land near various types of structures or any freehold land in Western Australia that is used for crops, pasture and grazing. Compensation for disturbance to and loss of use of the land is invariably required, whether or not consent is required, but the amount of compensation is to exclude any allowance for minerals in the land.

Existing arrangements have generated considerable conflict between holders of surface rights and enterprises seeking to explore and mine. The Industry Commission attributed the conflict to poorly specified property rights in the context of the historical separation of surface rights and ownership of minerals *in situ*.\(^{152}\)

There is evidence that consent provisions have inhibited exploration and mining, particularly in Western Australia. That is inconsistent with the economic efficiency criterion. Also, there is anecdotal evidence that, at least in Western Australia, consent requirements have allowed private holders of surface rights to obtain excessive compensation that captures some of the imputed nett value of minerals *in situ*.\(^{153}\) That involves a transfer of wealth from the community to relevant owners of surface rights to land, and has significant consequences for equity.

On the other hand, there is evidence that some private holders of surface rights have experienced difficulties in receiving full compensation for disturbance and damage. Also, there is dissatisfaction regarding inadequacy of buffer zones.\(^{154}\) Such effects are obviously undesirable on economic efficiency and equity grounds.

While these are potentially important matters, they do not appear to have attracted significant, meaningful research activity. As a result, there is insufficient information available to address these issues in detail. It is beyond the scope of this report to generate the information required.

11.3 Native Title Policy

Australia’s native title policy has been put into effect via the mechanism of the *Native Title Act 1993*, as amended in 1998. The background to this legislation has been outlined in section 4.2.2 of chapter 4. That Act:

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\(^{152}\) Ibid, Volume 3, pp. 98, 103.


\(^{154}\) Industry Commission, op cit, Volume 3, pp. 96-98.
• validated and protected native title that had been recognised by the High Court;
• validated past acts of governments that had been invalidated by the recognition of native title;
• established procedures for determining claims to native title; and
• provided a framework for dealings affecting native title.

This purpose of the native title regime has been perceived quite differently by different groups in the Australian community. Some Aboriginal spokespersons and the Aboriginal and Torres Strait Islander Social Justice Commissioner have argued that the purpose of the regime established by the Native Title Act 1993 (as amended) simply protects the pre-existing property rights and interests of Aboriginal people in respect of land. Indeed, the Aboriginal and Torres Strait Islander Social Justice Commissioner suggested that the regime does not adequately protect the human rights of Aboriginal people. These parties deny that the regime was also intended to serve the purpose of redressing the severe disadvantage of Aboriginal people in the Australian community. Other parties, including Commonwealth Government spokespersons, perceived native title legislation as an opportunity to advance such a purpose. It does appear that the Commonwealth Government sought to achieve both purposes.

Regardless of whether the regime established by the Native Title Act 1993 was intended to serve one or both purposes, that regime has important implications for the distribution of income, the allocation of resources and the costs of administering property rights. Therefore, it needs to be assessed with regard to the equity, economic efficiency and administrative efficiency criteria derived in chapter 3.

11.3.1 Equity

The Mabo and Wik decisions by the High Court and the protection of native title by the Native Title Act 1993 shifted the distribution of wealth in favour of some Aboriginal people relative to the position prior to the Mabo judgement. That shift occurred because of the return of unextinguished native title to land. It was enhanced by the inclusion of “right to negotiate” provisions in the Act in relation to mining sector activity on land subject registered native title or registered claims (see section 4.2.3 of chapter 4). Those provisions have given registered native title holders and claimants a constrained opportunity to appropriate a portion of imputed nett value of minerals in situ owned by the Crown in right of the relevant State or Territory. In contrast, State/Territory mining legislation generally does not provide other holders of surface rights to land with power to require that exploration and mining enterprises pay de facto royalties or payments in excess of reasonable compensation for loss of or interference with surface rights. The most notable possible exception arises from a legal obligation to obtain written consent from owners of freehold title to agricultural land in Western Australia.

The effect was to re-distribute some wealth from:

155 See Jonas, William, op cit, pp. 3-4, 10.
• the community in general, represented by the Crown in right of the relevant State/Territory, as former owner of Crown lands and apparent continuing owner of minerals in situ;
• mining enterprises who were able to capture residual resource rents not appropriated by governments or other parties and not destroyed by artificial impediments; and
• pastoral lease holders whose property rights are less than had been previously understood or assumed.

There will be a more substantial re-distribution of wealth towards some Aboriginal people if the High Court decides in future that native title includes mineral rights in some States. The High Court has not yet ruled on ownership of minerals in land subject to native title. The Native Title Act did not confirm that ownership of minerals in situ is vested in the Crown in right of the relevant State or Territory. In this context, the Aboriginal and Torres Strait Islander Social Justice Commissioner and others have argued that native title could include mineral rights, at least in some States, notably Western Australia, New South Wales and Tasmania.157

There is no doubt that the severe disadvantage of Aborigines must be addressed with urgency and vigour. However, there must be serious doubts that the opportunistic approach of attempting to address Aboriginal disadvantage through the Native Title Act 1993 is either adequate or appropriate. There are two reasons for those doubts. First, as discussed below, it does not appear that the benefits will be distributed equitably among indigenous people. Second, as discussed in subsequent sub-sections of this section, the collateral damage caused by the Commonwealth Government’s approach is likely to be substantial. These concerns are relevant even if the sole purpose of the Native Title Act 1993 is to protect indigenous property rights.

Substantive benefits are likely to accrue only to the lucky holders or registered claimants of native title over land containing substantial mineral wealth or some other special attribute. Provision of such benefits is random and dependent on the uncertain timing, value and location of discovery of mineral deposits or some other special feature of Aboriginal land. The relative disadvantage of other Aboriginal people will remain. In particular, indigenous people who are not able to have native title restored to them will gain nothing.

Formulating solutions to the problem of severe Aboriginal disadvantage must be given the highest priority by Commonwealth and State Governments. The cost should be borne equitably by the community. However, current and past approaches, including government expenditure programmes, judicial intervention, and native title/land rights policies have been ineffective. Past approaches require a major re-think.

In 1997, Denis Burke, who was then the Attorney-General and Minister for Health Services in the Northern Territory, argued:

“The continued emphasis on the symbolism of native title serves principally to raise the expectations of Aboriginal people and maintain the paternalism of the past, while damaging relations between black and white Australia. It is argued that the lot of the Aboriginal people will never be improved until they get their land back. But native title will not resolve that questionable notion because as former federal Attorney-General Michael Lavarch put it: ‘Native title only exists for those indigenous people who have not been dispossessed.’

In the (Northern) Territory in areas such as the Tiwi Islands and Arnham Land the descendants of the original occupiers of the land have never been dispossessed and have had formal title to the land for 20 years under the *Aboriginal Land Rights (Northern Territory)* Act, yet the health problems in these areas are formidable and, in relation to some diseases, deteriorating. And this is despite the Territory Government spending more than 50% of its health budget on Aboriginal health.

Yet the pursuit of the symbolism of native title will cost many millions – money that could be better spent on measures aimed at ensuring that present and future generations have a healthy lifestyle and a longer life in which to enjoy it.”

Denis Burke may be right about the money could be better spent by governments on helping Aboriginal people to attain healthier and longer lives. Unfortunately, the past performance of Commonwealth, State and Territory Governments indicates that they have not yet worked-out how to do it.

### 11.3.2 Economic Efficiency

Economic theory emphasises the importance of secure, unconditional property rights for an efficient allocation of resources. In section 12.3 of chapter 12, it has been explained in the context of exploration tenement policy that insecure, captureable property rights can induce rent-seeking behaviour to capture property rights with resource misallocation consequences. In other circumstances, insecure property rights in respect of some key element of a business activity can discourage investment in that activity. Property rights are also of relevance to environmental and community policies because they can play an important role in minimising the social costs of negative externalities.

Native title and the “right to negotiate” provisions of the Native Title Act 1993 facilitate internalisation of adverse effects of developments on the environment and Aboriginal cultural/religious observance. Internalisation is facilitated because native title-holders are able to strike a bargain in respect of compensation and/or amelioration of adverse effects. That appears to be positive for efficiency of resource allocation.

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158 Burke, Denis, “(Wik) Judgment Adds to Delay and Expense”, *The Australian*, 7 January 1997, p. 11.
On the other hand, the “right to negotiate” provisions, as currently framed, have given registered native title holders and claimants a significant tool to appropriate a portion of imputed net value of minerals in situ owned by the Crown in right of the relevant State or Territory. In other words, the “right to negotiate” provisions of the Native Title Act 1993 have undermined the property rights of State and Territory Governments in respect of minerals in situ and have therefore diminished the property rights they can attach to exploration and mining tenements that they grant. In contrast, State/Territory mining legislation generally protects State/Territory property rights in respect of minerals in situ and have therefore diminished the property rights they can attach to exploration and mining tenements that they grant. In contrast, State/Territory mining legislation generally protects State/Territory property rights in respect of minerals in situ in land subject to other forms of land title.

The “right to negotiate” provisions have consequences that extend beyond wealth redistribution. Economic efficiency is adversely affected because of:

- restrictions on access to land, in excess of those required to internalise negative externalities;
- any deferment of exploration activity beyond the optimal time to explore (See section 12.3 of chapter 12);
- additional uncertainty (“sovereign risk”) created by the “right to negotiate” regime that leads to reduced investment in exploration and resulting mine development (See section 10.7 of chapter 10.);
- partial destruction of resource rents by returns foregone on pre-negotiation outlays on exploration and other assessment during a period of project deferment caused by the “right to negotiate” regime (See section 12.4 of chapter 12); and
- distortion of exploration, investment and operating decisions caused by the form of de facto royalties or payments in excess of reasonable compensation for interference with surface rights, the environment or cultural/religious observance (Inefficiencies caused by distorting imposts are discussed in detail in chapter 13).

The main focus of attention in public debate about the “right to negotiate” provisions has been the effect on exploration activity. Views differ widely. Mining and exploration industry associations have argued that the negative effects on exploration will be substantial. Aboriginal interests have claimed that the effects will be negligible. Analytical work by economists has produced similarly varied views.

In 1993, the Centre for International Economics argued in a report commissioned by the Western Australian Government that adverse effects on exploration and therefore mining output would be substantial. That conclusion was formed on the basis of economic theory relating to investment in the context of uncertainty, the perceived consequences of the Aboriginal Land Rights (Northern Territory) Act 1976 in the Northern Territory, and a comparison of that Act and the Native Title Act.159

In 1997, Ian Manning argued in a report commissioned by the Aboriginal and Torres Strait Islander Commission:

“……there is very little evidence for depressed exploration activity in Australia following the historic High Court Mabo native title ruling in 1992. In fact, mineral exploration expenditures revived in 1993 after a lull during the recession of the early 1990s, and since then have been running at levels to rival the boom of the late 1980s. Contrary to the position put forward by some

members of the Australian mining industry, the Mabo decision and the subsequent Commonwealth *Native Title Act 1993* did not depress exploration expenditure.”

Ian Manning’s conclusion was based on econometric analysis of data for the period 1992-93 to 1996-97 and an allegation that the work of the Centre for International Economics contained methodological inadequacies. He also argued that, from the mid-1980s, there is no evidence that the Aboriginal Land Rights Act had hindered the mining industry in the Northern Territory.

According to Ian Manning, “The post-Mabo boom in mineral exploration is an embarrassment for those who claim that native title has depressed exploration.” However, the “boom” was ending as that statement was being written. Mineral exploration expenditure peaked in the June quarter of 1997 before turning down sharply and halving over the next two years before stagnating and then recovering slightly from the September quarter of 2000 (Petroleum exploration expenditure was not included because it is dominated by off-shore activity). The downturn lagged about 6 months behind the Wik decision by the High Court and continued through and beyond a period of substantial public and political controversy regarding proposed amendments to the *Native Title Act 1993*, which were finally enacted in July 1998. Nearly 5 years after the Wik decision, mineral exploration expenditure is no higher in real terms than in the early 1990s in the midst of a world-wide recession. In words based on Ian Manning’s earlier comments, the post-Wik slump in mineral exploration must be an embarrassment for those who claim that native title has not depressed exploration activity.

Ian Manning’s conclusion that the *Aboriginal Land Rights (Northern Territory) Act 1976*, the Mabo decision, and the *Native Title Act 1993* had not negatively affected exploration was counter-intuitive because of the established inverse relationship between uncertainty and investment. Explanations offered to support his conclusion were not convincing. The severe, protracted slump in exploration expenditure from mid-1997 further undermined his conclusion. It is clear that further research is needed to unravel the various causes of the behaviour of mineral exploration expenditure from 1992 to 2001.

As well as arguing that the *Native Title Act 1993* had not reduced exploration expenditure, Ian Manning claimed that delays to exploration activity had been minimal. He blamed any exceptions to this generalisation on:

- uncooperative State Governments;
- mining companies not allowing sufficient time for negotiations;
- inadequate funding of native title holders/claimants;
- strategic behaviour by governments and mining companies wanting to portray the regime in a bad light; and
- court appeals by native title holders/claimants.

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160 Manning, Ian, op cit, p. 2.
164 Manning, Ian, op cit, pp. 11, 13-14.
The contradictions in these arguments are obvious. It does not make sense to claim that delays are minimal and then offer various explanations for delays.

Although Ian Manning has argued that the Native Title Act 1993 “has not seriously delayed exploration”, he conceded “there is evidence of delays to mining projects.” However, he argued that mechanisms are available to minimise delays. In addition to procedural mechanisms provided by the Act, he proposed that:

- significant time be allowed for negotiations with native title holders/claimants;
- negotiations be conducted concurrently with State and Territory mining authorities;
- administration of native title be better integrated with administration of State/Territory tenement regimes.

The Aboriginal and Torres Strait Islander Social Justice Commissioner and the President of the National Native Title Tribunal have cited the Yandicoogina Land Use Agreement as an example of negotiations between a mining enterprise and Aboriginal people that allowed a project to proceed without delay. The former stated:

“……the Yandicoogina Land Use Agreement is between Hamersley Iron (a Rio Tinto Group company) and the relevant Aboriginal people in the Pilbara region of Western Australia. Hamersley Iron, through agreements with the traditional owners, had the mine operating ahead of schedule (commenced 1999) and under budget. This is very different to Hamersley Iron’s earlier Marandoo mine, which encountered extensive opposition from environmental and indigenous interests in its development – it was two years behind schedule (commenced 1994) and considerably over budget. (This)…suggests negotiation as the preferred option.”

The implication is that if negotiations are sensibly handled by mining enterprises and Aboriginal representatives, efficient outcomes can result. Otherwise, delays and consequent social costs can be substantial.

Ian Manning has argued that the “right to negotiate” provisions of the Native Title Act 1993 are superior on economic efficiency grounds to the absence of such provisions, because litigation would be precipitated in the latter case and that “would worsen uncertainty for the mining industry”. The Aboriginal and Torres Strait Islander Social Justice Commissioner, William Jonas, has made similar comments.

Increased litigation would indeed increase uncertainty. It would also be undesirable on administrative efficiency grounds because it would result in economic waste.

However, it is not clear whether or not Ian Manning’s and William Jonas’ prediction of increased litigation is accurate. The matter is particularly unclear if the only change was to remove the opportunity to acquire de facto royalty payments in the form of benefits in excess of reasonable compensation for disturbance of land and

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165 Ibid, p. 3.
168 Manning, Ian, op cit, p. 7.
associated cultural/religious matters. That constraint already applies to other land title holders. Neither Ian Manning nor William Jonas provided evidence to support their opinion that litigation would increase in the absence of “right to negotiate” provisions. Also, both avoided discussion of the important option of revising the *Native Title Act 1993* so as to reduce uncertainty and consequent adverse effects on the efficiency of resource allocation.

In February 2001, the President of the National Native Title Tribunal, Graeme Neate, attempted to counter claims of exploration and mining being inhibited and delayed by the *Native Title Act*. He argued that nearly 70% of proposals to grant mineral tenements for which expedited procedure notices were issued by governments were subsequently cleared for grant after the 4-month objection period.

However, other statistics provided by the Tribunal indicated that 47% of proposals to issue tenements were caught by either the “right to negotiate” or objections to application of the expedited procedure or both. Also, 85% of proposals to issue tenements that were subjected to the “right to negotiate” procedures between 1 January 1994 and 31 December 2000 had not been resolved by agreements or determinations by 31 December 2000. The number of tenement applications that were not made in the wake of the Native Title Act is not known and needs to be addressed by further research.

Graeme Neate offered two explanations for the low resolution-rate and, despite this, a low rate of referrals for determinations. His major reason was that enterprises had applied for exploration tenements and then deferred negotiations “for commercial reasons”. A secondary explanation was that native title parties had inadequate resources.

Ian Manning suggested that enterprises deferred negotiations to make the *Native Title Act* appear unworkable. However, there is a much more conceivable explanation. It would allow an enterprise to hold ground considered to be prospective in future without having to comply with normal expenditure and relinquishment conditions that force premature exploration and thereby destroy resource rent (See section 12.3 of chapter 12). As well as being in the interests of the relevant mining enterprise, such behaviour could improve the allocation of resources, rather than adversely affecting it.

The statistics indicating a low rate of resolution of proposed exploration tenement applications that were subjected to the “right to negotiate” procedures did not include very large backlogs of tenement applications in Queensland and the Northern Territory. Governments of those jurisdictions had issued few tenements after the Wik High Court decision, pending implementation of alternative State/Territory procedures as permitted by the *Native Title Act*. The Senate of the Commonwealth of Australia disallowed some or all of the alternative arrangements. The Aboriginal and Torres Strait Islander Justice Commissioner argued that it was done to protect indigenous rights. The President of the National Native Title Tribunal blamed the

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170 Neate, Graeme, op cit, pp. 23-24.
172 Manning, Ian, op cit, p. 11.
173 Jonas, William, op cit, p. 11.
backlogs in Queensland and the Northern Territory on failure to use the “right to negotiate” scheme under the *Native Title Act*.\(^{174}\)

The President of the National Native Title arrived at the following self-contradictory conclusion regarding the effects of the “right to negotiate” regime on exploration and mining activity:

> “Experience has taught that native title negotiations can be difficult and time-consuming. Frustrations and consequent delays can be expected. Reaching lasting agreements can take time, patience, effort and resources. How much of each is necessary may not be predicted with precision, but the need to engage in a meaningful way with groups of indigenous people needs to be factored into the planning for resource projects. There is no ‘one size fits all’ approach that, once-mastered, will guarantee a positive result in every case.

(Mining) Industry members should not lose heart or put these matters into the too hard basket. Much of the law is clear and certain. Procedures are in place under the *Native Title Act* and some State laws. Legally enforceable options for agreement making already exist. Aborigines do not have a veto over mining projects. If agreement cannot be reached then disputes can be resolved by arbitration within timeframes specified in the *Native Title Act*. In other words, the essential legislative and procedural schemes are already in place.

The challenge for the players is to make the schemes work in all their interests.”\(^{175}\)

The contradictions are obvious. The circumstance described in the first paragraph can be expected to discourage exploration and mining. The second paragraph claims a workable system is in place. The third paragraph says that the current system is still not working.

While debate has raged in respect of the effects of “right to negotiate” provisions of the *Native Title Act* on exploration and mining, a significant source of uncertainty that could discourage exploration and mining activity has been largely overlooked. That uncertainty relates to ownership of minerals *in situ* in land subject to native title. The High Court and the *Native Title Act* have confirmed that ownership of minerals is vested in the Crown in right of the relevant State or Territory. Meanwhile, the Aboriginal and Torres Strait Islander Social Justice Commissioner and some legal specialists have suggested that mineral rights might be included in native title, at least in some States. The failure of the Commonwealth Government and the High Court to resolve this matter is a source of significant “sovereign risk”.

If the issue of ownership of minerals is resolved in favour of holders of native title, State and Territory Governments will lose the right to impose a royalty on minerals and native title-holders will gain that right. If the issue is resolved in favour of State and Territory Governments, the “right to negotiate” provisions of the *Native Title Act* will still allow registered holders and claimants of native title to appropriate a portion of the imputed nett value of minerals. The form of any *de jure* or *de facto* royalty that

\(^{174}\) Neate, Graeme, op cit, p. 24.

\(^{175}\) Ibid, p. 37.
might be imposed by a native title holder/claimant or government can have important implications for the efficiency of resource allocation. That is explained in detail in chapter 13.

The Native Title Act, in its current form, does not contain any provisions that would prevent use of particular types of de jure or de facto royalty instruments that distort exploration, investment and operating decisions and destroy part of the imputed nett value of minerals. That matter needs to be addressed whether or not the formal ownership of minerals remains with the Crown in right of the relevant government.

11.3.3 Administrative Efficiency

The native title regime established by the Mabo and Wik decisions and the Native Title Act 1993 is very complex and involves high management, compliance and legal costs for exploration and mining enterprises, governments and native title-holders and claimants. These costs will certainly be much higher than in the case of land subject only to other forms of land title.

Unnecessarily high administration costs represent economic waste. It is socially desirable that such costs be at the lowest possible level consistent with the achievement of equity and economic efficiency objectives.

Ian Manning and the Aboriginal and Torres Strait Islander Social Justice Commissioner, William Jonas, have suggested that the alternative to the uncertainty and administration problems and costs associated with the “right to negotiate” aspects of the native title regime is more litigation and consequently, even greater uncertainty and costs. It is not at all clear why a simpler native title regime, including a simpler “right to negotiate” scheme, that reduces uncertainty and offers less opportunity for litigation would not be a practical alternative. Clearly, this matter requires further research.

11.4 Policy Implications

The issue of access to the surface of land held by private interests is a major issue facing the mining industry. The matter is a source of serious conflict and requires resolution.

The problems appear to have arisen from poorly specified property rights in the context of the historical separation of surface rights and ownership of minerals in situ. The problems and cause existed prior to the confirmation of native title. When the Commonwealth Government legislated in relation to native title it failed to learn from the mistakes of the States/Territories in respect of other privately held land. Indeed, it extended those mistakes. In particular, the Commonwealth Government blurred the distinction between rights to the surface and ownership of minerals to a greater extent than the States had done historically in their mining legislation. The Commonwealth did so through the controversial “right to negotiate” provisions of the Native Title Act. This appears to have been motivated, at least in part, by opportunism and a desire to deal with the severe disadvantage of Aboriginal people.
Governments must find better ways of addressing Aboriginal disadvantage than the “right to negotiate” provisions of the Native Title Act and other existing policies that have clearly failed to deliver outcomes that any reasonable person could regard as equitable. Not only have outcomes been inequitable, but also they have created artificial impediments to mining and sustainable development and are economically and administratively inefficient.

Legislation to clearly define and protect property rights is important for ensuring that resources are allocated efficiently. However, the distinction between surface rights and mineral rights has been poorly handled by the Commonwealth’s Native Title Act and State/Territory exploration and mining legislation. The result has been misallocation of resources and administrative waste, rather than the reverse.

Native title and other surface rights are not the cause of the problem. Poor legislation in relation to those property rights and mineral rights is. Therefore, a re-think of provisions relating to consent, negotiation and compensation is necessary. The aim would be to ensure that owners of surface rights are fairly and fully compensated, while exploration and mining enterprises and communities that benefit from their activities (directly or through government royalty revenues) are not subjected to costly uncertainty, delays, complex compliance arrangements and de facto royalty imposts.

A largely overlooked issue with enormous policy implications for governments in Australia is that there is a possibility the High Court may decide to attach mineral rights to native title, at least in some States. The effects would be revolutionary. Existing exploration, mining and royalty policy regimes in affected States would disintegrate. Exploration and mining investment would come to an abrupt halt in response to an enormous policy vacuum. The position of existing mining operations would be uncertain.
12 EXPLORATION AND MINING TENEMENT SYSTEMS

12.1 Transferring Rights to Explore and Mine to Business Enterprises

Government ownership of minerals in situ is almost uniform in Australia, but governments have chosen not to exploit these natural assets themselves. Instead, they have legislated to establish procedures to grant exploration and mining rights to business enterprises in return for payment of royalty and compliance with a range of other conditions. With very few exceptions, the business enterprises have been private sector entities.

In each jurisdiction, an exploration tenement authorises enterprise to explore for all or particular minerals in the area covered by the tenement on an exclusive basis. A mining or production tenement permits extraction as well as exploration in the area that is subject to the tenement on an exclusive basis.

The specific arrangements vary between legislatures, but there are many similarities in basic approaches. Some common features and notable differences were outlined in section 4.3 of chapter 4. The basic approaches have been assessed below having regard to criteria established in chapter 3. Particular attention has been focused on ways in which poorly designed tenement regimes may constitute artificial impediments to the mining sector and sustainable development.

12.2 Efficient Timing of Exploration and Development with Perfect Tenure

When resources are allocated efficiently, the nett present value of minerals in situ is maximised from a social perspective. In sub-sections 6.1.3 and 6.1.4 of chapter 6, it was pointed out that decisions regarding timing of commencement of exploration and development were important for achieving that result because these occurrences are non-repeatable events.

12.2.1 Exploration Tenure

In sub-section 6.1.3, it was demonstrated that the nett present value in the base year that can be realised by proving and exploiting a mineral deposit in a future time period will be maximised if the exploration-development-exploitation sequence commences when “immediate exploitation value” stops rising at a faster rate than the relevant risk-adjusted opportunity cost of capital. The diagrammatic model used to derive and depict this result has been reproduced and extended in Figure 2 below. The result is depicted by the “immediate exploitation value” curve touching the compound interest curve at point M. That occurs at time B. The maximum nett present value in the base year (year 0) of future exploration, development and extraction is represented by X-0 or L-B. It is the value that should be imputed in the base year to the right to exploit a prospect or expected mineralisation in situ.
Throughout this report, it is referred to as imputed nett value of minerals or the right to exploit.

**Figure 2: Timing of Exploration with Perfect and Imperfect Tenure**

In this analysis, “immediate exploitation value” at each point of time refers to the nett present value of future cash flows expected to be realised if the exploration-development-extraction sequence of activities (the exploitation sequence) commences and is expeditiously pursued as from that point of time. Immediate exploitation value is nett of exploration, other assessment, design/planning, development and operating costs. It is also nett of the risk-adjusted opportunity cost(s) of capital, which is (are) represented by the discount rate(s) in the nett present value calculation.

“Immediate exploitation value” might increase at a higher rate than the cost of capital (before time B in Figure 2) if the relevant product price is rising and/or costs are falling sufficiently quickly in real terms. While mineral commodity prices, in general, have exhibited long-term downward trends in real terms, they have also experienced periodical cyclical up-turns in response to demand surges and increasing short term costs at existing mines. Exploration and exploitation costs have tended to move downwards in real terms on a long-term basis. The causes of falling real costs are:

- continuous, small, and occasional large advances in technology and techniques applicable to exploration, mining, processing and transportation; and
• improved access to infrastructure and other goods and services as economic activity expands in quantitative and geographical terms.

Time B is the socially desirable time to explore because the intertemporal allocation of resources is efficient and, as a result, the nett present value of the resource is maximised. A rational commercial operator will wait to commence exploration at that time provided that exploration tenure is secure and not conditional on undertaking earlier activities on the tenement.

However, exploration risk and uncertainty will mean that the ideal timing of exploration can rarely be achieved in practice. Nevertheless, if pre-discovery tenure is secure and unconditional, risk and uncertainty will not interfere with the incentive to keep exploration outlays to a minimum and to incur them as late as possible without jeopardising the ideal time for commencement of development and extraction. Yet, exploration risk and uncertainty are likely to induce deferment and reduction of exploration activity, as explained in sub-section 6.1.3.

12.2.2 Development and Mining Tenure

In section 6.1.4 of chapter 6, it was explained that, if pre- and post-discovery tenure are secure, a rational enterprise will not seek to develop and exploit the deposit until the sum of “immediate exploitation value” and exploration/assessment costs is positive and stops rising faster than the relevant risk-adjusted opportunity cost of capital. That will occur after time B in Figure 2.

Prior to that condition being met, the enterprise and society can earn a higher return from appreciation of the natural asset in situ and the exploration investment in it, than from mining the deposit and re-investing the surplus. Premature development is commercially and socially undesirable and irrational.

12.3 Exploration with Imperfect Tenure

Exploration tenement systems established by governments in Australia have typically been designed to bring forward exploration activity and increase exploration expenditure. The relevant systems were referred to as conditional first-come-first-served and work programme bidding regimes and described in section 4.3 of chapter 4. Those policy instruments have been assessed below from the perspective of economic efficiency, administrative efficiency and equity criteria derived in chapter 3.

The analysis in this sub-section is a direct extension of that in sub-section 6.1.3 of chapter 6. It is based on the pioneering work of Mason Gaffney.176 and application of extensions of Gaffney’s analysis in the Australian context by the author.177 It draws on subsequent work by other economic analysts in the Australian context, particularly

contributions by Ben Smith, David Nellor and the Industry Commission. However, it represents a substantial further development of earlier analytical work.

12.3.1 Conditional First-Come-First-Served System

Conditional first-come-first-served regimes described in sub-section 4.3.1 of chapter 4 consist of two basic elements:

- highly conditional, insecure tenure designed to force the pace of exploration; and
- allocation of tenements on either a strict or discretionary first-come first-served basis.

The key characteristics of the exploration tenure arrangements are as follows:

- Exploration tenure does not automatically provide a secure right to mine.
- Granting of a right to mine in respect of ground covered by an exploration tenement is dependent on discovery of a deposit and may be at the discretion of the administering authority.
- Pre-discovery tenure is available for relatively short periods.
- Retention of exploration tenure is conditional on significant exploration activity being performed within specified time periods.
- Exploration tenements are subject to periodic, compulsory relinquishment of ground under title.

The strict, first-in-time allocation mechanism grants an exploration tenement to the first applicant who satisfies application requirements. A lottery is used to determine the successful applicant if it is considered that applications were lodged simultaneously. The legislation specifies the minimum amount of expenditure per unit area that the tenement holder must meet. This system applies in Western Australia for minerals other than petroleum.

The discretionary allocation mechanism, which applies elsewhere in Australia for minerals other than petroleum, provides the administering authority with discretion to accept a proposed exploration programme or specify an alternative that is considered to be satisfactory and to judge whether or not financial and technical capabilities of the applicant are adequate. As a result, expenditure and other programme conditions such as timing and content that are accepted or set by the administering authority will

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vary from case to case. If applications for an area conflict, the allocation is determined by an assessment of proposed exploration programmes and technical and financial capabilities of proponents.

The exploration tenure arrangements and allocation mechanisms provide a strong incentive to undertake pre-emptive exploration activity. The incentive is particularly strong when the discretionary allocation mechanism applies.

To obtain secure title to attractive ground under a conditional first-come-first-served regime, an explorer would be induced to commence exploration as soon as “lease value” covers exploration and other assessment costs. “Lease value” is the imputed nett value of the right to exploit a prospect (shown by the curve MNXP in Figure 2) plus the discounted efficient exploration cost (shown by the curve KQVZ). “Lease value” rises at a rate equal to the risk-adjusted cost of capital.

In Figure 2, the “lease value” would be the amount, N-A plus Q-A at time A, X-0 plus V-0 in the base year or P-C plus Z-C at an earlier time C. The explorer could be induced to spend these amounts, even though “immediate exploitation value” is not positive at the times specified in the example, because exploration and discovery allow the explorer to obtain secure title over “lease value” and to defer development until the sum of “immediate exploitation value” and exploration/assessment costs stops rising faster than the relevant risk adjusted opportunity cost of capital. That commercially and socially ideal time to develop will occur well after time A. It should occur around time B.

Exploration cost in real terms is assumed to fall over time as a result of technical advances. That is depicted by the “immediate exploration cost” curve in Figure 2.

The time at which an inducement to explore first emerges is depicted by time C in Figure 2, where “immediate exploration cost”, R-C, is equal to “lease value”, P-C plus Z-C. By the time development proceeds after time B, the exploration cost incurred plus foregone returns on that capital have compounded to more than M-B plus K-B, wiping out the realised value from exploitation at time B, which is M-B plus K-B. The imputed nett value of the right to exploit has been destroyed by:

- the opportunity cost of (foregone returns on) capital invested in pre-emptive exploration (M-B plus K-B minus R-C); and
- exploration expenditure in excess of the efficient amount (R-C minus K-B)\(^{179}\).

The conclusion from this analysis is clear. Conditional first-come-first-served regimes cause departure from the socially desirable timing and quantum of exploration by inducing too much exploration, too soon to pre-empt access by other enterprises.

Risk and uncertainty exacerbate the problem. The less information that is available about prospects, the more difficult it is to differentiate good from poor prospects in advance. Then, incremental pre-emptive exploration is more likely to be motivated by the average outcome rather than the marginal product of exploration activity. In

\(^{179}\) Herfindahl, Orris and Kneese, Alan, op cit, pp, 135-136 arrived at the same result with a highly simplified version of the type of diagrammatic model used by Mason Gaffney and Ken Willett.
effect, the imputed nett value of good prospects subsidises or at least encourages exploration activity on poor prospects. This will strengthen the inducement to undertake pre-emptive activity in areas not yet regarded as being highly prospective. This applies when exploration and mining enterprises are “risk-averse”, as well as when they exhibit “risk-loving” behaviour. In the former case, pre-emptive activity will destroy imputed nett value. In the latter case, too much exploration too soon may result in minerals in situ realising negative value.\(^{180}\)

In contrast, when tenure is perfect, exploration risk and uncertainty, and associated uninternalised informational externalities, would result in reduction and deferment of exploration or too little exploration, too late. That is explained in section 6.1.3 of chapter 6. However, that problem does not justify existing tenement regimes in Australia. Those regimes destroy imputed nett value, while the alternative policy of sensible measures for dealing with inadequate contingency markets and the existence of informational externalities would enhance it.

Conditional first-come-first-served systems not only perform very poorly with respect to the economic efficiency criterion, as explained above, but also are unattractive in terms of the administrative efficiency criterion. They involve unduly high administration costs, which represent social waste and effectively reduce realised resource rent. They are expensive to administer because:

- they rely heavily on bureaucratic/ministerial involvement and discretion; and
- their highly conditional nature requires substantial monitoring by governments and enterprises.

The strict, first-in-time allocation mechanism appears to have an advantage over the discretionary allocation mechanism in respect of the administrative efficiency criterion. However, that edge may not apply in some cases. The saga of the Bronzewing South tenement adjacent to the major Bronzewing gold discovery in Western Australia illustrates the point. Substantial sums were spent by a number of parties on litigation and interaction with bureaucrats and politicians over a period of nearly 9 years before and after a ballot to resolve competing claims.

Conditional first-come-first-served systems have distributional or equity implications that need to be considered. They relate to intragenerational and intergenerational concepts of equity.

The imputed nett value of minerals in excess of the amount captured by royalty is destroyed. The portion that can be captured by royalty is limited for reasons outlined in section 12.5. Therefore, the relevant government, on behalf of the community, is denied a fair market price for rights to explore and mine. This is inconsistent with the benefit principle of equity explained in sub-section 3.2.3 of chapter 3.

Destruction of the imputed nett value of minerals also means that it cannot be invested for the benefit of future generations. Therefore, conditional first-come-first-served systems are inconsistent with concepts of intergenerational equity (see sub-section 3.2.4 and sections 7.3 and 7.4).

The distributional winners from conditional first-come-first-served systems are providers of exploration and tenement administration services who, as a result of increased and earlier demand for their services, gain incomes in excess of the opportunity cost of their services. There is no indication that governments or the community regard providers of these services as more worthy recipients of a portion of the imputed nett value of minerals than other existing or future members of the community who would benefit from increased investment, government services, or lower taxes.

If competition for an area is strong, the discretionary, conditional first-come-first-served method of allocation takes on the character of work programme bidding. That system has been evaluated in the next sub-section.

### 12.3.2 Work Programme Bidding

Work programme bidding regimes described in sub-section 4.3.1 of chapter 4 consist of two basic elements:
- highly conditional, insecure tenure designed to force the pace of exploration; and
- allocation of tenements on the basis of an assessment of work programme commitments offered by competing enterprises.

Tenure arrangements associated with work programme bidding regimes do not provide secure, unconditional tenure. They have the following pertinent key features.
- Exploration tenure does not automatically provide a secure right to mine. Granting of a right to mine is dependent on discovery of a deposit and may also be at the discretion of the administering authority.
- Pre-discovery tenure is available for relatively short periods.
- Exploration tenements are subject to periodic, compulsory relinquishment of ground under title.
- Retention of exploration tenure is conditional on performance of the work programme, including timing aspects, that was accepted or specified by the administering authority following the work bidding process.

Under a work programme bidding system, the allocation mechanism has the following key features.
- The administering authority invites applications to explore particular areas.
- The application must include a proposed programme of work, including proposed expenditure, and a description of the financial and technical capabilities of the applicant.
- Tenements are generally allocated to the proponent of the exploration programme that is judged to be the “best”, subject to the technical and financial capabilities of the proponent being considered adequate.
- The administering authority has considerable discretion in setting programme conditions and granting tenements.

To capture secure title, an explorer could spend up to the “lease value”, which is the sum of the imputed nett value of the right to exploit a prospect (shown by the curve MNXP in Figure 1) and the discounted efficient exploration cost (shown by the curve
The inducement derives from a desire to capture the “lease value” and pressure from the tenure arrangements and allocation mechanism, which make the amount and timing of exploration expenditure and discovery the means of capturing the “lease value”. A discovery will dramatically improve security of tenure and facilitate deferment of development until the sum of “immediate exploitation value” and exploration/assessment costs no longer rises faster than the relevant risk adjusted return on capital. That occurs well after time A and should take place around time B.

If work programme bids are requested at time 0, the explorer could promise an exploration programme with a present value equal at time 0 equal to the “lease value” at that time, which is $X-0 + V-0$. When the deposit is exploited after time B, the realised value is $M-B + K-B$. However, promised exploration outlays of $X-0 + V-0$ at time 0 and compound interest on these amounts from time 0 to time B, total $M-B + K-B$. Therefore, the present value of the realised surplus from exploration and exploitation is zero. The imputed nett value of the deposit in the base year has been destroyed by excess exploration costs of $X-W + V-0$ and foregone returns of $Y-X + W-V$.

A work programme bidding system tends to destroy imputed nett value through a combination of:

- exploration expenditure in excess of the most efficient quantum; and
- the opportunity cost of (foregone returns on) capital invested in pre-emptive exploration.

As in the case of conditional first-come-first-served systems, exploration risk and uncertainty will tend to exacerbate the capacity of work programme bidding to destroy imputed nett value of minerals.

If a tenement allocated by work programme bidding turns out to be less attractive than anticipated at the time the tenement was granted, the programme specified will not be sustainable. Attempts by the administering authority to enforce the original programme can render future activity in the area uneconomic. Some enterprises may be prepared to submit to such pressure proceed to avoid being declared ineligible for future grants of tenements and write-off the losses against other ventures. The aggregate imputed nett value of minerals will still be reduced.

If bids are not enforced, the credibility of the work programme bidding system will be undermined. It will become a method of allocating tenements to those who can make unrealistic programme promises most convincingly. Therefore, their integrity is likely to be under constant threat.

Work programme bidding systems also perform very poorly with respect to the administrative efficiency criterion. They are expensive for governments and enterprises to administer for three reasons:

- recurring threats to the integrity of the system;
- substantial bureaucratic/ministerial involvement and discretion in respect of multiple issues; and
- a requirement for substantial monitoring effort in respect of work programme, relinquishment and other requirements.
Such unduly high administration costs represent social waste. Effectively they reduce realised resource rent.

Work programme bidding suffers from the similar deficiencies in terms of equity to a conditional first-come-first-served system.

12.4 Timing of Development

Proponents of conditional first-come-first-served and work programme bidding systems have argued that inducement of earlier and additional exploration is a good thing because it will result in earlier development of resources. The argument is seriously flawed.

To the extent that discovery provides relatively secure tenure, a rational enterprise will not seek to develop and exploit the deposit until the sum of “immediate exploitation value” and exploration/assessment costs:

- is positive; and
- stops rising faster than the relevant risk-adjusted opportunity cost of capital.

Prior to that time, the mining enterprise and society earn a higher return from appreciation of the natural asset and the exploration investment in it than from exploiting the deposit and investing the surplus. Premature development is commercially and socially undesirable.

If pre-discovery tenure is secure, development will occur after time B in Figure 2. If exploration is undertaken prematurely because of exploration tenure imperfections, development could commence a short time before time B in Figure 2, because the sum of “immediate exploitation value” and exploration/assessment costs can be expected to increase at a slower rate than “immediate exploitation value”. However, this effect may be offset to some extent by the tendency of extraction risk and uncertainty to induce deferment of commencement of development while risk/uncertainty assessments and management strategies are formulated. The nett effect will vary from case to case.

In any event, a rational mining enterprise would want to commence development around or not too long after time B in Figure 2. The ideal time to commence development from a social/economic perspective would be the same. A rational mining enterprise would favour that timing, whether or not pre-discovery tenure is conditional and insecure and exploration is pulled forward.

Premature discovery certainly does not justify early development and cannot be expected to induce it. After all, it is well known that prematurely discovered resources can remain undeveloped for years or even decades. Only if a newly discovered deposit is ripe for exploitation, will it be developed immediately after expeditious exploration and assessment.

Various government policy requirements may cause deferment of development. For example, acquisition of development tenure may require unreasonably protracted environmental assessment and approvals processes (see chapter 14) or unreasonably
prolonged mandatory negotiation and arbitration procedures with Native Title claimants (see chapter 11).

In such circumstances, development may be deferred far beyond the time when the sum of “immediate exploitation value” and exploration/assessment costs no longer rises faster than the relevant discount rate. Then, part of the imputed nett value of the deposit will be dissipated by foregone interest on capital invested in prior exploration, assessment and planning. That social loss adds to those arising from excessive costs of negotiating environmental approvals and land access, and any deadweight losses arising from the form of environmental and other land access conditions.

12.5 Tenement Regimes, Royalty and Income Tax

To the extent that the imputed nett value of minerals is captured by royalty and taxation regimes, the tendency of conditional-first-come-first-served and work programme bidding systems to misallocate resources and destroy imputed nett value of minerals will be restrained. This occurs because siphoning-off imputed nett value reduces the potential value of the prize to be captured by undertaking too much exploration, too soon.

However, to the extent that the royalty or taxation system excludes returns to exploration investments from the royalty/tax base, the incentive to explore too much, too soon is unaffected and the government revenue base is undermined by such activity. Any royalty system allowing effective immediate deductibility of exploration outlays against existing returns will exclude minimum required returns to exploration investments from the royalty base. Royalty systems that fully incorporate this feature include:

- economic profits and realised nett value royalty systems, which provide full loss-offsets (see sections 13.6 and 13.7 of chapter 13); and
- competitive, lump-sum cash bidding system, which allows enterprises to estimate and deduct all expenditures, including exploration, and the opportunity cost of capital when calculating their bids (see section 12.7 below and section 13.8 of chapter 13).

Royalty systems that provide full loss-offsets for exploration expenditures in some circumstances, but not others, include a resource rent royalty and an accounting profits royalty. This is explained in sections 13.4 and 13.5 of chapter 13. These systems will reduce the incentive to explore too much, too soon to the extent that they do not exclude exploration expenditures and the associated opportunity cost of capital from the royalty base.

Royalty systems based on gross revenue (ad valorem systems) or quantity of output (specific systems), disallow costs, and therefore, include exploration expenditure and returns thereto in the royalty base. The incentive to explore too much, too soon created by conditional first-come-first-served and work programme bidding systems is undermined by siphoning-off some of the imputed nett value of minerals and by effectively taxing minimum required returns to investment in exploration.
This does not justify retention of ad valorem and specific royalty systems, which apply throughout Australia. As explained in chapter 13, these royalty systems have various severe deficiencies, which include tendencies to reduce recovery, output and development investment, as well as exploration. The effects increase as the royalty rate is raised and as the royalty base is broadened. As a result, ad valorem and specific royalty systems are not able to capture a substantial portion of the imputed nett value of minerals without causing substantial damage to recovery, output and investment. To the extent that royalty rates are kept down to reduce these adverse effects, the usefulness of ad valorem and specific royalty systems as devices for offsetting the incentive to explore too much, too soon will be limited.

While conditional first-come-first-served and work programme bidding systems tend to counter the effects of revenue and output based royalty systems on exploration, they do not offset to any extent the adverse effects of those royalty regimes on recovery, output and investment. Therefore, those tenement systems are not useful devices for overcoming the deficiencies of revenue and output based royalty regimes.

Clearly, it is inappropriate to attempt to justify either the predominant royalty systems or the predominant tenement systems in Australia on the grounds that the other regime is in place.

Royalty systems that exclude exploration investments and the associated opportunity cost of capital from the royalty base should not be rejected because they tend to preserve the proclivity of existing tenement systems to destroy the imputed nett value of minerals. As demonstrated in sections 12.6 and 12.7 and chapter 13, economic profits, nett realised value and competitive, lump-sum cash bidding royalty systems are far superior to ad valorem and specific royalty systems when linked with tenements that do not induce destruction of the imputed nett value of minerals.

The message of this section should be obvious and clear. It is a message supported by the lessons of the economic theory of the “second-best”, which were discussed in subsection 3.3.2 of chapter 3. The appropriate policy response by State and Commonwealth Governments in Australia is comprehensive reform involving simultaneous replacement of highly imperfect tenement systems and deficient royalty systems, rather than piecemeal reform of either tenement or royalty policy.

12.6 Replacing Seriously Flawed Tenement Systems

Two key requirements for a replacement for existing, seriously flawed tenement regimes in Australia emerge from the preceding analysis in this chapter:
- elimination of tenement conditions that distort the allocation of resources to exploration;
- an allocation criterion that does not distort the allocation of resources to exploration and is equitable and objective.

Both requirements need to be satisfied. Satisfying one without the other is undesirable.
Removing tenement conditions that distort the allocation of resources to exploration, will increase the value of the tenements, often substantially. With greater value available for distribution or destruction, an allocation system that is equitable and efficient becomes correspondingly more important. If deficiencies in tenement conditions are corrected, but tenements continue to be allocated on the basis of the size and timing of exploration commitments, the imputed nett value of minerals will still tend to be destroyed because of pressures from the allocation mechanism to undertake pre-emptive or excessive exploration.

Similarly, implementing a tenement allocation system that satisfies equity and efficiency criteria is futile if tenement imperfections are not corrected. Then, the imputed nett value of minerals will be destroyed because of pressures inherent in tenement conditions to undertake too much exploration, too soon. For example, use of an economically and administratively efficient allocation mechanism like competitive, lump-sum cash bidding will not prevent destruction of the imputed nett value of minerals if the tenements being allocated are subject to conditions relating to short tenure, relinquishment conditions, pressing work conditions, etc. Deficiencies in respect of tenement conditions can be rectified by:

- attaching mining rights as well as exploration rights to the auctioned tenement;
- providing secure, long term tenure, without relinquishment requirements;
- eschewing conditions that increase the quantity or advance the timing of exploration and development activity;
- making tenements freely tradeable without approval of the administering authority; and
- confining conditions to requirements for improving the efficiency of resource use such as internalisation of social costs of impacts on the natural environment, local residents and the workforce.

A possible allocation mechanism for secure, long-term tenements, like those described in the preceding paragraph, is the strict first-in-time approach supported by a lottery for simultaneous applications, as in Western Australia. However, there are number of reasons why this approach should not be acceptable. First, it is arbitrary, lacking any logical foundation. Second, it would give away valuable resources without regard to the benefit principle of equity discussed in sub-section 3.2.3 of chapter 3. Third, if an area is highly prospective, an acquisitive race is still likely. At least some of the imputed nett value will be destroyed as a result of rent-seeking behaviour. A ballot may not put an end to such activity, as illustrated by the case of the South Bronzewing tenement discussed in sub-section 12.3.1 above.

A competitive, lump-sum cash bidding (tenement auction) system has been strongly advocated in the economics literature as a mechanism for allocating tenements. However, suggestions that competitive, lump-sum cash bidding should be adopted as a major tenement allocation device in Australia have been vehemently opposed by State/Territory bureaucrats and mining/petroleum sector representatives. Various suggestions that competitive, lump-sum cash bidding should be adopted as a major tenement allocation device in Australia have been vehemently opposed by State/Territory bureaucrats and mining/petroleum sector representatives. Various

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arguments for and against competitive, lump-sum cash bidding have been assessed in section 12.7 below.

12.7 Competitive Cash Bidding without Distorting Tenement Conditions

12.7.1 Outline of the System and Its Rationale

The assessment of competitive, lump-sum cash bidding in this section has been undertaken on the assumption that the tenements to be allocated are free of distorting conditions such as those discussed in previous sections of this chapter. For reasons outlined in the previous section, it is not useful to consider use of this allocation mechanism for tenements subject to various conditions that force the pace of exploration and reduce the value of those tenements.

Under a competitive, lump-sum cash bidding (tenement auction) regime, the relevant administering authority invites applicants to offer up-front, lump-sum, cash payments for the right to explore and mine particular areas. Tenements are allocated on the basis of the magnitude of payments offered.

Experts in exploration and mining enterprises estimate what a tenement is worth, having regard to all relevant geological, engineering, metallurgical, locational, environmental, infrastructural, and market factors, and any conditions attaching to the tenement or obligations imposed by legislation. They also have regard to risk and uncertainty and available devices for managing and ameliorating risk and uncertainty. After assessing all of these and other relevant matters, interested parties bid accordingly.

The underlying premise is that enterprises with superior combinations of knowledge, expertise, other resources, and capacity to manage risk and uncertainty will submit higher bids and win access to the resource. The winning bid should be the highest price an industry participant is prepared to pay up-front at the time of the bidding for the right to explore and mine.

The system used by the Government of the United States is a first-price, sealed bid auction. Under this system, potential buyers submit sealed bids and the highest bidder is awarded the tenement for the price offered by that bidder.

However, there are a number of different types of auction that could be used. The four basic types are:

- an English or oral (open), ascending bid auction;
- a Dutch or oral, descending bid auction;
- a first-price, sealed bid auction; and
- a second-price, sealed bid auction which awards the tenement to the highest bidder at a price equal to the bid of the second highest bidder.
There is a very substantial literature on auctions and bidding. This includes comparisons of the advantages and disadvantages of the various systems in different circumstances. It is beyond the scope of this report to survey that literature here.\textsuperscript{182}

A tenement auction regime serves dual purposes. As well as being a mechanism for allocating tenements, it is a device for charging an \textit{ex ante}, lump-sum royalty determined in the market for exploration and mining rights.

Economic arguments in favour of competitive lump-sum cash bidding are as follows.

- It is an economically efficient tenement allocation and royalty mechanism. A cash bid determined and paid before allocation does not distort subsequent exploration, investment and operating decisions by the tenement-holder because the cash payment is a sunk-cost when those decisions are being made.
- Competitive, lump-sum cash bidding is an administratively efficient allocation regime because it relies on an objective allocation criterion, avoiding arbitrary decisions and bureaucratic/ministerial discretion. As a result of those features, it involves much lower administration costs than existing tenement regimes that are heavily reliant on bureaucratic discretion. It is an administratively efficient royalty regime because it does not involve any administration costs additional to those required for its operation as a tenement allocation system.
- Competitive, lump-sum cash bidding is an equitable tenement allocation and royalty mechanism. It complies with the benefit principle of equity that beneficiaries of goods and services provided by government should contribute in accordance with the benefits they receive. Each bidder determines what it is prepared to pay in the differing circumstances of each prospect, having regard to all expected outcomes and revenues and costs, including risk and uncertainty. The \textit{ex ante}, lump-sum royalty will be adjusted downwards by the bidder to allow for income tax obligations and any obligations to pay an additional royalty calculated on the basis of realised outcomes (an \textit{ex post} royalty). It is a flexible mechanism for capturing the highest price for each prospect in the circumstances prevailing at the time of the tenement auction.

A number of issues have been raised regarding a competitive lump-sum cash bidding system. These have been briefly outlined and discussed below.

\textit{12.7.2 Affect on Exploration Activity}

A common concern among administering authorities is that replacement of conditional, first-come first-served and work programme bidding regimes by competitive, lump-sum cash bidding for secure exploration and mining rights with minimal conditions will reduce exploration activity. Such concern is based on the assumption that the amount and timing of exploration under existing tenement regimes is economically/socially appropriate. That assumption is inaccurate. It was demonstrated above that the predominant tenement regimes in Australia induce too much exploration, too soon to capture tenure for commercial advantage. The result is

destruction of imputed nett value of minerals. Regimes producing such a result do not provide an appropriate benchmark for the economically/socially desirable level and timing of exploration activity.

Also, it is important to note that the approach advocated by this report is comprehensive rather than piecemeal reform. As well as reform of tenement policy, comprehensive reform should include replacement of existing royalty regimes a proposed in chapter 13, and elimination of the multitude of other artificial impediments to exploration, mining and processing activity in Australia discussed in chapters 9 and 10. This comprehensive reform will stimulate exploration activity in Australia in a manner consistent with an efficient allocation of resources.

12.7.3 Funds Available for Exploration

A common concern expressed by geologists and administering authorities is that a tenement auction system will reduce funds available for exploration. This argument is flawed for five reasons.

First, the concern is based on the assumption that funds available to each enterprise for exploration is fixed. If so, it reflects deficiencies in corporate budgetary processes. Persistence of fixed quantities of funds for exploration beyond the normal budget period is not plausible. The opportunities available and the anticipated gains from exploration can be expected to influence the availability of funds for exploration to and within enterprises.

Second, if capital rationing is a common problem among bidders, it will be reflected by relatively high implicit costs of capital. Bids will fall because the imputed nett value of the right to explore and mine is nett of all costs. That will reduce the amount drawn from the pool, which is subject to rationing. If a tenement is considered a high priority prospect by an enterprise with capital rationing, it will gain an allocation of capital. If it is not a high priority prospect, exploration can be deferred until it attains that status.

Third, a lump-sum cash payment to acquire tenure is effectively an early, lump-sum payment of royalty, appropriately discounted at the relevant opportunity cost of capital, and appropriately adjusted to allow for uncertainty. That role of a cash bid will be reflected by a downward adjustment of the amount of the bid in response to any pre-determined additional obligation to pay a royalty based on realised outcomes. The worst case scenario is that a lump-sum cash payment might the timing of exploration in the context of deficient budgetary processes and capital rationing, but it will affect the quantity.

Fourth, capital accumulation in the mining sector should not be any less with a competitive lump-sum cash bidding system that preserves and redistributes the ex ante imputed nett value of minerals than with a regime that destroys imputed nett value by inducing too much exploration, too soon. Therefore, capacity to fund exploration should not be diminished by tenement auctions.
Fifth, if a tenement is worth paying-for it will be explored by a rational tenement-holder when its immediate exploitation value stops appreciating faster than the relevant opportunity cost of capital. If the tenement-holder does not wish to fund exploration at that time, it can enter into a joint venture agreement with or sell to another entity capable of funding exploration.

12.7.4 Speculation

Some representatives of the mining sector and government administering authorities have expressed alarm that tenements might be acquired by “speculators”, rather than enterprises interested in exploration and mining. That would be of concern on equity grounds if rights to explore for and mine minerals owned by the Crown were given away. But, under a tenement auction regime, exploration and mining rights are awarded to the highest cash bidder. If the winning bidder chooses to defer commencement of the exploration-development-extraction sequence, because it is considered that immediate exploitation value of the rights is appreciating faster than the relevant opportunity cost of capital, both the enterprise and society will benefit as demonstrated in sub-section 6.1.3 of chapter 6 and reiterated in sub-section 12.2.1 of this chapter. Such “speculative” activity is socially responsible. It facilitates the efficient allocation of resources over time and implicitly recognises the anticipated demands of and supply available to future generations.

12.7.5 Competition

Concerns have been expressed by representatives of administering authorities that the market for tenements will not be competitive for various reasons. These include the following.

- The number of potential purchasers of exploration and mining rights may be small, particularly in areas that are not considered highly prospective.
- Small explorers could be squeezed-out because of lack of capacity to fund up-front, lump-sum cash payments.
- Bidders might collude to restrain the size of bids.

These arguments are not convincing for the following reasons.

- Analysis of experience in the United States, where petroleum tenement auctions have been used for decades, indicates that competition for tenements at auctions has been sufficiently strong to protect the public interest.\(^ {183} \)
- Release of areas for bidding should follow receipt of at least one unsolicited expression of an interest and a subsequent call for written expressions of interest, the results of which would not be made public.
- Conducting of tenement auctions on a sealed-bid basis induces effective competition even if the number of potential bidders is small.
- Small explorers would encounter greater barriers to entry relative to existing conditional first-come-first-served and work programme bidding systems only to

the extent that increasing the length and reducing conditions of tenure and inclusion of mining rights increases the value of tenements. However, the increased security and extent of tenure will also provide a better foundation for capital raising.

- In any event, high potential bids would present a barrier to entry to small firms only in the case of very highly prospective ground.
- A tenement condition established prior to auction that a pre-determined royalty based on realised outcomes will be payable by the successful bidder(s) will reduce the size of the lump-sum cash bid needed to win a tenement. A number of other reasons for attaching such a condition to tenements offered for auction have been identified in chapter 13.
- Small explorers could be permitted to bid jointly, while very large enterprises might be prohibited from participating in joint bids.
- Bids can and should be accepted from anyone, not just exploration and mining enterprises. Investment funds and enterprises may be interested in holding natural assets in their portfolios. Bidding by conservation groups, owners of surface rights and the Commonwealth Government would help ensure that land is allocated to its highest-valued use. Participation in auctions by parties such as these from outside the industry would enhance competition.
- Declaration of the right to reject any or all bids, and setting of undisclosed reserve prices could be used to avoid granting of tenements when competition is considered not to be effectively competitive because of suspected collusion or other reasons.
- Collusive behaviour could be attacked under the existing Commonwealth Government legislation designed to prevent anti-competitive behaviour.

Representatives of mining enterprises have expressed concern that the market for tenements will not be competitive because governments might restrict supply of tenements to raise bids. It is not clear how much supply would need to be restricted before they become concerned. But, it is clear that it is in the interests of the community to avoid flooding the market for tenements. At the same time, each State/Territory Government competes as a supplier of tenements with other State/Territory Governments and with governments elsewhere in the world.

12.7.6 Informational Externalities and Asymmetric Information

A concern raised by some economists is that, in the absence of pressure from the tenement regime to explore, there may be too little exploration, too late because of uninternalised positive externalities associated with information about exploration. More specifically:

- tenement-holders explore less and later than is socially desirable because they cannot internalise information (uncertainty reducing) benefits provided to others by their exploration activities; and
- enterprises may wait for nearby ground to be explored so as to gain free information as a means of reducing risk and uncertainty that they face.

This does not justify an extreme response like retention of existing conditional first-come-first served and work programme bidding regimes. It was demonstrated above that these systems lead to too much exploration, too soon rather than an efficient supply of exploration effort, and as a result, they destroy the imputed net value of minerals. An appropriate policy response would target an efficient supply of exploration effort.

Joseph Stiglitz, George Fane and Ben Smith have suggested subsidising exploration. The ideal subsidy to an exploration venture would be equal to the sum of the amounts that holders of tenements in the area would be willing to pay for the information the venture is expected to provide to these other tenement-holders. Because the ideal subsidy would be difficult to estimate in practice, they suggested that a less ideal but practical approach was to subsidise most exploration expenditures, with the rate of subsidy varying according to perceived riskiness of the activity.\(^{185}\)

Because of the practical difficulties associated with an exploration subsidy, Walter Mead, Asbjorn Moseidjord, and Philip Sorensen\(^{186}\) have proposed another mechanism that simultaneously deals with concerns about the implications of asymmetric information for competition for tenements under a lump-sum cash bidding regime. Asymmetric information refers to an uneven distribution of information about a tenement among potential bidders.

Although the administering authority would make the information that it holds equally accessible by all potential bidders, enterprises that have been exploring ground near the tenement to be auctioned should have an informational advantage because of data generated by their own activities. Mandatory public announcements regarding exploration activity and leakage of information in various ways would not be adequate to remove the informational advantage held by some potential bidders.

If bidders recognise that information is asymmetrically distributed, those with inferior information may reason that, if they bid on the basis of the information available to them, they are unlikely to win, and if they do win, it is likely to mean they have overbid. A potential bidder with superior information may reason that those with inferior information will either not bother to bid or will bid low on the basis of their inferior information. In this context, a bidder with superior information may lodge a lower bid than can be justified by the information available to that enterprise. Therefore, the result of asymmetric information may be less competition for tenements and lower bids. This is supported by a detailed empirical study by Walter Mead, Asbjorn Moseidjord and Philip Sorensen. Their study covered the very large number of oil and gas tenements issued in the Gulf of Mexico the United States Government from 1959 to 1969.\(^{187}\)


\(^{187}\) Ibid.
Walter Mead, Asbjorn Moseidjord and Philip Sorensen argued that the results of their study were also consistent with the hypothesis that the first auction in an area, in which no bidder has superior information, might attract bids reflecting not only the right to explore and exploit, but also the opportunity to obtain information that could be useful in later auctions in the area. They argued this was sufficient to compensate for lower bids in circumstances where the distribution of information was asymmetric. The evidence cited to support the argument was that the average rate of return (after payment of cash bids and royalties) on all tenements issued in the Gulf of Mexico was no more than the average rate of return in U.S. manufacturing industry.

Mead, Moseidjord and Sorensen suggested that such bidding behaviour effectively internalises information externalities. They preferred this method of internalising information externalities to the provision of subsidies for exploration, which they considered impractical. Therefore, rather than perceiving asymmetric information as an impediment to a competitive, lump-sum cash bidding regime, Mead, Moseidjord and Sorensen proposed perpetuating the bidding advantage of neighbours.188

12.7.7 Risk and Uncertainty

Some critics of competitive, lump-sum cash bidding have claimed that it increases risk and uncertainty faced by explorers. The claim is misleading for a number of reasons.

First, cash bids will replace commitments to undertake too much exploration, too soon under conditional first-come-first-served and work programme bidding systems. There should be no change in risk and uncertainty borne by the enterprise unless they know in advance that the timing and size of expenditure/work commitments could be easily and regularly dishonoured.

Second, if a government decided to rely more on cash bids for royalty and less on royalty systems conditional on outcomes, it would reduce the rate or base of the latter. The cash bid offered by an enterprise will rise, but not by as much as the expected present value of the conditional royalty, because risk-averse enterprises would adjust cash bids downwards to reflect increased nominal risk and uncertainty borne by the enterprise. Effectively, the increased nominal risk is shifted back to the government via the bid. This matter is discussed further in chapter 13.

Third, there is a practical means of avoiding “sovereign risk” arising from fears of ex post government intervention to capture a bigger portion of “bonanza” returns not anticipated at the time of the tenement auction. Before bidding commences, a royalty regime conditional on outcomes can be specified as a condition of grant of a tenement. Then bids will be adjusted downwards to reflect the existence of the royalty. This matter has been discussed in detail in chapter 13.

Fourth, competitive, lump-sum cash bidding in respect of long-term tenure, including the right to mine and minimal conditions, would eliminate the substantial risk and uncertainty prevailing under existing regimes in respect of tenure.

188 Ibid.
Fifth, with secure tenure, enterprises can choose to wait for additional information and improved techniques, which ameliorate risk and uncertainty.

While the risk and uncertainty borne by enterprises under a competitive, lump-sum cash bidding regime will not rise and may indeed fall relative to existing tenement regimes, the former tenement system does not counter any retarding effects on exploration of residual risk and uncertainty ultimately borne by investors. Existing conditional first-come-first served and work programme bidding regimes tend to counter those retarding effects, but generate massive over-kill, destroying imputed nett value of minerals not captured by royalty conditional on outcomes. Clearly, existing tenement regimes are not appropriate instruments for dealing with any exploration-retarding effects of residual risk and uncertainty.

However, other sectors of the economy face risk and uncertainty. After allowing for the substantial range of devices available to exploration/mining enterprises and those available to other business enterprises to manage and ameliorate risk experience, it is not at all clear that residual risk and uncertainty borne by the former will be significantly greater. Therefore, if risk-taking is considered to be deficient, general policy measures to deal with that perceived problem would be more appropriate than special measures for exploration/mining, other than those eliminating artificial impediments to exploration/mining.  

12.7.8 Revenue Yield

Concerns have been expressed about the ability of competitive, lump-sum cash bidding to provide adequate returns to the community if it is the sole source of royalty revenue. Two reasons have been cited for these concerns.

First, bids will reflect the degree of risk-aversion of bidders as well their perceptions of risk and uncertainty. Unless bidders are risk neutral, the government could increase the value to government of royalty revenue by making at least some of it conditional on realised outcomes of mining. If a government is risk neutral, it could maximise the value to government of royalty revenue by relying solely on royalty based on realised nett value of minerals or economic profits. This matter is discussed in detail in chapter 13.

Second, if the government relies solely on tenement auctions for royalty revenue, “sovereign risk” may be generated because some ventures will inevitably turn-out substantially better than anticipated at the time of the tenement auction. This will induce enterprises to reduce their bids, which in turn, increases fears that the government will intervene to increase its royalty take by imposing an additional levy when the project is operating. This problem was referred to in the previous sub-section and has been discussed in more detail in chapter 13.

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As a result, of these issues, a case can be made for combining competitive lump-sum cash bidding with a royalty regime based on realised nett value or economic profits. This matter is discussed in detail in chapter 13.

12.8 Policy Implications

The predominant exploration tenement systems in Australia, conditional first-come-first-served and work programme bidding regimes, should be abandoned. They perform very badly in respect of equity, economic efficiency and administrative efficiency criteria. They destroy the imputed nett value of minerals by distorting exploration decisions and as a result of high administration costs.

Replacement of conditional first-come-first-served and work programme bidding systems is a pre-requisite for reform of royalty regimes. The reason is that royalty regimes that can substantially reduce the adverse effects of existing output and revenue-based regimes on exploration, investment and operating decisions tend to preserve the distortionary effects of these existing exploration tenement regimes. These distortionary effects destroy the base to which improved royalty regimes apply, with the result that their revenue yield is likely to be small.

Reform of tenement and royalty regimes should be accompanied by elimination of the wide range of artificial impediments discussed elsewhere in this report. These artificial impediments tend to reduce the efficient supply of exploration effort.

The preferred tenement regime combines long-term, secure exploration and mining tenure with allocation via competitive, lump-sum cash bidding (tenement auctions). This involves reform of both tenement instruments and the tenement allocation mechanism, not just one or the other.

Competitive lump-sum cash bidding should not be relied upon as the sole source of government royalty revenue from any tenement. It should be used in tandem with a royalty system based on realised nett value or economic profits as explained in chapter 13.
13 ROYALTY POLICY

13.1 Alternative Royalty Systems

The nearly universal vesting of ownership of minerals in the Crown in right of a State, Territory or Commonwealth Government allows the government of that jurisdiction to charge a price for the right to exploit those minerals. That price is typically referred to as a royalty. It could take the form of a series of payments conditional on outcomes (an ex post system) or a payment determined in advance of outcomes (an ex ante regime).

In this chapter, several alternative royalty regimes have been assessed. They include the main systems used in Australia and other systems that have been proposed in the economics literature.

The predominant royalty systems in Australia are ad valorem and specific royalty regimes. The former is based on revenue. The latter is based on production.

In a few cases, the States have adopted royalty systems based on an accounting profits concept, either alone or as an alternative to or in conjunction with an ad valorem royalty. Some prominent examples of the application of accounting profits based royalty regimes were briefly summarised in section 4.5 of chapter 4.

The Commonwealth Government applied a “resource rent tax” to “greenfields” off-shore petroleum projects from 1 July 1984, and subsequently extended the application of the system to include producing Bass Strait fields. This tax is a de facto royalty. Some background information and basic details of the system were provided in section 4.5 of chapter 4.

Four alternatives to the main royalty regimes operating in Australia have been analysed in this chapter. One alternative is an economic profits royalty, which has often been referred to as a “Brown tax/royalty” in the economics literature. A second option is a realised nett value royalty, which combines features of an economic profits royalty and a resource rent royalty. A third alternative is competitive, lump-sum cash bidding, which serves dual purposes as a tenement allocation system and an ex ante royalty. This system was discussed in section 12.7 of chapter 12. A fourth option is a system combining competitive, lump-sum cash bidding and either a realised nett value royalty or an economic profits royalty.

The criteria used in the assessment of alternative royalty regimes in this chapter are equity, economic efficiency and administrative efficiency. These criteria were discussed in detail in chapter 3.

The assessments of royalty regimes in this chapter depend critically on the accompanying tenement regime. In chapter 12, it was pointed-out that conditional first-come-first-served and work programme bidding systems, which have been the predominant mechanisms for allocating exploration tenements in Australia, tend to destroy the imputed nett value of minerals. Consequently, they undermine the base for, and revenue yield of realised nett value and economic profits systems, to a lesser
extent resource rent royalty systems, and to a lesser extent again, accounting profits
systems. Indeed, to the extent that these systems provide loss-offsets for exploration
expenditure through immediate write-offs, rebates or other means, they preserve the
tendency of existing tenement regimes to destroy resource rent. In contrast, *ad
valorem* and specific systems reduce the tendency of existing tenement regimes to
destroy resource rent to the extent that they are able to siphon-off the imputed nett
value of minerals without providing any recognition of exploration costs.

Because of pressing need for reform of existing tenement regimes in Australia, the
analysis below focuses mainly on the alternative royalty systems in the context of
prior or simultaneous correction of faulty tenement policy. However, the
implications for royalty policy of not correcting flaws in tenement systems are also
discussed.

### 13.2 *Ad Valorem* and Specific Royalties

The royalty systems most commonly used by State Governments in Australia, both
currently and historically, have been *ad valorem* and specific systems. An *ad valorem*
system charges a price calculated as a percentage of some concept of gross value,
such as ex-mine, free-on-rail or free-on-board value. A specific system charges a
price per unit of physical output.

*Ad valorem* and specific royalty regimes do not allow for nett value differences
between units of ore within each deposit. Consequently, they make it unprofitable to
produce units of ore that would yield a pre-royalty surplus that is less than the royalty
applying to those units. The higher the royalty rate and broader the royalty base (eg,
f.o.b. value instead of ex-mine value or units of ore rather than units of crude metal),
the higher will be the quality and quality of ore left behind. As well as interfering
with recovery of material, it is known that, to the extent that barriers to entry to and
exit from the industry exist, these royalty systems may induce changes to the timing
of extraction.

Specific and *ad valorem* royalties also fail to allow for nett value differences between
deposits. Therefore, the less economically attractive a deposit is, the more likely it is
that one of these regimes will prevent development of a mine because too much
material is made uneconomic by the royalty. Also, the higher is the royalty rate and
the broader is the base, the more likely it is that development will not proceed or that
closure will occur prematurely.

An additional deficiency of *ad valorem* and specific royalty regimes is that they
discourage risk-taking, because they increase the probability of achieving each
possible level of negative nett present value and reduce the probability of attaining
each possible level of positive nett present value. This tends to skew the frequency
distribution of nett present values in a negative direction, discouraging exploration
and investment. The magnitude of these effects increases with the level of the royalty
rate and breadth of the royalty base.

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190 The analysis in this chapter relies heavily on previous work by the author, particularly Willett, Ken
Specific royalties are completely insensitive to changes in prices and costs. *Ad valorem* royalties are sensitive to prices, but insensitive to costs up-stream from the point at which they are levied (e.g., ex-mine, ex-beneficiation plant, free-on-rail, f.o.b.). The damage caused by these regimes increases as cost conditions deteriorate, and no revenue benefits accrue to the government when cost conditions improve. The damage caused by a specific royalty regime increases as commodity prices fall.

*Ad valorem* and specific royalty regimes cannot capture a substantial proportion of the imputed nett value of minerals and comply with the benefit principle of equity (see sub-section 3.2.3 of chapter 3) without substantially damaging incentives to explore for, invest in and extract ore from mineral deposits. Indeed, they partly destroy the imputed nett value of minerals in the process of attempting to capture a portion of it for the community. The resulting “deadweight losses” or “excess burdens” generated by such royalty systems increase with the royalty rate and the breadth of the royalty base.

Because of their inability to capture a substantial proportion the imputed nett value of minerals for the community they perform poorly in terms of the benefit principle of equity. By partly destroying the imputed nett value of minerals, they perform poorly in respect of intergenerational equity. When resource rent is destroyed it cannot be invested for the benefit of future generations.

Therefore, *ad valorem* and specific royalty systems perform dismally with respect to equity and economic efficiency criteria. They represent major artificial impediments to the mining sector and sustainable development in Australia, because of their destructive effects on the imputed nett value of minerals and incentives to explore and invest.

The main strength of specific and *ad valorem* royalty systems is that they are relatively easy to administer. *Ad valorem* royalty systems are harder to administer than specific systems because fair market prices need to be identified in the case of the former. However, they are easier to administer than other royalty regimes based on realised outcomes that take all or most costs into account.

There can be no doubt that the damage to exploration, investment and recovery incentives and to capacity to raise revenue caused by these regimes overwhelms administrative savings that they provide. Despite the damning evidence compiled against *ad valorem* and specific royalty regimes over the past 25 years, State Government bureaucrats have continued to apply relatively heavy weights to administrative efficiency and relatively small weights to equity and economic efficiency criteria.

At the same time, these bureaucrats have overlooked or chosen to ignore the relatively high administration costs associated with conditional first-come-first-served and work programme bidding systems operated by the same government agencies. The inconsistency is breathtaking.

State Government bureaucrats have also persisted in attaching relatively heavy weight to revenue stability. They have ranked *ad valorem* and specific systems highly as
providers of relatively stable royalty revenue. However, in section 3.5 of chapter 3, it was demonstrated that the case for including revenue stability as a criterion for royalty policy lacked substance and logic. In that context, the practice of attaching much higher weights to revenue stability than equity and economic efficiency is ludicrous.

13.3 Accounting Profits Royalty

The base for an accounting profits royalty is calculated by deducting from revenue the sum of exploration, operating and borrowing costs and depreciation allowances for capital investment. The base for an accounting profits royalty is similar in concept to that for the Commonwealth income tax system.

The most prominent examples of accounting profits-based royalties in Australia are as follows. The Northern Territory Government has charged a price calculated as a percentage of accounting profits in excess of $50,000 for all mines (excluding petroleum extraction) established since 1 July 1982. The royalty rate is 18%. Except for the small royalty-free component of the royalty base, it is a proportional accounting profits royalty. A progressive accounting profits royalty regime applied to the Broken Hill Mines in New South Wales for many decades. The Argyle Diamond Mine in Western Australia was subjected to a royalty regime requiring payment of the greater of 7.5% ad valorem or 22.5% of accounting profit. The system established for the Roxby Downs Mine in South Australia specified payment of 2.5% to 3.5% under an ad valorem system plus a percentage of accounting profits that increased with rate of return.

In this section, the focus will be a proportional accounting profits royalty. The analysis of systems that are progressive with profit and progressive with rate of return is significantly more complex. Progressive systems will not be analysed here because of the complexity of the analysis, the fact that they are not mainstream royalty systems, and the inferiority of progressive to proportional systems in respect of equity, economic efficiency and administrative efficiency.

An accounting profits royalty makes substantial allowance for nett value differences between deposits and between units of ore within a particular deposit. Given the level of investment in a mine, a proportional rate takes a constant proportion of the difference between price and marginal cost for each unit of ore. On a marginal unit of ore, the royalty liability will be zero, and ore that is supra-marginal before the royalty will remain in that category after the royalty. However, an accounting profits royalty will adversely affect decisions relating to exploration and investment for a number of reasons.

First, periodic losses from exploration and mining activities are not refunded at the same effective rate as profits are siphoned-off. Therefore, the probability/frequency distribution of possible outcomes is negatively skewed by the royalty. The result is discouragement of risk-taking in the form of exploration and other investment.

Second, accounting depreciation allowances typically do not reflect the true decline in the value of assets because of their arbitrary nature and the effects of inflation.
Determination of true economic depreciation allowances is not a practical proposition. In the absence of such allowances, decisions regarding investments, including asset life and investment ranking may be distorted.

Third, because of uncertainty, exploration cannot be funded by debt and full debt funding of major projects is not practical. An accounting profits royalty falls on minimum required rates of return on equity in exploration and mining. This discourages investment in exploration and mining.

Fourth, the royalty base may include some implicit returns, in excess of deductible payments, to the synergistic efforts of skilled technical and management teams. The effective tax on these returns will discourage efficient and entrepreneurial activity.

Despite these deficiencies, an accounting profits royalty system is much less likely to damage incentives than *ad valorem* and specific systems, which effectively tax returns to all inputs up-stream from the point at which the impost applies. An accounting profits royalty regime is able to capture a much larger proportion of the imputed nett value of minerals for a given amount of damage to incentives or to cause much less damage to the long-term revenue base in capturing a given amount of government revenue from mining. In other words, an accounting profits royalty is much less destructive of the imputed nett value of minerals in the process of capturing a portion of it for the community. Therefore, it is greatly superior to revenue and output based regimes in terms of the benefit principle of equity, inter-generational equity concepts, and economic efficiency.

An accounting profits royalty will involve significantly greater administration costs than *ad valorem* and specific royalty systems. However, unless rates are trivial, the economic efficiency and equity gains are likely to swamp the administrative efficiency losses.

**13.5 Resource Rent Royalty**

The Commonwealth Government applied a “petroleum resource rent tax” to “greenfields” off-shore petroleum projects from 1 July 1984. This new *de facto* royalty regime replaced an *ad valorem* royalty of 10-12.5% of well-head value and a *de facto* royalty in the form of an excise duty regime for crude oil involving marginal rates of tax that increased with production rates.

The petroleum resource rent tax rate was 40% of positive cash flows. Annual negative cash flows, including exploration and development outlays, were carried forward at a threshold rate of return to be offset against future positive cash flows. The threshold rate was equal to the long term Commonwealth Government rate plus 15% percentage points.

When calculating cash flows for the purposes of determining the resource rent royalty/tax base, payments in the form of dividends, interest, and repayment of borrowed capital are not deductible. Also, receipts of dividends, interest and capital funds are not assessable.
In the early 1990s, the Commonwealth Government modified the petroleum resource rent tax by allowing company-wide deductibility of exploration costs in areas subject to the tax and by reducing the threshold rate for carrying forward development expenditures. It also extended application of the petroleum resource rent tax to the Bass Strait fields in place of the ad valorem royalty and ever-changing crude oil excise regimes.

The resource rent tax/royalty concept was originated by Ross Garnaut and Anthony Clunies-Ross.\textsuperscript{191} It is purported to be a politically more acceptable way of taxing or imposing a royalty on resource rent or realised nett value of minerals than the realised pure economic profits system discussed in the next section. The political obstacle to the latter system is that it provides rebates to enterprises equal to periodic negative cash flows multiplied by the royalty rate (full loss offsets). To avoid such rebates, the resource rent royalty carries forward negative cash flows with interest for deduction from future positive cash flows.

A resource rent royalty may be proportional or progressive. Only the proportional version has been considered in this section, because that version was the one adopted by the Commonwealth. Also, the progressive version is more likely to discourage risk-taking and damage incentives for efficient management.

A resource rent royalty allows for variations between nett values of units of ore within a deposit and for differences in nett value between deposits. Units of ore and deposits that are supra-marginal (nett value exceeds zero) or marginal (nett value is zero) remain supra-marginal or marginal, respectively after the royalty is levied.

In principle, a resource rent royalty applies to nett cash flows and exempts the minimum required rate of return on capital. Therefore, it should not affect the quantum and timing of exploration and investment and the rate of recovery.

However, principle is not easy to translate into practice in this case. A resource rent royalty will not provide the equivalent of full loss-offsets in some circumstances. If an exploration venture or a mining project yield negative nett cash flows that cannot be recouped by the enterprise along with the appropriate interest at a later time, the frequency/probability distribution of nett present values will be skewed negatively by the royalty system. The expected (anticipated average) nett present value of some investments could become negative. Investment in exploration and development would be discouraged to some extent, and ranking of investments could be affected.

The Commonwealth Government’s initial response to this problem in the case of its petroleum resource rent tax was to set a much higher threshold rate than if full loss offsets applied. This was not an appropriate response because the nett effect was to subsidise lower-risk expenditures and tax higher-risk expenditures. Modifications to the tax in the early 1990s only partly ameliorated the inappropriateness of inadequate loss-offsets and an excessive threshold rate.

The problem of determining the correct threshold rate(s) for a resource rent royalty is insoluble in practice. The appropriate rate may vary between enterprises, investments, and project phases. A different set of rates could be required for each project and these would need to be set before exploration commences in each case. Setting two rates that apply to all projects, as was done by the Commonwealth Government when it modified the system, is not enough. A further complication is that the appropriate threshold rate will be affected by the extent of the inadequacy of loss offsets. In addition, there is the unresolved theoretical issue of how to calculate the opportunity cost of capital to use as a threshold rate for a resource rent royalty that is deductible for the purposes of Commonwealth income tax.

If the threshold rate is too high in a particular set of circumstances, overcapitalisation may be induced. If it is too low, part of the minimum required return to investment would be taxed, discouraging investment. For example, a threshold rate that has been set between the rates appropriate for “greenfields” exploration and expansion of a project, would induce too much exploration and investment in and around existing projects and too little investment in exploration and development in new areas.

A resource rent royalty system with a very high royalty rate would damage incentives to operate efficiently. The incentive to realise nett value of minerals would diminish, and the penalty for ill-advised and wasteful expenditures would decrease, as the royalty rate rises. The damage to incentives to operate efficiently would be reinforced if the royalty base includes some implicit returns, in excess of deductible payments, to the synergistic efforts of skilled technical and management teams.

Clearly, a resource rent royalty will distort exploration and investment decisions. However, it represents a significant step forward from an accounting profits royalty and an enormous improvement over \textit{ad valorem} and specific royalty regimes in terms of the economic efficiency criterion. A resource rent royalty should capture a significantly larger portion of the imputed nett value of minerals for a given degree of destruction of that base than an accounting profits royalty, and a very much larger portion than \textit{ad valorem} and specific royalty systems. Therefore, it is correspondingly superior to these other royalty regimes in terms of the equity criterion.

Because of the ability of a resource rent royalty to capture a larger proportion of the imputed nett value of minerals for the community than accounting profits, \textit{ad valorem} and specific royalty systems, it performs better in terms of the benefit principle of equity. By destroying less of the imputed nett value of minerals, it performs better in respect of intergenerational equity, because imputed nett value of minerals that has been destroyed cannot be re-invested for the benefit of future generations.

The administration costs associated with a resource rent royalty regime are likely to be less overall than with an accounting profits system. The carry-forward procedure for exploration and capital expenditure should involve less administrative effort by mining enterprises and royalty administrators in government than depreciation systems and separate arrangements for exploration expenditure.

Some government bureaucrats have been critical of revenue stability associated with a resource rent royalty regime. One issue is the fact that royalty is not payable until outlays on exploration and development have been recovered with interest at the
threshold rate. Another is that additional investment, a price slump, or increased costs associated with technical issues may substantially reduce or eliminate royalty liability of individual mines from time to time. In section 3.5 of chapter 3, it was demonstrated that the case for including revenue stability as criterion for royalty policy lacked substance and logic. In that context, the practice of attaching a relatively heavy weight to revenue stability is ludicrous.

### 13.6 Realised Economic Profits Royalty or “Brown” Tax/Royalty

In his major contribution to the literature on the economics of mining royalty/taxation and tenement systems and their interaction, Mason Gaffney nominated a levy on realised economic profits from mining as one way of capturing a high proportion of the imputed nett value of minerals without “deadweight losses”\(^{192}\). This system was based on a general business income taxation scheme proposed much earlier by Cary Brown.\(^{193}\) However, Gaffney had reservations about a realised economics system because of disincentives to realise economic profits at high rates of royalty/tax and administration costs.

Following publication of the resource rent tax proposal by Ross Garnaut and Anthony Clunies-Ross, Peter Swan\(^{194}\) revived the realised economic profits royalty/tax system that had been suggested with reservations by Mason Gaffney. Because of the link with Cary Brown’s scheme, Peter swan referred to a realised economic profits tax/royalty as a “Brown Tax”. This terminology is common in the Australian literature on mining royalties/taxes. The concept of a realised economic profits royalty has attracted as much interest and heated debate as the resource rent tax/royalty concept.

The Brown scheme exempted the supply price or minimum required rate of return on capital as well as other costs from tax. It fell only on pure economic profits accruing to enterprises as windfall gains, monopoly profits or economic rents. Cary Brown, Vernon Smith and others argued that this tax did not affect the allocation of resources. Also, it was said to be neutral even if applied to a single sector or enterprise.\(^{195}\)

In the case of a realised economic profits system, the base for the royalty is nett cash flow in each period. When nett cash flow in any period is positive, the enterprise conducting the project pays an amount of royalty equal to the product of positive nett cash flow and the royalty rate. If nett cash flow is negative in any period, such as during the exploration, development or expansion phases of a venture, the

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government pays a rebate equal to the royalty rate multiplied by negative nett cash flow. A “Brown” royalty is equivalent to government participation in a venture with an interest equivalent to the royalty rate, but without voting and other privileges of a major shareholder or joint venture participant.

An economic profits royalty eliminates two major deficiencies of a resource rent royalty by providing full loss-offsets and avoiding the problem of setting different threshold rates for different enterprises, projects and phases of projects. Therefore, it follows from the analysis of a resource rent royalty that an economic profits royalty does not distort decisions relating to the extent and timing of recovery of ore, exploration, and investment, at least when the royalty rate is not very high.

However, Harry Campbell and Bob Lindner argued, with the aid of mathematical analysis, that that an economic profits royalty would actually increase the probability of risk-averse enterprises mining high and low risk projects, and this probability would increase with the royalty rate. This effect had two sources:

- a direct relationship between the attractiveness of investment and the degree of risk-sharing with the government, as represented by the royalty rate which applies equally to positive and negative cash flows; and
- a positive relationship between the royalty rate and the amount of appraisal exploration in the case of high and low risk projects.

The first relationship also applied to all projects involving risk-averse enterprises. In the case of intermediate risk projects involving risk-averse firms, the relationship between royalty rate and appraisal exploration was unclear. Campbell and Linder confirmed that an economic profits would be neutral with respect to economic exploration and investment decisions in the case of an enterprise that was indifferent to risk because of a risk-neutral attitude or held a diversified portfolio of assets. 196

Researchers at the Australian Bureau of Agricultural and Resource Economics (ABARE) also argued that a “Brown” royalty may encourage investment in sub-marginal projects, because risk-averse enterprises place a higher value on reductions in risk and uncertainty (possible losses) than the same percentage reduction in possible surpluses. ABARE commented that this could improve the allocation of resources in the context of imperfect markets for risk. 197

ABARE’s argument that a “Brown” royalty may encourage investment in sub-marginal projects has been investigated and disputed by the Industry Commission. 198 It is not clear that the matter has been resolved.

A clearer issue is that an economic profits royalty system with a very high royalty rate would damage incentives to operate efficiently. The incentive to realise economic

profits would diminish and the penalty for ill-advised and wasteful expenditures would decrease as the royalty rate rises. The problem is likely to be more severe than in the case of a resource rent royalty, because of the availability of full loss offsets at the very high royalty rate. The damage to incentives to operate efficiently would be reinforced if the royalty base includes some implicit returns, in excess of deductible payments, to the synergistic efforts of skilled technical and management teams.

In terms of the economic efficiency criterion, an economic profits royalty would be an improvement over a resource rent royalty, which in turn, would represent a significant step forward from an accounting profits royalty and an enormous improvement over ad valorem and specific royalty regimes.

An economic profits royalty should capture a larger portion of the imputed nett value of minerals for a given degree of destruction of that base than a resource rent royalty, significantly more than an accounting profits royalty, and very much more than ad valorem and specific royalty systems. Consequently, an economic profits royalty system will be correspondingly superior to these other royalty regimes in terms of the benefit principle of equity.

By preserving incentives to explore, invest, and extract and thereby preserving the imputed nett value of minerals while capturing a substantial amount of it, an economic profits royalty performs better than the royalty regimes discussed above in respect of intergenerational equity. After all, any imputed nett value of minerals that has been destroyed cannot be re-invested for the benefit of future generations.

The administration costs associated with an economic profits royalty are likely to be comparable to those of a resource rent royalty. They would be lower to the extent that it is easier to administer full loss offsets than the facility to carry-forward negative cash flows with interest under a resource rent royalty.

The major obstacle to acceptance of an economic profits royalty is the issue that apparently spawned the resource rent tax/royalty concept, namely, negative political perceptions of the feature of paying rebates to exploration and mining enterprises when cash flows are negative.

### 13.7 Realised Nett Value Royalty

George Fane and Ben Smith proposed a variant of the resource rent royalty that would:
- provide the equivalent of full loss-offsets available under a realised economic profits system, while avoiding payment of rebates at the royalty rate during periods of substantially negative cash flows, such as the development and expansion phases of ventures;
- eliminate the need to choose between the impractical task of setting different threshold rates for different enterprises, projects and phases of projects, and a compromise threshold rate that induces either under- or over-investment in most circumstances.
The concept has two key aspects. First, within a resource rent royalty framework, the government guarantees to pay rebates at the royalty rate for any accumulated losses, compounded at the threshold rate, that remain to be recovered when ventures are wound-up. Second, the threshold would be set at the long-term government bond because such rebates are government-guaranteed.\(^{199}\)

Instances of payment of rebates by the government could be reduced by transferability of losses with interest between enterprises, as well as between ventures within an enterprise. Opportunities for transfers/trading of losses with interest to present or future ventures with royalty liability under this variant of resource rent royalty would be exhausted before payment of any rebates. Details of such arrangements and potential competitiveness of the market for losses with interest need to be subjected to further detailed investigation.

A royalty scheme of the type described above has been referred to as a realised nett value royalty in this report. That nomenclature is a convenient way of distinguishing this hybrid system from resource rent royalty and realised economic profits (“Brown”) royalty regimes.

A realised nett value royalty would match the economic efficiency and equity advantages of the economic profits royalty over resource rent, accounting profits, \textit{ad valorem} and specific royalty systems. In terms of the administrative efficiency criterion, a realised nett value royalty could be expected to rank between the economic profits and resource rent royalty systems.

\section*{13.8 Competitive, Lump-Sum Cash Bidding as an Ex Ante Royalty}

As explained in section 12.7 of chapter 12, competitive, lump-sum cash bidding serves dual purposes. First, it is a mechanism for allocating tenements. Second, it is a device for charging an \textit{ex ante}, lump-sum royalty determined in the market for exploration and mining rights.

\subsection*{13.8.1 Assessment in the Absence of Government and Market Failure}

Competitive lump-sum cash bidding is an economically efficient tenement allocation and royalty mechanism. It does not distort exploration, investment and operating decisions by the tenement-holder subsequent to the bidding process, because the cash payment is a sunk-cost when those decisions are being made.

Competitive, lump-sum cash bidding is an equitable royalty mechanism. It complies with the benefit principle of equity that beneficiaries of goods and services provided by government should contribute in accordance with the benefits they receive. Each bidder determines what it is prepared to pay in the differing circumstances of each prospect, having regard to all expected outcomes and revenues and costs, including risk and uncertainty. It is a flexible mechanism for capturing the highest price for each prospect in the circumstances prevailing at the time of the tenement auction. It is

consistent with intergenerational equity concepts because it does not destroy any of
the imputed nett value of minerals.

Competitive, lump-sum cash bidding is an administratively efficient royalty system
because it does not involve any administration costs additional to those required for
its operation as a tenement allocation system. Moreover, the administration costs
involved in operating this system as a tenement regime are substantially lower than
administration costs associated with existing conditional first-come-first-served and
work programme bidding regimes, which do not collect any royalty revenue.
Therefore, competitive, lump-sum cash bidding is far superior to any combination of
an *ex post* royalty regime and an existing tenement regime in respect of the
administrative efficiency criterion.

The case for using competitive, lump-sum cash bidding as a royalty regime as well as
tenement allocation system is very strong, at least in the absence of pertinent instances
of government failure and market failure. However, the effect of such pertinent
instances on the role of this system as a royalty regime need to be taken into account.
Therefore, the following relevant issues have been discussed below:

- faulty, pre-existing tenement systems;
- the possibility of “sovereign risk” undermining revenue from an *ex ante* royalty
  regime;
- the possibility of the value to government of *ex ante* royalty revenue being
  undermined by an inadequacy of risk-sharing/spreading devices available to
  exploration and mining enterprises.

### 13.8.2 Government Failure – Existing Tenement Systems

As explained in chapter 12, existing tenement regimes in Australia destroy the
imputed nett value of minerals by encouraging too much exploration, too soon. That
undermines the ability of royalty systems to capture the imputed nett value of
minerals, to the extent that those systems fully allow for the amount and timing of
expected or actual exploration expenditure. Therefore, it was emphasised in chapter
12 and section 13.1 that tenement reform was a pre-requisite for royalty reform. The
necessary reform included replacement of short term, highly conditional exploration
tenements and expenditure-linked allocation arrangements, both of which contributed
to the problems of destruction of imputed nett value of minerals and impaired
capacity to raise royalty revenue.

Substitution of competitive, lump-sum cash bidding for existing tenement allocation
arrangements will solve only half of the problem. Destruction of resource rent and
loss of revenue from bids will continue as long as the tenements to be auctioned
continue to have short terms, relinquishment conditions, expenditure/work conditions
and no attaching right to mine. Such conditions will continue to induce too much
exploration, too soon. In the process of destroying resource rent, they reduce the
value of tenements.

This problem certainly does not justify rejection of competitive, lump-sum cash
bidding as a royalty system. Instead, it means that this implementation of this system
must be accompanied by reform of tenement conditions. Then the deficiencies of
both the tenement and allocation components of existing tenement regimes will be eliminated. In the context of such reform, the strong case for competitive, lump-sum cash bidding as a royalty system remains intact.

13.8.3 Government Failure – “Sovereign Risk”

A number of contributors to the Australian economics literature on mining royalty/taxation have suggested that the ability of competitive, lump-sum cash bidding to capture the imputed nett value of minerals and raise royalty revenue may be undermined by a potential “sovereign risk” problem. The argument runs as follows.

If risk and uncertainty at the time of bidding is perceived to be high and bidders are risk-averse, the winning bid may be low. If the winning bidder subsequently earns “bonanza” returns, the government or governments may be tempted or placed under political pressure to change the “rules of the game” when the project is operating to capture a portion of the substantial realised returns. If the government succumbs and applies a new tax or royalty to the project, it will create fear of future intervention of this type. Subsequently, potential bidders could be discouraged from participating in tenement auctions or would reduce their bids in accordance with the perceived extent of the “sovereign risk” and the applicant’s degree of aversion to risk and uncertainty. That, in turn, could further increase the likelihood of government intervention to increase its take when the project earns high returns, exacerbating the “sovereign risk” problem. The result of this “sovereign risk” is reduced bids and, possibly discouragement of exploration activity.

The “sovereign risk” argument displays a substantial degree of mistrust of Australian politicians and their advisers. Is this mistrust justified?

The counter-argument is that sophisticated governments and their advisers will recognise the adverse effects of creating “sovereign risk” and therefore, will be inclined to honour deals they have made. Richard Dowell claimed that the “sovereign risk” argument is probably irrelevant in the Australian context, where fear of confiscation of realised nett value of minerals is relatively less pronounced than in developing countries.

Competitive, lump-sum cash bidding has not been properly trialed by State and Commonwealth Governments in Australia. Therefore, there has not been a practical test of the “sovereign risk” argument.

However, some governments in Australia have been willing to change the royalty regime to improve their short-term de jure or de facto royalty revenue. For example,

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in the 1970s and 1980s, the Commonwealth Government applied very high rates of excise tax on crude oil production after exploration and development investment had been committed. A very recent example was the Queensland Government’s decision to broaden the base of its 7.5% *ad valorem* royalty on coal from free-on-rail value to free-on-board value.

It is important to note that the source of any inefficiencies and revenue losses arising from the “sovereign risk” problem would be the perceived inability of governments to honour a deal that subsequently strongly favours the other party. Low bids under competitive, lump-sum cash bidding system are an effect, not the cause of the problem. The solution is to deal with the cause of the problem, rather than the effect.

If a government is concerned about its own ability to honour a deal or does not trust its successors to do so, a precautionary response would be to make any tenement offered for competitive, lump-sum cash bidding subject to a pre-determined royalty system based on realised outcomes. That pre-determined royalty system would need to be sufficiently large to ensure that the temptation or pressure to change the “rules of the game” after the event does not arise. For reasons detailed in preceding sections of this chapter, the preferred royalty should apply to realised nett value or realised economic profits.

### 13.8.4 Market Failure – Inadequate Risk-Sharing

A wide and imaginative range of market-related instruments have been developed to lay-off risk and uncertainty. Such devices that are pertinent to the mining sector include joint ventures, portfolios of exploration tenements, multiple mining ventures, commodity diversification, long-term contracts, other forms of commodity price hedging, currency hedging, issues of company shares to institutional and private investors, and conventional insurance policies.

However, it has often been assumed in the economics literature on mining royalties and taxation that these devices will fall short of the equivalent of a perfect and complete set of contingency claim markets. Such a shortfall is a form of “market failure”. Risk-averse behaviour (see section 5.3 of chapter 5) in response to the residual risk and uncertainty will be manifested by less risk-taking than is socially desirable on the grounds of economic efficiency. In the case of the mining sector, the result will be reduced investment in exploration and mining.

If an enterprise is required to bid for the right to explore and to mine, it will adjust downwards the magnitude of the *ex ante* payment it is prepared to make to allow for the residual risk and uncertainty it perceives and its degree of aversion to risk and uncertainty (see section 5.3 of chapter 5 on risk aversion). Therefore, the government, as owner of the resource, will *ultimately* bear the cost of residual risk and uncertainty as estimated by the exploration and mining enterprise, even though the initial incidence is on the enterprise.

The “market failure” leads to lower bids as well as misallocation of resources. Competitive, lump-sum cash bidding is not the cause of the problem. Therefore,
correction of this perceived “market failure” is the solution, not abandonment of competitive, lump-sum cash-bidding.

The specific correction proposed by Hayne Leland and several Australian economists, who were impressed by his analysis, is “risk-sharing” between enterprises and government through operation of competitive, lump-sum cash bidding in tandem with a relatively non-distorting royalty regime based on realised outcomes. A simple account of their approach has been provided below.

If an enterprise is obliged to pay for the right to explore and mine only if it exploits a deposit, the initial burden of risk and uncertainty is shared by the government and the tenement-holder. The closer the basis for payment is to realised economic profits or net value, the greater is the share of the initial burden of risk and uncertainty carried by the government, and the smaller will be the reduction in exploration and investment forced on the enterprise by the royalty regime. Conversely, a base for ex post payments that is not closely related to imputed net value will impose a much greater initial burden of risk and uncertainty on mining enterprises and a correspondingly smaller burden on governments, as well as causing greater adverse effects on exploration and investment. Ad valorem and specific royalty systems have bases with very little relationship with imputed net value of minerals.

The greater is the initial burden of risk and uncertainty carried by the government, the more enterprises will be prepared to pay on an ex post basis for the right to explore and mine. The government as owner of rights to explore and mine will not be able to avoid the cost of bearing risk and uncertainty. It may carry this cost by:

- accepting the price for bearing residual risk and uncertainty deducted from up-front cash bids;
- charging a low royalty rate for any ex post payments regimes with a base not closely related to imputed net value in order to reduce adverse effects on exploration, investment and recovery decisions; or
- directly accepting variable outcomes with a royalty base closely related to imputed net value.

Hayne Leland and his followers argued that a government may alter the risk-adjusted value to itself of its royalty revenue without adversely affecting the efficiency of resource allocation by combining competitive, lump-sum cash bidding with an ex post royalty based on realised economic profits or net value of minerals. The spectrum of possible combinations ranges from complete reliance on tenement auctions when the rate of the ex post royalty is zero, to complete reliance on the royalty based on

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realised nett value when the royalty rate is 100% of realised nett value or economic profits. In the latter case, the complementary cash bid is zero.

If, at a point on the spectrum, it is perceived that the government is less risk-averse than exploration and mining enterprises, the risk-adjusted value to the government of the royalty-take can be increased by government acceptance of some additional risk/uncertainty in the form of some greater variability of royalty returns. That could be achieved, prior to the tenement auction, by increasing the rate of royalty to apply to realised nett value and receiving smaller cash bids. Conversely, if it is perceived that the government is more risk-averse than enterprises at a particular point on the spectrum, it should reduce the rate of royalty to some extent for the realised nett value-based system before auctioning tenements, and thereby rely more on receiving higher lump-sum cash bids. In each case, the nett effect would be an increase in the risk-adjusted value to the government of the combined \textit{ex ante} and \textit{ex post} royalty revenue.

The combination that maximises the risk-adjusted value of royalty revenue from the perspective of a government is not clear. It will depend on the relative degrees of risk aversion of governments and mining enterprises in different circumstances in respect of risk and uncertainty. Those circumstances will be influenced by their respective income levels, and capacities to manage/ameliorate risk and uncertainty through size and diversity of asset portfolios and other techniques. Only in the event that either a mining enterprise or government is risk neutral (see section 5.3 of chapter 5) would the risk-adjusted value to the government of the revenue be maximised when there is total reliance on \textit{ex ante} or \textit{ex post} royalty payments, respectively.

Strong doubts has been expressed about the efficacy of compulsory risk-sharing through a royalty based on realised resource rent or economic profits in the context of the wide range of risk management devices already available to exploration and mining enterprises.\textsuperscript{203} Some of the issues have been briefly discussed below.

Exploration and mining enterprises hold diverse portfolios of tenements and enter into joint ventures to reduce residual risk and uncertainty. Individual investors in exploration and mining enterprises also hold portfolios of shares in multiple enterprises from a range of sectors. Competitive, lump sum cash bidding does not interfere with use of those mechanisms. Indeed, on the basis of detailed studies of tenement auctions in the Gulf of Mexico over many years, Walter Mead concluded that there was no evidence of risk-averse behaviour in the aggregate.

A royalty based on realised nett value or economic profits, which provides full loss-offsets, effectively adds an additional joint venturer or investor to each mining project in the relevant jurisdiction, and adds a substantial interest in each mining project in that jurisdiction to the portfolio of assets held by the relevant government. The former may simply distort or partly displace risk-sharing/spreading arrangements that enterprises would otherwise put in place themselves. The latter may add risky assets

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to the government’s portfolio that may otherwise be allocated by markets to investors who for a price and by choice are prepared to accommodate the associated risk and uncertainty

13.8.5 Comparison with Other Royalty Systems

Competitive, lump-sum cash bidding is clearly superior to any other royalty system discussed above in terms of the administrative efficiency criterion. Unlike royalty systems based on realised outcomes, it does not distort the allocation of resources and avoids the dilemma of how high to set the royalty rate. However, competitive, lump-sum cash bidding has been criticised because it may be accompanied by a “sovereign risk” problem, and does not eliminate “market failure” in respect of risk and uncertainty. The validity of these criticisms is not clear, but if real, they would undermine its revenue yield and appeal on equity grounds.

13.9 Competitive Cash Bidding with Efficient Ex Post Royalty

A number of arguments for combining competitive lump-sum cash bidding with either a realised economic profits or realised nett value royalty can be adduced from the preceding analysis in this chapter.

First, competitive, lump-sum cash bidding for secure, long term, exploration and mining rights provides the changes to existing tenement that are essential prerequisites for reform of the royalty system. In the absence of such changes, the government’s capacity to collect substantial royalty revenues without substantial deadweight losses will be seriously impaired.

Second, it is not necessary to impose high rates of royalty to capture the imputed nett value of minerals, because tenement auctions pick-up an ex ante estimate of the portion left behind by a moderate royalty rate. As a result, disincentives to realise the nett value of minerals that emerge at high royalty rates can be avoided. Also, the size of rebates required to provide full loss or their equivalent is reduced. These problems associated with stand-alone royalties applying to realised economic profits or nett value were discussed in section 13.6.

Third, the potential “sovereign risk” problem discussed in sub-section 13.8.3 can be avoided. Establishment of a substantial royalty on realised nett value or economic profits prior to bidding removes the temptation or pressure on the government to change the “rules of the game” after projects have been successfully established.

Fourth, combining a realised economic profits or nett value royalty with a competitive lump-sum cash bidding system provides an additional mechanism for sharing risk to those already available to mining enterprises. As discussed in sub-section 13.8.4, this may allow the government to increase the value to itself of its total royalty revenue from the mining sector.

Fifth, implementation of a combination of a realised nett value or economic profits royalty with competitive, lump-sum cash bidding for secure, long-term exploration
and mining rights would greatly increase government royalty revenue and eliminate the very substantial inefficiencies created by existing royalty and tenement regimes in Australia. The additional revenue could be used to reduce distortionary taxes and charges imposed by governments, reducing aggregate inefficiencies caused by taxes and government charges in Australia. Alternatively, governments could increase investments or reduce debt for the benefit of present and future generations. Either way, aggregate inefficiencies in the Australian economy will be reduced.

Effectively, competitive, lump-sum cash bidding and a realised nett value or economic profits royalty would be highly complementary. The former would certainly improve the performance of the latter in respect of equity and economic efficiency criteria. The latter would improve the performance of the latter in respect of these criteria to the extent that concerns relating to “sovereign risk” and inadequate risk-sharing mechanisms are valid. To that extent, the combined system will be superior on economic efficiency and equity grounds to either of its constituents.

Obviously, the administration costs associated with a combined system will be substantially greater than for competitive, lump sum cash bidding alone. The reason is that a realised nett value or economic profits royalty involves relatively high administration costs.

The status quo is probably a more useful benchmark, particularly because State Governments have placed substantial weight on the relatively low administration costs associated with *ad valorem* and specific royalty systems. However, these systems operate in conjunction with conditional first-come-first-served or work programme bidding tenement systems, which are characterised by high administration costs as discussed in chapter 12. While a realised economic profits or nett value royalty will be substantially more costly to administer than *ad valorem* and specific royalty systems, competitive, lump-sum cash bidding for secure, long-term exploration and mining rights will be substantially cheaper to administer than conditional first-come-first-served or work programme bidding tenement systems. Because there is a very much larger number of exploration tenements to administer than producing mines on which to collect royalty, it is likely that the combined tenement auction and realised nett value royalty will be superior overall to the status quo in respect of administrative efficiency.

The ideal combination of competitive, lump-sum cash bidding and realised nett value or economic profits royalty is not clear. Further research is required on that matter.

### 13.10 Policy Implications

The following policy recommendations emerge clearly from the analysis in this chapter.

- Existing tenement regimes in Australia should be replaced by a system of competitive, lump-sum cash bidding for freely tradeable, secure, long-term rights to explore and mine with minimal conditions. That will establish an economically and administratively efficient tenement allocation and *ex ante* royalty regime.
The tenement reform recommended above should be undertaken prior to or simultaneously with reform of *ex post* royalty arrangements, because existing tenement regimes undermine the capacity of economically efficient, *ex post* royalty regimes to collect a substantial share of imputed nett value of minerals for the benefit of the community.

Existing *ad valorem* and specific royalty regimes, which are the most common systems used in Australia, perform dismally in terms of economic efficiency and equity criteria. They represent major artificial impediments to the mining sector and sustainable development in Australia because of their destructive effects on the imputed nett value of minerals. They should be replaced by a system based on realised nett value or economic profits in combination with competitive, lump-sum cash bidding. The appropriate mix of *ex ante* and *ex post* royalty requires further research.

Although accounting profits-based systems are superior to *ad valorem* and specific systems, moving to the recommended new system would represent a substantial step-forward.

The *de facto* resource rent royalty applying to off-shore petroleum should be transformed into a realised nett value royalty system. That will not require major modifications to the existing legislation. The capacity of the existing resource rent royalty or proposed realised nett value royalty to raise revenue will be greatly improved by abandoning the existing work programme bidding system, which undermines that capacity.

State and Commonwealth Governments should cooperate to design a uniform combined realised nett value royalty and competitive, lump-sum cash bidding regime. Industry organisations and bodies independent of industry and government that are concerned about efficient use of and equitable community returns from natural resources should be involved in the design process.

The highly complementary nature of realised nett value royalty and competitive, lump-sum cash bidding systems should be recognised as a critical key to establishing an equitable and economically efficient royalty regime. Each of those systems compensates for deficiencies of the other system by itself. In terms of equity and economic efficiency criteria, this combination is far superior to any other combination of royalty and tenement regimes.

Administrative efficiency considerations further highlight the importance of considering royalty and tenement regimes as a package, rather than separately. The administrative efficiency gains from replacing existing tenement systems should outweigh administrative efficiency disadvantages of a realised nett value royalty regime compared to the existing predominant *ad valorem* and specific royalty systems.
14 NATURAL ENVIRONMENT AND SUSTAINABLE DEVELOPMENT BASED ON MINERAL WEALTH

14.1 Mining, the Natural Environment and Government

Mining and processing inevitably disturb the natural environment. Indeed, most activities of mankind do so.

In the past, mining and processing activities in Australia have been responsible for some high profile “environmental disasters” that are now universally condemned. Historically, agricultural, pastoral, manufacturing, and urban development activities have also generated serious environmental effects that are now be widely regarded as “disasters”.

In recent decades, governments in Australia have intervened to substantially reduce adverse environmental effects of mining, processing and other activities, and to dramatically limit the possibility of disastrous environmental outcomes. While the need for government action has been widely accepted, the extent and nature of that intervention has attracted considerable criticism from conservationists, mining enterprises and other interested parties. However, the criticism has not been uniform. It has tended to vary with the particular interests and ideologies of the critics. Conservationists want more and tougher restrictions on adverse environmental effects. Mining enterprises would prefer less. Economists emphasise the importance of trade-offs between social benefits and social costs to maximise nett social benefits of mining and processing activity. Economists also prefer market-orientated mechanisms for internalising environmental externalities, rather than the “command-and-control” devices favoured by conservationists and regulators from technical disciplines.

14.2 Natural Environment and Resource Allocation

The natural environment provides extremely important services to humanity. It supports life, provides inputs to production or provision of goods and services, provides aesthetic and recreational amenities, and acts as a dump for waste.

Historically, the services of the natural environment have been treated as free goods in unlimited supply. Over the past century, mankind’s demand for these services has increased substantially with growth of population and output per head. Simultaneously, there has been a dramatic increase in mankind’s capacity to degrade the natural environment, reducing the quantity and quality of environmental services available. As a result, it has become increasingly clear that the natural environment has become a scarce resource with significant value, and its services need to be allocated efficiently.

Unfortunately, in the absence of clear property rights to many environmental resources, markets for the services of these resources have not developed. As a result, users of the environment have not been required to pay for environmental services or the social costs of damage to the natural environment. In the context of such “market
failure”, and inadequate or non-existent corrective government action to internalise negative externalities in the form of social costs of overuse and abuse of the natural environment, resources (including environmental resources) will be misallocated.

Strategies to pursue sustainable economic development and the closely related objective of economic efficiency must include measures to correct “market failure”. Properly designed measures to internalise environmental externalities are not artificial impediments. Instead, they serve the important economic function of ensuring that legitimate social costs are taken into account so that resources, including natural environmental resources, are allocated efficiently.

Of course, when there are numerous inefficiencies, as in Australia, the theory of the “economics of second-best” has shown that piecemeal action to remove inefficiencies may result in an overall reduction in economic welfare rather than an improvement. For example, output in the mining and processing sectors is already sub-optimal because of numerous government induced inefficiencies (artificial impediments) discussed in preceding chapters. Internalising an environmental externality such as the perceived social costs associated with the “greenhouse effect” would further reduce output of particular commodities. As a result, removing the perceived inefficiency associated with the “greenhouse effect” without eliminating the numerous artificial impediments handicapping mining and processing could result in a less efficient allocation of resources rather than greater economic efficiency.

However, this is not a valid economic reason for governments to shirk their responsibility to internalise environmental externalities in pursuit of economic efficiency and sustainable development objectives. Instead, it means that comprehensive economic reform is the appropriate approach. Specifically, governments should simultaneously attack causes of “market failure”, such as environmental externalities, and “government failure” in the form of poorly designed policies adversely affecting the mining and processing sectors. Then, with externalities internalised and artificial impediments removed, economic efficiency will be enhanced and genuine sustainable development can be achieved.

This strategic approach can be illustrated by reference to the problem of formulating policies to:
- ameliorate potential climate change arising from greenhouse gas emissions; and
- deal with the adverse effects on industries and regions of reducing these emissions.

If emissions of greenhouse gases impose social costs on humanity that emitters have not had to bear and take into account in their investment and operational decisions, it is legitimate to correct that “market failure” by internalising these external costs. That will have substantial adverse effects on some sectors of the economy and regions that are heavily dependent on those sectors.

Economic modelling work by the Australian Bureau of Agricultural and Resource Economics (ABARE) in 1999 indicated that implementation of the Kyoto Protocol on reduction of greenhouse gas emissions will cut Australia’s Gross National Product by about 0.5% or $A2,900 million per year. The effect on some mining and processing sectors will be proportionately much greater, with coal production estimated to fall by
about 6%, oil by 3%, iron and steel by more than 7%, and non-ferrous metals production by approximately 6.5%. In the absence of international emissions trading, the sectoral output reductions are estimated to be around 23%, 12.5%, 13%, and 15%, respectively.²⁰⁴

Chapter 9 included a summary of results of econometric modelling by the Industry Commission to assess the effects of eliminating a limited range of government induced impediments to the mining and minerals processing sectors. These results were released in 1991.

The reform package included in the modelling exercise fell well short of comprehensive elimination of artificial impediments. However, the estimated gains were still substantial. Mining output was estimated to expand by 14.2% on average, with the estimated increase for the black coal industry being 35.4%. In the long run, alumina refining would expand by 16.5%, aluminium smelting would grow by 6.3%, nickel smelting and refining would increase output by 12.6%, and silver, lead and zinc processing activity would grow by 11.8%. The positive effects were not confined to the mining and processing sectors. The estimated net effect of the reduction of impediments considered in the modelling was an expansion of Australia’s GDP by over $A11,000 million per year.

These estimated effects of limited economic reform substantially outweigh the estimated negative effects on the mining and processing sectors and the Australian economy as a whole of internalising greenhouse gas externalities in accordance with the Kyoto Protocol. A more comprehensive approach to elimination of artificial impediments could be expected to overwhelm the effects of proposed greenhouse abatement actions to an even greater extent.

This example indicates that government intervention to deal with a major environmental concern like climate change, which is expected to have serious adverse affects on mining and minerals processing, need not result in contraction of those sectors. Instead, it could provide a catalyst for a range of economic reforms that lead to net expansion of and increased prosperity in those sectors and the economy as a whole. In those circumstances, sustainable economic development can mean more development based on Australia’s mineral wealth, not less.

### 14.3 Internalising Negative Environmental Externalities

#### 14.3.1 General Principles

The task of internalising externalities is concerned with ensuring that generators of externalities adjust their outputs of these effects to what they would be if the generators had to bear the marginal social costs and were able to capture the marginal social benefits associated with their actions. Then, marginal social benefits will equal

marginal social costs with the result that resources will be allocated efficiently and economic welfare will be maximised.

Internalisation of negative externalities does not imply that all adverse effects are eliminated. Rather, it means that the gains from trading-off lower/higher social benefits against lower/higher social costs are exhausted. Further reductions in adverse effects would be sub-optimal because the social benefits foregone would exceed the social costs avoided. Unfortunately, this point is often not grasped by members of the environmental lobby who mistakenly perceive that any reduction in adverse environmental effects always yields nett social gains.

Internalising externalities is easier said than done. It involves difficult conceptual and practical issues. In addition, the nature and extent of internalising intervention may be constrained or exaggerated as a result of political lobbying by parties pursuing their particular interests. That has been very evident in Australia.

As a result of these factors, past environmental policies in Australia have often overcorrected or under-corrected for social costs of environmental effects. Overcorrection of environmental externalities will create an artificial impediment, necessitating government action to eliminate “government failure” and properly correct for “market failure”. The under-internalisation of environmental externalities will necessitate further government action to eliminate the residual “market failure”. In some cases, action may also be necessary to eliminate an artificial impediment created by a measure that is ineffective as an internalisation mechanism.

An example of overcorrection of environmental externalities was the complete prohibition in 1991 of mining in the highly mineralised province incorporating the Coronation Hill and El Sherana deposits in the Northern Territory (See chapter 4 for more details.). That action by the Commonwealth Government threw away the nett benefits that could have been produced if the project had proceeded, and the maximum nett benefits that would have resulted from trading-off some social benefits for lower social costs. It also generated “sovereign risk”, thereby discouraging exploration and mining investment.

An example of under-internalisation of environmental externalities in Australia is provided by existing “greenhouse” policy, which consists of a number of arbitrary, _ad hoc_ measures to reduce “greenhouse” gas emissions. These measures have not been based on a coherent, analytically sound strategy. They have been ineffective in restraining emissions. Moreover, some of these measures are also artificial impediments to mining activity. They were funded by denying the diesel fuel excise rebate to all off-road use of diesel fuel in quarrying and some off-road use in other mining and exploration activities when major tax reforms and “measures for a better environment” were introduced in July 2000. Denying the diesel fuel rebate to those activities resulted in taxation of an intermediate input and created an inefficiency in production. This has been discussed briefly in section 10.6 of chapter 10, and in detail in another report by the author.\(^{205}\)

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14.3.2 Environmental Impact Assessment

A key mechanism used by Commonwealth and State Governments in Australia to facilitate internalisation of negative externalities is the Environmental Impact Assessment process outlined in chapter 4. Externalities identified by such studies can be addressed by making government approval conditional on ameliorative action by the developer/operator.

The Australian Environmental Impact Assessment regime has been subjected to considerable criticism in the past. Valid criticisms include the following.206

- Typically, the full range of alternatives is not considered. This may result in yes/no/conditional decisions by governments rather than identification of optimal outcomes.
- Preparation of Environmental Impact Studies by consultants engaged by the developer may lead to perceptions of bias.
- Environmental Impact Studies are generally too narrowly focused. Inadequate attention is given to economic impacts and to the assessment of all effects in a social cost-benefit analysis framework.
- The Environmental Impact Assessment regime is generally applied as a once-only test or hurdle, rather than an ongoing impact management process. Follow-up and ex post review of assessed impacts, adequacy of development conditions, and compliance therewith is not normally part of the process.
- The cumulative effects arising from a project and other effects that may be induced by it are not covered because of the project by project focus of the regime.
- Governments have the discretion to approve projects, set conditions, or block projects on the basis of political expediency rather than outcomes of the assessment process.

Most of these criticisms indicate that the Environmental Impact Assessment regime does not comply with the economic efficiency criterion.

The Commonwealth Government’s new legislation, the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) did not resolve these problems. Unfortunately, it added new reasons for concern about the environmental assessment and approvals process.

It was not possible within the scope, budget, and time-frame for this report to undertake a detailed assessment of the substantial and complex EPBC Act in terms of equity, economic efficiency, and administrative efficiency criteria discussed in chapter 3. However, the following few brief points help to illustrate the nature of the concerns.

- The EPBC Act provides the Commonwealth Environment Minister with substantial discretion in refusing or granting approvals and setting conditions of

206 For a more detailed assessment of the Environmental Impact Assessment regime in Australia as it applies to mining and processing, see Commonwealth of Australia, Industry Commission, op cit, Volume 3, chapter 9.
approvals. The result is likely to be an increase or fears of an increase in the incidence of overcorrection of environmental externalities, and an increase in government-created uncertainty faced by enterprises.

- There is greatly reduced emphasis on a “whole-of-government” approach to decision making and a consequent reduction in the likelihood of the full range of benefits, costs and trade-offs being taken into account.

- There is no provision for compensating holders of exploration and mining tenements in the event that an area subject to such tenements is declared a World Heritage Area or Ramsar Wetlands Site. Such an action by government would increase “sovereign risk”.

- The EPBC Act increases government’s undue reliance on command-and-control mechanisms for internalising the social costs of environmental externalities. However, as explained in sub-section 14.3.5 below, on economic efficiency grounds, there is a strong case for greater reliance on market-oriented mechanisms, rather than less.

- Administration costs are likely to rise for governments and mining enterprises relative to costs under the old regime because of increased Ministerial discretion and opportunities for delays.

14.3.3 Legislative Proliferation

The various levels of Government in Australia governments have established substantial bodies of legislation dealing with environmental matters. There has been a proliferation of such legislation since the natural environment became a major political issue in the early 1970s. For example, the Industry Commission cited examples of mining operations having to comply with between 15 and 35 State statutes relating to the environment, as well as Commonwealth and local government environmental requirements.

Following a detailed review of environmental issues and regulation in the mining and processing sectors in Australia, the Industry Commission commented that there appeared to have been an unwieldy proliferation of Commonwealth, State and local government legislative provisions relating to the environment that affect the mining sector. The Industry Commission described the effect as “excessive legislative complexity”. That is clearly inconsistent with the administrative efficiency criterion for assessment of assessment of government policy instruments, which was discussed in chapter 3.

14.3.4 Rehabilitation

Mining and processing disturb the land surface and water systems as a result of construction work, excavation activities, dumping of waste rock, disposal of tailings.

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\(^{207}\) Ibid, pp. 186-187.
and run-off or drainage of water from mining and processing sites. Unlike agricultural and urban and industrial areas, which may maintain those uses for centuries, mines typically operate for 5-50 years, and occasionally for shorter or longer periods. Consequently, rehabilitation of land and water systems to serve a post-mine purpose is an important environmental policy tool, and economic, political and environmental issue.

In the interests of an efficient allocation of resources, a mining enterprise should be required to pay for negative externalities or external costs imposed on others. Those external costs include, but are not confined to the foregone present value of benefits from land in its best alternative use to mining, degradation of the water supply used by others, and intangibles costs such as loss of the social value of an aesthetically pleasing landscape, wildlife habitat or recreational area.

If a mining enterprise is required to pay for negative externalities it generates, it can be expected to adjust the ways in which it conducts its activities to maximise profits with all costs internalised. The mining enterprise could mine less, adjust its method of mining, or increase rehabilitation activities up to the point at which the marginal costs of these adjustments equal the marginal gains from paying less compensation for externalities.

Rehabilitation expenditure is a partial substitute for compensation payments in respect of externalities. It eliminates at least some of the costs that would otherwise be imposed on others in the post-mining period. Obviously, it cannot eliminate such costs during mining, but progressive rehabilitation would reduce them. It follows that if mandatory rehabilitation requirements are to be used as an instrument for internalisation of external costs, in most cases, supplementary mechanisms such as compensation arrangements or environmental levies will be necessary to fully internalise external costs.

Rehabilitation will not fully internalise external costs in the post-mining period unless land and water systems are restored to their pre-mining condition, an equally beneficial state, or a superior condition. Land might be rehabilitated to provide services different to those provided by the land in its original use. The flow of benefits may be less, equivalent or greater. If land was already degraded prior to mining, rehabilitation may produce a result that is superior to the pre-existing state. Rehabilitation to a superior state would to some extent offset loss of benefits during mining.

If the present value of the flow of benefits from land rehabilitated by a mining enterprise is less than the present value of the foregone flow of benefits from unmined land in its best alternative use to mining, the shortfall is a social cost of mining. In the interests of economic efficiency, the mining enterprise should bear this social cost, as well as rehabilitation costs.

Mandatory complete rehabilitation may not be economically efficient. If the cost of complete rehabilitation exceeds the present value of the flow of tangible and intangible benefits from rehabilitated land, mandating complete rehabilitation would waste resources. That does not mean that mining enterprises should be absolved from
external costs they generate. It just means that mining enterprises should not be required to bear more than those social costs.

The preceding discussion facilitates an assessment of the role of rehabilitation in the Australian policy framework for internalisation of external effects of mining.

In Australia, mandatory rehabilitation is a key instrument for internalising external costs of mining. Because it can deal only with post-mining externalities, it operates in conjunction with mandatory compensation for landowners on whose land a mine will operate (but, not other bearers of external costs), and command-and-control mechanisms to reduce adverse environmental effects. Rehabilitation requirements and other command-and-control mechanisms flow from Commonwealth and State environmental impact assessment processes, as well as from State/Territory mining legislation and other statutes.

Typically, rehabilitation requirements are included as conditions of mining leases, following assessment of a rehabilitation plan included in an application for a lease or an environmental impact assessment study. Rehabilitation requirements vary from mine to mine, because mines and the environmental conditions in which they operate vary widely, but tend to be set on the basis of broad guidelines formulated by the administering authority.

Nett benefits from rehabilitation will be maximised when rehabilitation is progressed up to the point at which the marginal costs of rehabilitation equal the marginal social benefits. At lower levels of rehabilitation, the gains from incremental restorative activity exceed the incremental costs. At higher levels of rehabilitation, the incremental gains are less than incremental costs of rehabilitation. At these lower or higher levels of rehabilitation, resources will not be allocated efficiently.

The Australian Bureau of Agricultural and Resource Economics (ABARE) cited rehabilitation of open cut coal mines in Queensland’s Bowen Basin as example of an inefficient level of rehabilitation activity. ABARE pointed out that coal mining had taken place on land that had previously been used predominantly for cattle grazing and that the typical approach was to return the land to a condition suitable for grazing. ABARE reported that the estimated cost to mining companies was around $12,000 per hectare, compared to an average value of $400 per hectare for comparable land. ABARE pointed out this inefficient level of rehabilitation activity had destroyed part of the imputed nett value of the coal.208

ABARE did not make it clear whether or not this level of coal mine rehabilitation activity was mandatory. However, ABARE commented that “gold-plated” rehabilitation could result from a desire by mining companies to earn goodwill from the community or government to increase chances of gaining access to other resources in future. ABARE described this as rent-seeking behaviour that caused misallocation of resources and destruction of resource rent.209 However, some of the “gold-plating”

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209 Ibid.
may reflect either corporate or government sensitivity to the need to avoid social costs arising from an unattractive post-mining landscape.

A government seeking to determine the efficient level of rehabilitation activity for the purpose of specifying rehabilitation requirements for mines will encounter several conceptual and practical difficulties.\(^\text{210}\)

- The relationship between various types of rehabilitation activity and the environmental outcomes they produce is often subject to considerable uncertainty.
- The value to place on some rehabilitation benefits is not provided by markets. The value that the community places on an aesthetically pleasing landscape or on the existence of wildlife habitat would fall into this category. Such benefits are typically difficult and costly to estimate and the estimates lack precision.
- The benefits and costs of rehabilitation and the efficient level of this activity will vary from mine to mine depending on the characteristics of the operation and the environment in which it operates. Therefore, adoption of “one size fits all approach” in the interests of simplicity will inevitably result in too much or too little rehabilitation activity in many cases.
- Estimation of an appropriate social discount rate for aggregating social benefits and costs over time is a challenging task.

It does not appear that relevant government authorities in Australia have made serious efforts to deal with the challenges of determining the economically efficient level of rehabilitation activity for each mining operation within a social-cost benefit analysis framework or any other framework focusing on the efficiency of resource use. Instead, they have chosen to specify rehabilitation requirements on the basis of bureaucratic discretion or arbitrary standards. Rehabilitation requirements based on existing approaches will not result in an efficient allocation of resources.

Mandatory rehabilitation requirements typically specify progressive activity as mining proceeds, rather than just post-mining restorative activity. Progressive rehabilitation allows land to be returned to its original use or allocated to some other acceptable use more quickly. It can also reduce the overall costs of rehabilitation by reducing the extent of double handling of soil, sub-soil and fresh waste rock. As mining proceeds, these materials can be trucked directly to and applied at areas being rehabilitated, rather than being stockpiled for future use.

However, there is a danger that if a mining enterprise is performing poorly, progressive rehabilitation will be neglected and rehabilitation may not be completed if the mining enterprise fails. As a result, all Australian States require that mining enterprises lodge performance bonds in the form of security deposits or bank guarantees to:

- apply financial pressure to comply with progressive rehabilitation requirements; and
- ensure that adequate funds are available to the government to complete rehabilitation to a specified level if necessary.

In some States, bonds are set in accordance with a schedule of expenditures per hectare that varies with the nature of the nature of the land use. In other States, bonds

\(^{210}\) Ibid, pp. 27-29.
are determined on the basis of a case by case assessment by professional staff within government. The bonds are reviewed periodically, and may be adjusted upwards or downwards according to rehabilitation performance and changes in circumstances. In some States, the frequency of reviews may vary with perceived environmental risk.

A detailed analysis of the advantages and disadvantages of rehabilitation bonds as a mechanism for supporting rehabilitation requirements has not been undertaken in this report. It seemed pointless because governments in Australia have not seriously addressed:

- the issue of determining the economically efficient level of rehabilitation; or
- the overriding issue of formulating an efficient approach to internalising external costs of mining and determining whether or not mandatory rehabilitation has an economically justifiable part to play in that approach.

Governments in Australia must give much higher priority to addressing these issues than to devising mechanisms to induce compliance with rehabilitation requirements based on bureaucratic discretion. Anyone seeking a review of issues relating rehabilitation bonds may wish to access a recent review of the issues by ABARE.211

14.3.5 Command-and-Control Versus Market-Oriented Mechanisms

Instruments for internalising social costs of adverse environmental effects fall into two broad categories: command-and-control measures and market oriented measures. Command-and-control devices include measures such as mandatory rehabilitation requirements, controls on emissions of various types, dust suppression requirements, prohibition of various activities, etc. Market-oriented mechanisms include compensation agreements in respect of external costs, government charges/taxes to price external costs, government subsidies to induce reduction of external costs, and creation of markets in rights to affect the environment.212

In Australia, governments have generally adopted command-and-control mechanisms, rather than market-oriented mechanisms to internalise social costs of mining and processing. On economic grounds, there is a strong case for greater reliance on market-oriented mechanisms and less on command and control measures. On this matter the Industry Commission made the following concluding comments.

“Market-oriented mechanisms are in principle more efficient than command-and-control systems. However, there is limited operational experience using market-oriented mechanisms in mining activities. This is particularly true of effluent charges and transferable permits. Moreover, the likelihood of errors and the administrative and monitoring costs associated with most market-oriented mechanisms are probably higher than those associated with command-and-control systems. Thus, compromises are necessary between the

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211 Ibid, pp. 34-42.
economic efficiency of market-oriented mechanisms and the certainty and low administrative costs associated with command-and-control systems.

Thus, in practice a combination of market-oriented and command-and-control mechanisms to regulate the use of environmental services by mining activities may be often necessary. At specific locations, the best particular mix (if one is required) will depend on the particular interaction between a mining-related project and the environment."213

Further research on this matter was not possible within time and budget constraints. However, such research is clearly necessary.

14.4 Policy Implications

Several recommendations follow logically from the analysis in this chapter,

- In the interests of efficient use of resources, including natural resources, it is appropriate that exploration, mining and processing enterprises be required to bear the social costs of adverse environmental effects that they generate. There is a clear case for government intervention to ensure that such externalities are internalised.

- Properly designed measures to internalise environmental externalities are not artificial impediments. Instead, they serve the important economic function of ensuring that legitimate social costs are taken into account so that resources, including natural environmental resources, are allocated efficiently.

- When there are numerous inefficiencies, as in Australia, the theory of the “economics of second-best” has shown that piecemeal action to remove inefficiencies may result in an overall reduction in economic welfare rather than an improvement. However, this is not a valid economic reason for governments to shirk their responsibility to internalise environmental externalities in pursuit of economic efficiency and sustainable development objectives. Instead, it means that comprehensive economic reform is the appropriate approach. Specifically, governments should simultaneously attack causes of “market failure”, such as environmental externalities, and “government failure” in the form of poorly designed policies adversely affecting the mining and processing sectors. Then, with externalities internalised and artificial impediments removed, economic efficiency will be enhanced and genuine sustainable development can be achieved.

- When framing environmental policies, governments and environmental lobbyists need to note that internalisation of negative externalities does not imply that all adverse effects are eliminated. Rather, it means that the gains from trading-off lower/higher social benefits against lower/higher social costs are exhausted. Further reductions in adverse effects would be sub-optimal because the social benefits foregone would exceed the social costs avoided.

Relevant government authorities in Australia need to give serious attention to the task of developing a methodology for determining the economically efficient level of rehabilitation activity for each mining operation within a social-cost benefit analysis framework. This is needed to replace the current practice of specifying rehabilitation requirements based on bureaucratic discretion or arbitrary standards.

Further research is required on the efficacy of market-oriented and command-and-control mechanisms in the context of internalisation of social costs of environmental externalities generated by the mining and processing sectors.

State and Commonwealth Governments need to address the problem of unreasonable legislative proliferation and complexity in relation to environmental matters.
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