

**Mine By Rights
or the
Right to Mine?**

Veronica Jacobsen

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Mining Policy in New Zealand

New Zealand Policy Papers 2

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CONTENTS

FOREWORD	Peter Ackroyd	vii
ACKNOWLEDGEMENTS		ix
ABOUT THE AUTHOR		x
1	INTRODUCTION	1
	WEAKNESSES OF THE PRESENT SYSTEM	1
	SOME CHARACTERISTICS OF THE MINING PROCESS	2
	MODIS OF ALLOCATING MINING RIGHTS	3
2	LICENSING MINING IN NEW ZEALAND	5
	THE LICENSING PROCESS	5
	BUREAUCRATIC INEFFICIENCIES	6
	COSTS	6
	INCENTIVES	7
	RENT-SEEKING	8
	INFORMATIONAL PROBLEMS	8
3	MARKETS AND MINERALS	10
	MARKET FAILURE AND GOVERNMENT INTERVENTION	10
	TRANSACTION COSTS	11
	PROPERTY RIGHTS	12
	TRADE IN RESOURCES	13
	PUBLIC PARTICIPATION	14
	FUTURE GENERATIONS	16

4	THE RIGHTS TO MINE	19
	LANDOWNERS' RIGHTS	19
	THE DEPARTMENT OF CONSERVATION	20
	ACCESS RIGHTS	23
	ENVIRONMENTAL RIGHTS	24
	MINERAL RIGHTS	27
	RESOURCE RENTS	27
	MINERAL OWNERSHIP	30
5	SYNOPSIS AND CONCLUSION	32
	REFERENCES & BIBLIOGRAPHY	36

Foreword

Reforms to government administration since 1984 have led to a more critical assessment of government's role in the New Zealand economy. Whereas criticism had previously centred on the character of that role, there is now more openness in evaluating government administration by reference to a range of alternative institutional arrangements.

It is particularly appropriate that government involvement in mining be subjected to critical enquiry. Mining has probably been more explicitly directed through government command and control than any other sector of the economy. The alliance between government administration and the private enterprise of miners has produced undoubted benefits to New Zealanders. Indeed, those benefits have always seemed so obvious that mining has historically been accorded status as a preferential land use.

In these more sophisticated times has come the realisation that choices in resource use are not as straightforward as the old arrangements might suggest. Governments in New Zealand and Australia have commendably been concerned to incorporate a wider range of choices in their decisions on mining. In New Zealand the Mining Act 1971, the Mining Amendment Act 1981, the protracted and abortive attempts to review minerals legislation during 1985-86, and later decisions on mining policy within a comprehensive review of resource management statutes during 1988-90, all involved consideration of how government administration could recognise alternative land uses and the effects of mining on the environment.

The reviews of mining in New Zealand also canvassed the alternative option of discontinuing the reservation of minerals and mining rights to the Crown in favour of freehold title and private negotiations. This option was seldom entertained seriously. Privatising minerals has simply been regarded as too radical by the different groups with an interest in mining policy; their reticence is perhaps justified in view of the fact that privatisation would amount to a major change of policy and that the case for what appears to be a return to old-fashioned arrangements is not well understood.

Arguing for private property and free enterprise in mining therefore requires intellectual rigour. In New Zealand this rigour has been supplied by two economists who have highlighted the inefficiencies of the administrative allocation of mining licences. Their research has

led them to give detailed consideration to contractual arrangements for the allocation of rights to minerals: to what are called, in the fashion of the day, market solutions. The two economists are Veronica Jacobsen and her colleague Grant Scobie.

In this monograph Veronica Jacobsen encapsulates the key features of the argument that decisions on the use of mineral resources are best taken in a system of tradable property rights. All the evidence now suggests that market mechanisms are more efficient than systems of public administration. Ms Jacobsen identifies the weaknesses of the present approach and the potential of market forces in overcoming these difficulties. However, the public interest in mining is not confined to questions of efficiency. The monograph tackles head-on potentially tricky but important areas of public interest such as market failure, the scope for public participation and recognition of future generations. Ms Jacobsen runs through these critical areas in clear, jargon-free language, dispelling some old myths and explaining how market forces better accommodate the public interest than do existing arrangements.

The monograph also investigates how the theory of market forces fares against present-day practice. Of particular interest, in Australia as well as in New Zealand, is the tussle between mining and nature conservation. In both countries ever-larger areas of prospective terrain are being placed within restrictive conservation zones. Ms Jacobsen demonstrates that the ability to trade is necessary to ensure that conservation and mineral resources are put to their most valued uses. The implication is that a preferential policy for conservation has no more validity than the preferential mining policy of the past.

This monograph reflects the author's familiarity with the subject and her confidence in handling the policy issues posed by mining. The discussion of environmental rights and resource rents introduces innovative ideas into what is sometimes a tedious debate. The monograph's breadth of commentary and expertise in analysis ensures that its arguments will be central to future debate on the management of New Zealand's mineral resources.

The character of any future management arrangements within a market system must remain unknown, but Veronica Jacobsen has identified a path for their discovery.

Peter Ackroyd
Lincoln University

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About the Author

After a career as a computer programmer and systems analyst, Veronica Jacobsen completed a B.A. degree at Massey University and an M.Soc.Sc. from the University of Waikato. She subsequently spent three years as partner in a firm of consulting economists. She has specialised in macroeconomics and public policy analysis with an emphasis on science and natural resources. She is currently a lecturer in Economics at the University of Waikato, where she is undertaking D.Phil. and LL.B. degrees.

Chapter 1

Introduction

MINERALS, the land above them and the surrounding environment are scarce resources. If they are used by one group for one purpose, they are unavailable to others for other uses. While resources are scarce, there will be competing claims for their use.

This monograph addresses some of the issues involved in resolving those competing claims. Its fundamental premise is that scarcity, whether it be in minerals, land, air or water, must be expressed so that firms, individuals or community groups recognise the true value of using those resources. Only in this way will the use of the nation's scarce resources be allocated to the highest valued uses, whether these be for mineral development, forestry, tourism, land of spiritual significance or conservation. The central issue is how to allow for those values to be determined and reflected in the decisions of competing claimants. This study explores the use of market forces to reflect the values of those scarce resources.

Weaknesses of the Present System

The mining industry in New Zealand is currently a topic of much debate, especially concerning its possible environmental effects. This is particularly true in ecologically sensitive areas such as the Coromandel peninsula. The law pertaining to natural resources has recently been reviewed, and consolidated legislation, which includes Crown-owned minerals, is currently before Parliament. The environmental damage associated with gold mining in the 19th century, the scars of which are still visible today, is both a root cause of scepticism about mining and a symptom of the fundamental problem: the need to prevent mining harming the environment.

In New Zealand, the Crown issues licences to explore, prospect and mine certain mineral deposits. The principal reason for the use of this mechanism has been the Crown ownership of the minerals and the control of the environmental consequences of exploration, pros-

pecting and mining. The present system has many strengths, not least the explicit recognition that mining affects the environment, and that protective measures are necessary.

At the same time there are a number of fundamental weaknesses. Rights to explore, prospect, mine and use the environment are themselves scarce and hence valuable. However, unlike other inputs that a mining company could use (e.g. labour, machinery, accountants) these rights carry no explicit price to reflect that scarcity. Potential users who receive these rights without explicit payment have no incentive to ensure that they acquire the correct quantity of rights or to use them efficiently.

This is not to imply that such rights are 'free'. In fact the present lengthy bureaucratic procedures impose very high costs on applicants. As the procedures involve many discretionary elements they create uncertainty about the outcome. And the outcomes may vary across applications or over time. Because mining companies recognise the value of the rights, they may devote considerable resources to acquiring them.

Finally, the present system does not recognise that other activities also affect the environment. Any policy framework that aims for neutrality of outcomes would necessarily have to treat similar users of the environment in a similar fashion. The present system is clearly non-neutral in its stringent treatment of mining because it relies excessively on 'activities' rather than 'outcomes' in deciding how resources should be used.

Some Characteristics of the Mining Process

The present system includes certain policies that are required by the nature of mining. These policies would need to be incorporated in any other system of resource management. Informational problems are inherent in mining. Unlike most other productive activities, mining involves the use of a raw material that must be discovered before it can be evaluated, and evaluated before any decisions can be made about whether to go ahead with mining. Mineral deposits are location-specific, so that discovery and evaluation require on-site exploration. This property of the mineral production process is recognised in the access rights permitting licence-holders to enter land that they do not necessarily own. Without information about the location, nature and value of mineral deposits, it is impossible for the resources of the land or the subsurface to be allocated in a way that takes all interests into account.

Mineral deposits are initially sought and assessed through exploration and prospecting. Because minerals are scarce, however, much exploration must be carried out to locate possible deposits before the more rigorous phase of prospecting to assess their potential can take place. Not all exploration leads to prospecting, and not all prospecting leads to mining, since deposits may prove to be uneconomic. However, the incentive to explore and prospect is provided by the potential return from mineral extraction. An economic mineral deposit consists of the mineral ore itself and the information about its location, nature and value generated by the investment in exploration and prospecting. Without that information, there exists only the possibility of an economic deposit. Some of the returns generated by a successful mining operation in a very real sense accrue to the investment in information gathered through the risky stage of exploration and prospecting. The proportion of the return in excess of that necessary to induce investment and production (including the return to all the costs of exploration, prospecting and development) accrues to the mineral deposit itself in the form of a 'true' resource rent that is the due of the owner of the minerals.

It may not be possible to appropriate the information generated by exploration and prospecting. In fact, the actions of mining companies may themselves disclose that information. There would be little incentive to invest in exploration and prospecting unless investors had some prospect of capturing the returns to that investment by mining. The situation is analogous to that of research and development, where there is little incentive to invest in risky research if discoveries cannot be protected by devices such as patents.

The present system of mineral licences recognises this need to appropriate the returns to exploration and prospecting through priority provisions of licences. These provide holders with priority to licences at succeeding stages. Any alternative system would need to recognise this and provide a means for companies to be assured that they could eventually receive a return on their investment in exploration.

Modes of Allocating Mining Rights

The present system of bureaucratic licensing is one mode of allocating the rights to explore, prospect or mine minerals. The market is an alternative mode. This study argues that this alternative could result in a more efficient allocation of the resources of the land, the mineral estate and the environment. The fact that some markets do not currently exist provides no justification for the type of intervention

observed. Why are markets in certain natural resources missing in New Zealand? How have they evolved in some cases over time? And how might they be expected to develop where regulation is currently used as an allocational device? Empirical analysis of the comparative performance of government and the market in the allocation of natural resources in New Zealand remains an area for further research. What is clear is that the past record of extensive reliance on regulatory controls has not ensured adequate environmental quality; arguably, mining may be the exception.

Rather than enshrining further controls in, and placing reliance on, adversarial 'winner takes all' approaches, we should allow market forces to improve environmental quality and reward more equitably the owners of minerals. A policy environment free from the uncertainties and delays created by the present system could encourage rather than discriminate against investment in mineral exploration and development. As well, greater reliance on market prices to reflect scarcity values would contribute to preserving and enhancing areas of high conservation values.

Chapter 2 reviews the procedures and shortcomings of the present licensing system in New Zealand. In Chapter 3 the role of markets is examined. That role depends crucially on the definition of property rights.

Chapter 4 explores how mineral rights and rights of access and environmental use might be specified and traded. Chapter 5 offers a synoptic view of the possible directions of reform.

Chapter 2

Licensing Mining in New Zealand

THE present system of allocating rights to Crown-owned minerals involves licences that correspond to different stages of mineral production. **Exploration** licences permit wide-ranging, low-impact initial exploration for minerals, **prospecting** licences permit more detailed investigation of smaller areas of land, and **mining** licences permit mineral extraction. The rights and obligations of the holders are defined in the licences. Additional conditions may be imposed through a process of consents and consultations with interested parties and government departments. The rights of licence-holders relate to the surface (where the effects of mineral activity on the landowner are negotiated) and to the environment (where conditions controlling the use of the environment by that particular applicant are imposed on the licence).

If the Crown owns the access rights to the minerals, a licence may be granted without the consent of the owners and occupiers, who are, however, entitled to compensation for disturbance. If the Crown does not own the access rights, then the consent of both the occupiers and the owners is necessary for prospecting or mining. The landowner is generally compensated for the surface damage. Additional conditions and compensation may also be negotiated. At the mining stage the mining company may simply buy the land itself to internalise the external on-site effects. Where the Department of Conservation is the landowner, the Minister may impose conditions on a licence.

The Licensing Process

Applications for licences are made to the Ministry of Energy, and a procedure of consultations with different bodies is carried out to assess the potential impact of mining or prospecting activity and to determine the conditions to be attached to the licence. The Minister's decision must be based on the social, environmental and economic costs and benefits of the proposed activity, and its effects

within the mining industry.

If the land subject to a prospecting or mining application is administered by another Minister of the Crown, the consent of that Minister is required before a licence can be granted. The decision of that Minister is not subject to review by the Planning Tribunal. Since the Department of Conservation is responsible for much of the surface of New Zealand, the decisions of the Minister of Conservation have important consequences for the granting of prospecting and mining licences.

Once a decision has been made, and the conditions it is proposed to attach to the licence publicised, interested parties may register objections. If there are only a few objections, they may be resolved by direct negotiation. Where there are many objections, they must be heard by the Planning Tribunal which reports to the Minister on a wide range of criteria. The Minister is obliged to follow a negative recommendations from the Tribunal, but retains the power to decline a licence despite a positive recommendation. The objections procedure is intended to permit widespread public participation in deciding both the allocation of mineral licences and the conditions to be attached.

Bureaucratic Inefficiencies

Not only is the licensing system itself inefficient and wasteful, but the resources that it purports to manage wisely may themselves not be efficiently allocated. This bureaucratic and judicial system of resource allocation does not ensure that the resources of land, the environment or minerals are allocated to the most highly-valued uses.

The process is adversarial in nature and does not provide for the possibility of negotiated settlements. The procedure is costly, not only in terms of the direct administrative and judicial costs (borne indirectly by taxpayers) and the direct costs on the applicants and objectors, but also in terms of the indirect costs imposed on the applicants, which significantly delay their expected return. The process invites rent-seeking behaviour and suffers from uncertainty and informational problems.

Costs. The costs borne by the applicants dissipate the rent which accrues to the communally-owned resource and which would otherwise be payable to the Crown. A resource rent, by definition, is the amount that a firm would be willing to pay for the rights to bring a resource into production. The direct costs that firms are willing to incur on obtaining mineral licences, and the indirect costs associated

with licensing delays, may together amount to the entire resource rent. The indirect costs imposed on applicants are not trivial. A mine producing 60 000 oz of gold annually loses \$2.6 million from a one-year delay in the licensing procedure. A two-year delay costs \$5.6 million (Jardine & Scoble, 1988).

Although there is provision for the collection of resource rentals, the present system does not require their payment. Resource pricing is currently under review (Ministry of Energy, 1989a-d). Since the bureaucratic system itself ensures that the resource rent is dissipated, any further taxation of successful mining operations, through measures such as royalties, would fail to collect the correct amount of the resource rent, and would represent a punitive tax on the industry.

The forgone revenue imposed by the bureaucratic system of allocating licences represents a cost to taxpayers, but not to those who impose the delays. Since the latter do not themselves forgo revenue, but on the contrary may capture benefits as a result of the delays, there is little impetus to seek alternative methods of allocation. Furthermore, taxpayers may be unaware of the costs they bear, and since each one in any case bears only a small proportion of the total cost, they also may have little incentive to promote reform. Objectors too impose costs on applicants. Since the direct cost of objection to each individual may be low, and the benefit from preventing mining may be higher, there is an incentive to oppose applications. Where an application is delayed or declined, costs are also imposed on those who would benefit from the mining operation, such as potential employees, who, in addition, are disenfranchised by the present process. Since they may be unaware of the potential benefits, they have no incentive to support the application. As a result, hearings may be dominated by objectors.

The generally unrecognised, and hence unquantified, costs are not necessarily offset by the generation of commensurate benefits to another group. The administrative system has no means of quantifying the size or the incidence of the costs and benefits of the process, or of its decisions, and no means of internalising these. Bureaucrats and judicial decision-makers do not bear the consequences of their actions, and so lack the incentives 'to make the right decisions'. This is a fundamental weakness of the system.

Incentives. The adversarial nature of the hearings process means that neither party has the incentive to provide an optimal or efficient amount of information. Conversely, there may be an incentive to provide misleading information, to conceal pertinent evidence, or to provide overwhelming amounts of supporting data of dubious value.

There are incentives for all parties to make extravagant claims. The decisions of public hearings are based on the imperfect evidence presented before them and on the advocacy of the various parties rather than on any underlying environmental, social or economic factors. Imperfect information and perverse incentives make it unlikely that decision-makers in public hearings will achieve a better allocation of resources than could be obtained in the market. The wide scope for discretionary decisions may preclude consistent decisions across projects and through time. Importantly, it also adds uncertainty to the process.

Rent-seeking. The process is dominated by rent-seeking behaviour on the part of both those supporting and those opposing the application; all seek outcomes that reflect their particular interests. There are incentives to spend excessive amounts in presenting evidence. Furthermore, there is the potential for corruption, albeit limited.

The process is designed to balance the economic and social benefits of mining against the environmental consequences. But the trade-off is not explicit. It encourages applicants to focus on the benefits, and objectors to emphasise environmental damage. Since many exogenous factors not under the control of the mining company influence the actual social and economic benefits that arise from mining, it is by no means clear that the intended benefits will be realised on the scale, or for the period, envisaged at the hearings stage. In addition, since these effects may not be wholly under its control, it is not clear to what extent a company could or should be responsible for ensuring that the envisaged outcomes are realised. If any environmental damage is long term or of a permanent nature, and the benefits short term or transitory, a trade-off may be difficult to make unless the future costs are appropriately discounted.

The costs of environmental damage are considered in licensing decisions. However, in general, firms and individuals do not include all the costs of their use of the environment in their production decisions unless appropriate mechanisms are in place. Regulation and licensing can reduce such externalities, but because the system does not provide for the pricing of those externalities, the allocation of resources is likely to be less than satisfactory.

Informational problems. A system that administratively prohibits certain uses of land for mining imposes an implicit tax on the mining companies and a transfer to the community of an improved environment. Nothing in the system ensures that the implicit tax is in any way related to the value of an improved environment. There is no

price signal to indicate whether the enhanced environment is valued less than, more than, or the same as an externality created by the mining operation. If it is valued less, a greater level of externality is tolerable: the mining company could devote less money to reducing the environmental effects and more to producing minerals. If it is valued more, the company would have to devote more money to reducing the environmental effects and less to producing minerals. At lesser or greater values the possibility exists that altering the balance of resource allocation between the two activities would improve efficiency.

An administered allocation of resources does not ensure that the values placed on resources are comparable across competing uses. It does not produce signals that would indicate that a reallocation of resources would improve efficiency. It does not allow for changes in the relative values to occur over time that would encourage a reallocation of resources into higher-valued uses. An administered system of resource allocation is therefore likely to be inefficient even though it may reduce externalities to some extent, since there can be no assurance that either the land or the environment is being used in its most highly valued way. Nor is the resulting allocation of resources likely to be equitable, since there is no mechanism to ensure that each party bears the costs and benefits of his or her own actions.

On the other hand, a system of fully defined, enforceable and tradable property rights to the use of the resources of the environment would bring the costs of environmental degradation to bear on the users through the discipline of the market. The price of the rights would reflect the costs of the externality, and trade would occur until the environment is used in the way that reflects its highest value. Under such a system the environment would be used efficiently, since no further trade in environmental rights could make anyone better off without making someone else worse off. Like other externalities, environmental externalities can be alleviated by the formulation of tradable property rights to use the environment through negotiation or legislation.

The replacement of the present system with markets for the sale of land, mineral and environmental rights, would result in a better allocation of resources, remove the incentive for rent-seeking, and be more equitable than the 'winner takes all' approach of judicial allocation that has evolved in New Zealand.

Chapter 3

Markets and Minerals

THE allocation of resources in a competitive economy is efficient if it is impossible through reallocation to make someone better off without making someone else worse off. No further bargaining or trade will take place, since all resources, including land, minerals and the environment, are being used in the way that has the most value for their owners, whether those owners are individuals, firms or the community.

A competitive market may be constrained in its ability to achieve an efficient allocation of resources, when 'market failure' is present. The removal of those constraints could improve the operation of the market, permit further potential gains from trade to be realised, and improve the allocation of resources. Government intervention might also permit those unexploited gains to be made.

Market Failure and Government Intervention

The principal justification for government intervention in the minerals sector has been the presumption of 'market failure' arising from externalities. Externalities refer to the activities of individuals or firms which have consequences for others but which are not taken into account by those who produce them and which therefore lead to the misallocation of resources. For example, mining activity may involve pollution of streams; manufacturing may involve air pollution; aircraft produce noise. All these effects represent negative externalities to the community and are not treated as costs by those who engage in mining, manufacturing or flying. But if, say, a mine operator had to produce clean rather than dirty waste water as a by-product of mining, the full costs of water pollution would be borne by the company and resources would be more efficiently allocated.

The market failure approach stipulates that, when externalities occur, the government should intervene and supplant the role of markets. There are two essential problems with this approach. First,

it does not seek the underlying cause of the externality. What is it that permits a mine operator to ignore the costs of water pollution? Without considering the underlying cause of the presence of the externality, it is impossible to determine an effective, targeted solution. If there is a range of causes, there may be a range of possible solutions that go beyond the automatic response of 'more, or better regulation'.

Second, the market failure approach does not assess the efficiency of the alternative it advocates. Just as markets fail, so too can the government alternative 'fail'. Although an efficient allocation does not necessarily require markets, it is much harder for government to allocate resources efficiently. The very nature of bureaucratic decision-making suggests that it may lead to outcomes that are more costly, inefficient and inequitable than the outcomes determined by decisions of individuals in the market. Despite their good intentions and dedicated efforts, bureaucrats and politicians are subject to errors of judgment; they are susceptible to influence by organised interests; they may be imperfectly informed of all the relevant costs and benefits; and above all they lack the incentives to make 'correct' decisions. Short of gross incompetence, they bear none of the costs of 'bad' decisions. The evidence of government-orchestrated environmental damage in New Zealand should make the most hardened anti-market cynic question the ability of the state to foster environmental quality.

Transaction Costs

For these reasons the market failure approach has been refined and extended by the concept of transaction costs, which focuses on the underlying causes of market failure. Transaction costs are real and ubiquitous costs that impede or constrain any exchange, and explain the existence of actual markets and forms of bargaining as compared with the theoretical ideal. The transaction cost approach can be used to examine the comparative efficiency of alternative forms of exchange. Unlike the market failure approach, which considers government intervention mandatory in the mere presence of market failure, it seeks to reduce transaction costs to enable the market to function more effectively.

The underlying causes of market failure can be expressed in terms of transaction costs. An important prerequisite for the functioning of competitive markets is that property rights are defined and enforced. Where there are no property rights, no market can exist. The lack of property rights imposes prohibitive transaction costs on negotiators. Any consideration of the use of markets to allocate

resources thus begins with a consideration of property rights.

Property Rights

The market cannot operate to allocate resources efficiently where there is no system of clearly defined, enforceable and tradable property rights. Without property rights the transaction costs of establishing contracts between those affected by externalities and those creating them are prohibitive. The mere presence of externalities, however, suggests that property rights will emerge where the benefits of their formation outweigh the costs. The existence of property rights permits individuals affected to negotiate with those producing the externality, forcing them to bear the costs of their actions. Government intervention to allocate mineral resources attempts to emulate the market, but without establishing property rights and allowing their trade (Bergstrom, 1984).

Externalities can be internalised by the formulation of property rights. Property rights can be defined for the use of the land, minerals and the environment, and can be traded to achieve an efficient allocation of those resources. Surface owners' rights would be similar to those that landowners presently enjoy; mineral rights would permit exploration, prospecting and extraction of ores; and environmental rights would permit waste disposal.

Property rights refer to the right to use resources in a particular way (Furubotn & Pejovich, 1974; Cheung, 1983). Different uses of goods or assets can be defined as separate rights, or a number of uses may be defined together so that they comprise a bundle of rights. A wide range of possible property rights can be created, from full, unattenuated private property rights through private attenuated individually or collectively owned rights, to purely public property rights. Examples of property rights include the right of access to a national park, the right to cultivate or subdivide one's land, and the right to use the airwaves.

Property rights may be developed by mutual consent between individuals or groups, without government intervention, particularly where the number of parties is not large. Property rights may also be created by custom and judicial precedent. They may also be formulated by government legislation to design, define and reform private property law; adding to or disposing of the public domain and by providing facilities, such as the courts and land registries, for the enforcement of private rights (Scott, 1984a). Property rights change over time, becoming better defined, simpler, more exclusive or easier

to transfer. How a market operates, and the efficiency with which it allocates resources, are both affected by the manner in which property rights are defined, enforced and allocated.

Once property rights are fully and clearly defined and enforceable, it is possible for individuals to trade in those rights. The market provides price signals to potential buyers and sellers of the rights that reflect the costs and benefits of acquiring them. If the mining industry could acquire the right to use the environment without paying full costs, scarce environmental resources could be used excessively. Conversely, if conservationists could establish rights leading to the prohibition of mining in certain areas without bearing the costs, they too would have an incentive to seek excessive and inefficient levels of conservation.

Trade in Resources

The existing system of resource allocation permits some definition and trade in property rights. For example, negotiations with landowners who own access rights determine permissible exploration and prospecting activity, and provide for compensation for surface disturbance. The rights are mutually determined and tradable. At the mining stage the land itself may be purchased. In both cases the price paid reflects the forgone value of the surface. The compensation payable to landowners where the Crown owns access rights and mineral rights is also intended to reflect that value, although in this instance neither the rights nor the price are subject to mutual bargaining.

Conditions attached to mining privileges regulating the use of the environment are determined through the licensing system. Although the process is long and costly, it represents a mutual formulation of property rights between the mining company and the community. Despite the many disadvantages to the system, the fact that defined property rights emerge at all is a tribute to their robustness. Where externalities occur, it is in the interests of those affected to institute a system of property rights to internalise those effects.

However, when a large number of people are affected by a firm's activity, it may simply be too costly for them all to negotiate individually with the firm. Local or national government may thus be necessary in order to define and initially sell or otherwise allocate the rights efficiently on behalf of the affected individuals. Public participation may be involved in the formulation and pricing of those rights, as it is in many other local and national government affairs. However, the costs involved from rent-dissipating activities in formulating the rights

where there is government involvement may exceed the benefits (Anderson & Hill, 1983).

In a market system, all the rights pertaining to mining would be tradable and independent of one another. A mining company wishing to explore, prospect or mine would buy mineral rights from the owner. In the case of gold, silver, uranium or petroleum, the owner is the Crown. It could also negotiate with the landowner to buy some or all of the surface rights. For example, if exploration were to involve activity not specifically permitted by the mineral rights, then those rights, such as the cutting of a track or the felling of trees, could be purchased from the landowner. At the mining stage it is likely that a mining company would buy all the surface rights, that is, the land itself. The external effects of exploration, prospecting and mining could be controlled by the purchase of environmental rights. Other users of the environment would also be required to purchase environmental rights, thus establishing neutrality between activities that would result in a more efficient use of the environment.

A system of tradable property rights would permit the allocation of the rights to all the land, mineral and environmental resources to their most highly valued uses. They would be traded until they were held by the owner who placed the highest value on them. The owners of the property rights would enjoy the benefits and bear the full costs of their use. Such a system would protect the interests of future generations and would explicitly permit public participation. It would facilitate the resolution of conflict between alternative uses of the land through negotiation and trade rather than through an adversarial process that fails to elicit the true preferences and values of interest groups or to place prices on rights so as to encourage users to economise on the use of scarce resources.

Public Participation

The present regulatory system of allocating mining privileges assumes that the process of public participation, objection and appeal provides a consistent and equitable input into public decision-making. However, the inadequacies of the present system of public participation are highlighted by the fact that neither the mining companies nor the groups opposing mining are generally satisfied by the result of the process. It is costly and frequently results in conflict and a polarisation of viewpoints.

Members of the public may be reduced to rent-seeking behaviour, emotional campaigns and appeals to bureaucratic decision-making in

order to have their values considered in the absence of direct means of implementing their preferences. A market system would allow them to translate their objections into action, and would also explicitly translate their preferences into monetary values.

The market accommodates an infinite variety of preferences and allows individuals to express these through their actions. The regulatory system, in contrast, reflects a single preference only. The market also accurately reflects the relative strengths with which preferences are held, whereas the bureaucratic system relies on imperfect indicators, such as lobbying, to gauge the strength of public opinion. The market allows people individually or collectively to benefit themselves and foster or conserve their values, be these recreational, environmental, aesthetic, scientific, historical, tribal, cultural, ethnic or spiritual. In buying property rights they value more and selling those they value less, they can negotiate directly with property-owners, eliminating the need for costly government intervention and reliance on possibly faulty bureaucratic or judicial decision-making.

A system of tradable property rights would enable groups opposing mining or favouring increased conservation to realise their preferences by buying the relevant rights and holding them to prevent mining taking place. They might trade in rights of all kinds, including land rights, fishing rights, logging rights, mineral rights, or environmental rights. They could buy environmental rights and retain them where they preferred a higher environmental quality than the minimum standard on which the rights were based. Community groups could bid against mining companies in auctions for mineral rights. The price of the rights would reflect the resource rent of the mineral deposit.

Such a system is likely to be efficient and equitable. A range of prices is likely to emerge over many auctions. Since bids from mining companies are likely to be low for marginal mineral deposits, community groups with limited funds would be likely to concentrate their bids on these auctions. Mining companies would thus be likely to win the rights to high value deposits, and other groups to win the rights to deposits of low value. Under the existing system, no such efficient outcome is guaranteed.

Even if mining companies won the mineral rights to deposits of high value, they would still have to buy the surface (landowner's) rights in order to mine. Community groups concerned with conservation could thus buy the surface rights above the mineral deposit without buying the mineral rights themselves. If they valued the

surface more than the price the mining company was willing to pay in order to mine, then the land would not be mined. However, conservation itself is costly, and the acceptance of a mining company bid for the surface rights would enable the group, for example, to buy other land that might be more valuable in conservation terms, but less so in mineral values; to engage in conservation education; or to carry out conservation projects.

The actions of groups of individuals are not incompatible with market solutions. Indeed, the formation of collectivities overcomes one of the causes of market failure, namely, the high transaction costs that arise in dealing with many people individually. The existence of many kinds and sizes of groups in many fields, such as environmental watchdog groups, ratepayers associations and tramping clubs, suggests that the costs of their formation are not prohibitive.

It is sometimes held that such collective action is infeasible because no group of private individuals could compete with the economic resources of large mining companies. Yet there are hundreds of everyday examples of groups of individuals acting collectively to hold resources for their own interests. Sports clubs, for example, acquire land and buildings, often in areas of valuable real estate. They are not necessarily precluded from such action by the economic might of property developers. Where that land would have a higher value, in, say, apartments or a shopping mall, the group can exercise the choice of retaining the existing site or selling and using the funds to acquire an alternative site.

Future Generations

The present system of allocating mining privileges has no explicit mechanism for connecting the present and future values of resources. Since mineral rights and rights to use the environment are allocated on a non-price basis, there is no means of assessing their value in either the present or the future.

The market system, in contrast, explicitly makes this connection between present and future values, and in so doing preserves resources, including environmental and mineral resources, where their future values exceed their present values. Any owner of land and mineral rights may decide to maximise his or her revenue, and to mine the land himself or sell the mineral rights to a mining company. In the latter case the owner perceives that the net present value of the land surface forgone through mining activity is less than the net present value of the mineral income. However, if another interested party

judges that the net present value of the land forgone is higher than that of the minerals, it would offer the owner a price for the land rights. By buying the land and keeping it in its unmined state, the new owner is not only seeking to maximise his or her income in the future, but also conserving both the surface and the mineral resource. The converse may also occur. If a speculator judges that the future value of the minerals is greater than in the present, he or she has an incentive to buy the mineral rights in the present, and preserve them for future mining or sale. The speculative activity of private individuals ensures that resources are preserved for the future where the future value is higher than the present value.

This future value may be monetary or non-monetary. If a resource has an option value (its future value cannot be determined on the basis of current knowledge) or a bequest value (its preservation is intrinsically important) it may still be bought or sold. The sale would reveal the implicit value. Withholding a resource from sale also reveals its implicit value, since it indicates that the value of the resource is greater than any prices that might be offered. Whether their values are implicit or explicit, the market allows resources to be used in their most highly valued way.

Although it is true that the preferences of future individuals are currently unknown, market forces reveal the different perceptions of the present generation concerning the future value of resources. Uncertainty about the future is an inherent characteristic of all investment decisions. Private individuals continually make decisions regarding such matters as education, insurance, superannuation, marriage and child-raising, all of which involve judgments about the well-being of future generations.

It is sometimes argued that the government should act on behalf of the nation to preserve certain resources, such as mineral, spiritual, cultural, or wildlife. In this case the government is free to act in the same way as a private speculator, buying resources that are undervalued in the present for future, possibly non-monetary, reward for the nation as a whole. However, the government may not be less short-sighted than private investors, nor may it have better information about future values. If that were true, however, a better strategy than intervention might be the wide dissemination of information (Freebairn, 1987). Like any other resource-owner seeking to maximise the net present value of the resource, the government can control the depletion of its mineral estate by selling mineral rights.

A non-price system of resource allocation provides no mechanism to reflect time preferences for ownership. Far from preserving re-

sources, the granting of mining privileges by licence rather than sale, lease or a tax related to the resource rent may encourage their exploitation at a faster rate. Underpricing the right to develop mineral reserves encourages companies to invest more in immediate exploitation than they would have chosen to had they borne the full cost. Administrative allocation may accelerate depletion. In contrast, the market-determined pricing of mining rights ensures that mining companies incorporate the value placed on the resources in selecting the rate of extraction. Further, under a mining licence of limited duration the holder has no incentive to conserve the deposit beyond the expiry of the licence period.

Since the present method of trading-off the social and economic benefits against the environmental costs of mining is not explicit, it disenfranchises future generations: the benefits may accrue to present generations, but the costs may be imposed on both present and future generations.

Chapter 4

The Rights to Mine

THREE sets of property rights are relevant to the use of mineral resources. These are the rights to the surface, the rights to use the environment as a repository for waste, and the rights to discover and exploit the mineral resource itself. These rights are clearly separable in both their function and their form. There is no fundamental requirement that the rights to use the environment should be traded off against the rights to explore or the rights to extract minerals. The rights to each activity could be negotiated separately with each owner.

The use of each of these rights is the subject of much controversy and often emotional debate. Surface or landowners' rights raise the issue of access rights for mineral exploration and prospecting. The Department of Conservation is itself a substantial landowner in New Zealand, and controls much of the area that is likely to contain mineral deposits. The management of any potential mineral deposits underlying that land is affected by the manner in which the Department carries out its mandate. The use of the environment raises issues concerning the control of any external effects of mining. The use of mineral rights themselves raises issues about their ownership, how they should be allocated, and whether any price should be paid for them.

Landowner's Rights

Landowners own the land's surface. Since minerals generally occur below the surface, mining companies and landowners must negotiate before exploration, prospecting or mineral extraction can occur. The evolution of negotiation and contracting between mining companies and landowners is a tribute to the power of tradable property rights to resolve conflicts. It suggests that where clearly defined, widely understood, enforceable and tradable property rights do exist, the use of the market can lead to mutually satisfactory outcomes.

Under an integrated system of property rights, landowners could

explicitly negotiate with mining companies to control the effects of mineral activities on the surface. It is clear that the issues of access to the minerals and the environmental effects associated with exploration and prospecting are separable. While access to the minerals by mineral owners may be fully justified, surface disturbance is not. Mining companies wishing to engage in exploration and prospecting would be subject to several limits on the external effects of the surface disturbance associated with their activities. First, they would have to abide by any conditions defined in the mineral rights. These might be similar to the conditions presently defined in a licence, but could be more stringent.

Second, they would have to abide by any conditions or performance standards applicable to that location. These might be similar to the restrictions of the present Town and Country Planning legislation, which could be translated into generally applicable performance criteria to limit the external effects of land use. Alternatively, they could be negotiated between the parties, using various mechanisms, such as covenants, to apply the agreement. In a fully fledged system of environmental property rights, it might be necessary for a mining company to buy some of those rights.

Third, mining companies would have to meet any additional conditions laid down by the landowner. Of course, if exploration and prospecting could be carried out without surface disturbance, or if the conditions specified in mineral rights adequately controlled the environmental effects, then no further negotiation with the landowner would be necessary.

The imposition of conditions controlling mineral activity would represent the mutual formulation of property rights by the landowner and the mining company. These would specify permissible environmental effects or mineral activities, the obligations of both parties, and the price to be paid for those rights. If the landowner valued the undisturbed surface very highly, then the price of any such rights might be very high. Very high prices for surface disturbance would encourage the development of lesser cost technologies which would permit exploration and prospecting without costly disturbance.

The Department of Conservation

Where the Crown owned land, it could act like any other landowner in negotiating with mining companies in order to control surface disturbance. Since the Department of Conservation is a large landowner in New Zealand, its management of the surface has important con-

sequences for the mining industry.

The Department of Conservation is a substantial landowner, controlling about 40 per cent of the land and 70 per cent of the prospective area of New Zealand. It is broadly charged with preserving the country's heritage for the benefit of future generations. The Crown in fact owns all the relevant rights: the right to the minerals (through Crown ownership of minerals); the access and land rights (through Crown ownership or the ownership of the land); and the environmental rights (through the nation's 'ownership of the environment').

Any private owner of these rights would weigh up the costs and the benefits of the alternative uses of the resource. If the net present value of the unmined land were less than that of the minerals, then it is likely that the mineral rights would be sold. On the other hand, if the land itself were more valuable than the minerals, then the mineral rights would be likely to remain unsold. In either case the resource would be used in its most highly valued way. Because a single owner owned both the land and the mineral rights, the decision would be internal. The trade-off might be implicit, or it might be explicit with the costs and benefits of each alternative calculated. The latter would require specific estimation of the relative values of the surface and the subsurface. If circumstances changed, say improved technology decreased the costs of mineral extraction and increased the value of the minerals, the alternatives could be re-evaluated and a fresh decision made. If other parties offered prices for either resource that exceeded the net present value as calculated by the owner, the latter could sell the resource to the highest bidder and use the income obtained from the sale of either the mineral or land rights in any way he or she wished.

Although the Crown itself owns all the rights on behalf of the community, the present policy framework does not require it to consider alternative uses of the land. Although mineral licences are issued by the Minister of Energy, the Department of Conservation as the landowner is empowered to prohibit mineral activity on its land. Since the Department possesses wide powers to limit mineral activity and is charged with considering only the conservation values of the land, the implicit valuation of a preserved environment revealed by the prohibition of mining is very high indeed. The proposed prohibition of mining in National Parks is another example of a land use decision that fails to reflect the true values of both parks and mines.

An efficient allocation of the resources of the surface and the subsurface requires a mechanism for allowing the Crown to evaluate

all the costs and benefits of alternative land uses, including mining. However, this requires information about the relative values of those uses, including information about the minerals below the surface. Minerals are valued through exploration and prospecting. Without the possibility that mining could follow, however, there is no incentive to explore and prospect. An arbitrary ban on mining would imply an infinite valuation on the surface. It would also remove any incentive for valuing the minerals below the surface and challenging the rationality of the resource allocation. Under the present system of allocation, potential losers from a ban on mining are unrepresented in the decision-making process. Mining companies themselves may protest such a ban, but other potential beneficiaries, such as future employees or suppliers, remain unidentified, and thus cannot participate.

Some areas of land controlled by the Department of Conservation are likely to have very high values; so high in fact that banning mining in those specific and identified areas may reflect their infinite worth. Other land may have less value. If minerals of a high value were to be found beneath land of lower value, then efficiency would dictate that mining should take place. Land of low conservation but high mineral value could thus be used for mineral production, while land of high conservation and low mineral value could be conserved.

Unlike private landowners who can easily buy and sell land, the Department is constrained in its ability to trade. Explicit trade would help the Department to carry out its mandate. The sale of land of low conservation value would enable it to purchase land of high conservation value. Conservation is costly; the sale of some land, or some of the rights to use land, could be used for conservation, education and restoration of habitats and the purchase of privately owned land. The ability to buy and sell land rights would ensure that the land held by the Department and the mineral rights held by the Crown went to its most highly valued use.

If the Department of Conservation enjoyed the ability to trade like any other landowner, then the allocation of mineral rights could conceptually be separated from the allocation of the rights to mine, as they would be with private landowners. The sale of mineral rights would result in the efficient allocation of the resources of the surface and the subsurface, if both those agencies were able to emulate private transactors.

The introduction of the right to trade would permit both the Ministry and the Department to carry out their respective functions more efficiently and equitably. The assessment of costs and benefits

would be easier if prices were allowed to reflect true values. Individuals and interest groups would have much better information on which to judge the performance of the Department in enhancing the value of its portfolio of Conservation lands.

Such a system would allow changes in the relative values of the resources over time to be reflected in the pattern of allocation. A bureaucratic decision on land use, such as the banning of mining based on current values, which is binding 'in perpetuity' does not allow such changes in value to be reflected in land uses.

Access Rights

The ownership of access rights is the key to mineral activity. Without rights of access, all the other rights are worthless, since it is impossible to explore for or evaluate minerals. Without some knowledge of the existence and potential value of minerals it is impossible for the market to operate, since prices cannot be determined without some information. When information about the value of minerals is available, negotiations with the landowners can proceed, since mining itself generally involves the purchase of the surface of the land from the landowner.

Without information about the value of the surface or subsurface it is impossible to allocate the surface of the land or mineral resource to its most valued use. This in turn gives rise to the fundamental need for access to the subsurface, since without such access evaluation of the mineral estate is impossible. While the landowner could possess information regarding the value of the surface, a mining company could not know the value of the subsurface, and the market would fail.

Access rights are seen to provide the mineral industry with an advantage not enjoyed by other industries, although they are fundamental to any mineral activity. They merely provide mining companies with the opportunity to identify and evaluate potential inputs: an opportunity readily available to most other industries without special provisions. The existence, location, nature and potential value of mineral deposits must be ascertained before any decisions can be made regarding mining. They must be identified, evaluated and extracted where they occur; other industries can generally shift their activities elsewhere.

The possession of access rights stems from the multiple use of the land and its subsurface. The rights to the use of the subsurface are clearly distinguishable and separable. Being separable, there is no

guarantee that they have the same owner. Indeed, in New Zealand the Crown owns the rights to certain deposits, while the surface may have private or Crown owners. The access rights to the minerals may be owned by either the surface owners or the mineral owners.

In the absence of access rights neither the landowner nor the mineral owner can enjoy his or her rights to the full without impinging on the rights of the other party. The landowner cannot have exclusive use to the surface without denying the mineral owner the use of the resource. Neither can the mineral owner or licensee use the resource through exploration, prospecting or mining without denying the landowner the use of some of the surface. Through the non-exclusivity of the rights, each imposes an external cost on the other. Access rights are intended to alleviate this problem; indeed negotiated property rights are the classic solution to the existence of such externalities.

While access to the subsurface to evaluate minerals is wholly justifiable, the infringement of the rights of the surface owner is not. Access rights permit exploration and prospecting of the subsurface in order to identify and evaluate minerals. They may be narrowly or broadly defined, but generally would not include the rights to disturb the surface. If exploration and prospecting could occur without disturbing the surface or infringing on the rights of the landowner, then no negotiation with the landowner would be necessary.

On the other hand, if exploration and prospecting involved surface disturbance, then the rights to create a disturbance and the payment for the use of the rights would need to be negotiated with the landowner. The costs of the disturbance would be borne by the mining company, who would also enjoy the benefits of exploration. The existence and tradability of landowners rights thus permits the internalisation of the external effects of exploration or prospecting. The greater the costs of the disturbance, the greater would be the incentive for mining companies to develop and use lower-cost technology to permit exploration and prospecting with a minimum of costly disturbance.

Environmental Rights

Environmental degradation can and does occur precisely because property rights to use the environment and the land are not clearly defined. The destruction of native forests, the pollution of Maori fishing grounds, the overgrazing of South Island alpine country and the destruction wrought by mining operations in the 19th century are attributable directly to the inadequate definition and allocation of

property rights. Without property rights, the use of the environment is costless, and there is no accountability to others for the external effects of individual actions. The rational pursuit of self-interest leads to outcomes that are efficient for individuals and firms, but which are harmful to society. If the rights to use the environment, to chop down native trees, to pollute fishing grounds, to graze animals in tussock country or to use land for toxic tailings had been defined, owned and traded, individuals and firms would bear the full costs of their environmentally degrading activities, and would take account of those costs in their land use decisions.

The present process of allocating Crown minerals attempts to trade off the environmental effects against the social and economic costs and benefits. The conditions on mineral licences impose implicit costs on mining companies that may be unrelated to the benefit of an improved environment. A requirement for water discharge of a certain quality imposes the cost of the water treatment on the user before discharge. This is also the implicit price of high water quality to the community. However, since the prices are implicit, there is simply no means of relating the benefits to the costs.

Environmental property rights with trade in permissible uses would result in an efficient and equitable use of the environment. The market in rights would allow the environment to be used in its most highly valued way, while the users would both enjoy the benefits and bear the full costs of that use.

The use of environmental property rights such as transferable discharge permits (TDPs) involves setting specific levels of sustainable environmental damage, and defining property rights in terms of units of those levels. They can be issued by an authority, and then traded for explicit prices that reflect both the value of a clean environment and the value of the facility to pollute. Users of the environment would have to buy the relevant property rights. Since the number of rights would be fixed, increased demand for rights would not increase the overall level of pollution but would increase the price of the rights. New users, or users requiring additional rights, would negotiate with existing owners.

The incentive for firms to seek technological advances for environmental enhancement is perhaps the major advantage of a system of environmental property rights. Lower-cost technological alternatives to environmental rights would simultaneously reduce the input costs of firms, increase their competitiveness, and would permit them to sell their existing rights. Firms therefore have twin incentives to reduce pollution. By explicitly pricing the use of environment,

property rights ensure that those costs enter the production decisions of firms. Firms can no longer enjoy the free, or underpriced, use of the resource, which would then be allocated more efficiently. The costs of using the environment would be neutral between uses and industries, and resources would be allocated between industries in a way that reflected the full costs of their use of the environment. At the same time, the firms would be continuously seeking innovations that would reduce the impact on the environment.

There are two fundamental issues in the implementation of environmental property rights: first, how to determine the minimum 'acceptable' level of pollution, and second, how to allocate initially the fixed number of permits, which limit pollution to that level (Newman & Rosenthal, 1983). Setting the minimum acceptable environmental standard may be similar to setting regulatory standards or performance criteria, and subject to the same difficulties of imperfect scientific knowledge, uncertainty as to the magnitude or incidence of the costs and benefits of abatement, and rent-seeking and conflicts of interest among regulators, polluters and environmental groups. The initial allocation of environmental rights must also be determined: their initial price; how they are to be allocated; the quantity to be allocated to each holder; and who those holders should be. Different systems of initial allocation are likely to have different distributional effects (Bromley, 1978; Izac, 1986).

Public participation in the use of environmental rights would involve the initial process of the setting of criteria or performance standards. Such public participation in the definition of environmental rights by local or regional bodies (probably with the assistance of national guidelines and expertise) would reflect local physical conditions and the preferences of the community. It would reduce the transaction costs of negotiating property rights between many individuals. However, rent dissipation in the formulation of property rights imposes costs that might, in some circumstances, outweigh the associated efficiency gains from their establishment (Anderson & Hill, 1983).

Many technical questions must be overcome before TDPs can be implemented, such as the unit of measure of the permits; the potential for collusive and strategic behaviour between traders and the size and composition of the market. Without specific consideration and resolution of these issues, the practical implementation of a system of environmental property rights may not result in the desired outcomes.

The implementation of environmental property rights is also likely to be hampered by institutional factors. Legislators and ad-

ministrators of legislation are far more likely to amend familiar existing policies than to submit them to radical and fundamental change. The potential benefits of a market system may be unrecognised or poorly understood, and hence there may be little pressure for innovative reform.

The adoption of a system of environmental property rights involves many theoretical and practical challenges. While they are likely to constitute a pollution policy to which to aspire, it is likely that policy formulation will take place in small, incremental steps, beginning with the present situation and gradually moving towards a market system.

Mineral Rights

Mineral rights could include rights of access, rights to explore, rights to prospect and rights to mine. The mineral rights themselves may be attenuated to some degree in order to limit the on-site external effects. Access, exploration, prospecting and mining would be negotiated to limit further the surface impact of those activities and compensate the landowner. Where there are many landowners, the transaction costs of negotiation with each one could be high. As a result a transaction-cost-economising agreement with groups of landowners would be likely to emerge, defining rights and setting compensation levels.

The inclusion of all stages of production in the mineral rights is explained by informational spillovers. Information gathered at the exploration and prospecting stages is costly to obtain and difficult to conceal from competitors. Not only can the information be gleaned by others, but the mere activities of firms can reveal valuable information. The current system of mineral licensing ensures that the returns to information can be appropriated through a system of priority rights to licences. An integrated system of rights would incorporate all the stages of mineral production from exploration to extraction, and thereby ensures that information can be appropriated.

Resource rents. Resource rents for minerals are the *in situ* value of the mineral rights, including the rights to explore, prospect, develop and extract the deposit. The Crown ownership of minerals gives governments the prerogative of extracting rents. Government mineral policies for Crown-owned mineral resources involve two primary and sometimes conflicting goals: equity and efficiency. The first is the maximisation of revenue to compensate the community for the use of its resource, subject to the avoidance of distortions in resource use. The second goal is the efficient allocation of resources, which will

serve to maximise national welfare.

The resource rent on a mineral deposit comprises the return to the resource itself (the true rent) and a return to the investment in information. Without information, a deposit may have a low value (the true rent alone). With increasing information, the value of the deposit increases, but this increase in value is a return to the information generated by the costly investment in exploration and prospecting. A resource rent is defined as the amount that a company would be willing to pay in order to bring the resource into production. This rent includes the return to knowledge at any stage. If the owner has no information about a deposit, then a resource rent payable to the owner at the pre-exploration stage would comprise only the true rent. If the owner also has information about a deposit then the resource rent also includes the return to the investment in information. The stage at which the resource rent is paid is immaterial, since the true return to the resource itself is not affected: only the return to information changes.

The resource rent may alternatively be conceived as the surplus profit that accrues to the enterprise over and above the minimum necessary to induce production. This minimum amount is the net rate of return below which investment would not occur. This minimum expected rate of return is the supply price of capital, and includes risk, uncertainty, cost considerations and the investor's attitudes to risk. The resource rent is the difference between that actual rate of return achieved by an enterprise and the minimum expected rate of return.

The pricing of mineral rights is currently being reviewed (Ministry of Energy, 1989a-d). The present licensing system results in the dissipation of the resource rent otherwise payable to the Crown. Mining companies face sovereign risk in their dealings with governments that collect resource rents. Revenue-maximising governments have both the incentives and the power to impose rent collection not in place at the start of a mineral lease or to adjust existing rents in their favour. This introduces uncertainty into the decision to mine, reducing mineral exploration, extraction and production activity. Fear of future taxation, however, may lead to excessive levels of activity in the present.

Resource rent taxes are different in principle from the taxes imposed on industries and individuals, such as company or income tax, to pay for government services. Resource rent taxes aim to compensate the government for the use of the publicly-owned asset (e.g. mineral deposits or fish). The collection of a resource rent is separate in function and form from general taxation.

The means of allocating and obtaining the resource rent are closely related. Market methods of allocation are associated with *ex ante* methods of collecting the rents, such as auctions with bonus bidding with cash or deferred payments, royalty, profit share, or work program bidding. *Ex ante* rents are those supernormal profits expected at the time when a firm seeks to explore for a particular mineral. Bureaucratic allocation, such as licensing, is associated with *ex post* methods of collecting the rents, such as royalties or the Resource Rent Tax. *Ex post* rents are the supernormal profits that occur on a developed deposit.

The criteria of equity and efficiency can best be met by an auction system in which bids are made for mineral rights. The rights could be sold outright, or they could be leased for a fixed period. Tradable mineral rights could be resold or sublet. They could be redefined by negotiation between the parties. A cash auction of mineral rights would reveal the exact amount of the resource rent. It would also include the return to the seller's investment in information about the deposit. A payment of this nature would be efficient, since it would not distort production decisions, and would be equitable, exactly compensating the seller for both the use of the resource and existing information about the deposit. Such auctions would also place those rights in the hands of the most efficient company.

The rent available on a proven resource is very different from that on an unknown deposit. The belief that an auction does not capture all the rent fails to make this distinction. There is always a temptation for the Crown as the owner to impose a royalty on a proven deposit subsequent to an auction, particularly if the development is judged to be very profitable. The amount bid for mineral rights, however, would be adjusted for this sovereign risk as well as for the probability of finding a commercial deposit and the riskiness of the market. An alternative is a combination of an *ex post* rent payment with a cash bid. In this case the amount bid *ex ante* is also adjusted by the expected *ex post* payments.

Ex post systems of resource rent collection are likely to be neither efficient nor equitable. Determining the exact amount of the rent is difficult and highly imperfect. The payment may distort production decisions, and may include some of the return to the investment in information. There is a trade-off between the amount of the rent collected and the efficiency losses that result from the collection of the rent. *Ex post* methods associated with bureaucratic allocation may not necessarily allocate those rights to the most efficient company.

The government also has an incentive to monitor the performance

of the mining company and the minerals market since the amount of the rent it collects will depend on both. It also has an interest in providing incentives for the mining company to develop the resource so as to maximise revenue, despite the distortionary effects. In addition, unlike a private contract, the government is not constrained to abide by its rent collection agreements, and further taxes can be implemented (Nellor, 1983).

Rent-seeking is endemic in any system of bureaucratic allocation of mineral rights, although it also occurs with work program bidding. Both those who wish to acquire the rights and those who grant them find opportunities for rent-seeking, which, since it dissipates the rent, reduces the return to the owner of the resource and distorts activities leads to outcomes that are neither equitable nor efficient.

Only the resource rent is available for distribution, since it is the value of the resource in excess of that required to induce production. Owners of other rights, such as land, have an incentive to bargain strategically with the mining company in order to capture some of the rent. However, the government as the resource owner also has an incentive to capture the rent. Competitive bidding between mining companies should ensure that the rights are sold to the company that has permitted the least amount to be captured by the other owners of rights. Mining companies themselves would thus have an incentive to minimise the prices paid to the other owners, through mechanisms such as options.

Mineral ownership. The inefficiencies of the present system of mineral ownership are attributed to the fact the bureaucrats have neither the incentives nor the mechanisms to make decisions that would result in a more efficient allocation of resources. Crown ownership of the mineral rights, without the means of trading those rights, results in an inefficient, non-market allocation that will always be less efficient than market allocation. If the Crown were free to trade in the rights, bureaucrats would be free to buy and sell rights so that they were used in their most highly valued way, maximising the return to their shareholders.

There are two fundamental reasons why it has been suggested that mineral ownership and land ownership should be combined. First, the decision to permit mining would be internal to the owner of both the rights. Following the initial allocation, the mineral title would be alienable, and separate title would diminish this advantage. Second, private ownership of the rights would necessarily be more efficient than Crown ownership (Ackroyd, 1987;1988a;1988b). However, vesting the existing landowners with the mineral rights

implies a transfer of a potentially valuable asset from the community to an individual. No private owner would give away potentially valuable mineral rights without receiving something in return.

Another option would be to sell mineral rights on the open market. This would not necessarily fulfil the goal of aligning mineral and land ownership under a single owner in the first instance. However, the outcomes are likely to be more efficient, as the rights would be bought by those who valued them most highly. The sale of mineral rights would be entirely in keeping with the property rights approach and the collection of resource rents by the Crown by auction. Mineral rights could thereafter be traded by private owners. This approach allows owners to be individuals, groups of landowners or tribal groups. Any system of mineral rights must face the practical question of how these are to be defined. Should they be related to the pattern of surface ownership, or should they be defined in terms of a geological entity? In the first case, the transaction costs of negotiating to purchase mineral rights over many small parcels of land may be substantial. In the second case, there may be incomplete information on which to base the initial definition of geological units. This need not be an insurmountable barrier. In fact, the efficient size, extent and type of rights would evolve over time in response to the needs of the market.

A final option would include the definition and sale of mineral rights to the highest bidder, with the area of the rights unrelated to surface title. The initial sale of mineral rights to large areas of land, such as those at present covered by an exploration licence, would overcome the problems of negotiating those rights with many owners. Much of the criticism associated with private ownership of mineral rights essentially stems, not from the private nature of ownership as such, but from the area of the mineral rights.

The sale of the rights to Crown-owned minerals at auction to the highest bidder would simultaneously be efficient, allocating minerals to their highest value use; and equitable, compensating society for the use of the communally-owned asset. It would achieve the efficiency gains generally associated with private ownership without the losses to the taxpayer possible with the vesting option; and it would enable the Crown to control the rate of depletion of the resource, selling mineral rights only where the private discount rate was equal to or less than the social discount rate.

Current consideration of the implications of the Treaty of Waitangi could result in the ratification of Maori ownership of mineral resources. Maori ownership, once established, would be no different from that of any other private mineral owner.

Chapter 5

Synopsis and Conclusion

NATIONAL welfare is maximised when resources are used efficiently; that is, in the way that yields the greatest value for all. These values need not be necessarily only monetary values. Achieving gains in efficiency is in no way incompatible with responsible stewardship of the environment, where the environment is judged to be valuable. The economic value placed on environmental attributes must be reflected in the decisions of economic agents. Present policies do not always fully reflect the value of the environment. In fact, most of the environmental damage done in the past has arisen precisely because the full costs of the use of the environment were not being borne by the users (land, water, soil, air etc.), despite the existence of 'wise use' resource policies. The extent of the damage has varied both across industries and through time.

Present policies, especially concerning the use of the environment, are far from neutral. Exploration, prospecting and mining are, through the licensing process, subject to a system of environmental scrutiny that is far more severe than that facing any other industry. Other uses of the environment, such as farming, roading and electricity generation, have arguably greater environmental impacts than does mining. Yet they face few environmental restrictions, and consequently impose significant environmental damage. This does not constitute a case for lowering the standards that mining must meet. It does demonstrate, however, that resource management can never be efficient or equitable while the central focus is on activities rather than impacts.

The present mineral licensing system is lengthy, costly, and inefficient. Bureaucratic and judicial decision-making results in inefficient and inequitable uses of the resources it purports to allocate wisely. External environmental effects remain despite government intervention, since the system does not ensure that those who damage the environment bear the costs as well as enjoy the benefits of their actions. Nor does it result in the efficient or equitable allocation of

mineral resources.

A system of environmental property rights applicable to all activities, including mining, offers many advantages compared to a regulatory system. The idea of private property rights in the use of the environment is relatively new, and challenges remain in the successful formulation and implementation of transferable permits. However, their potential to achieve a more efficient and equitable use of the environment indicates that future environmental policy is likely to move in the direction of marketable permits, with increasing reliance on market incentives for pollution control.

The separation of environmental controls from the allocation of mineral resources is fundamental to a neutral policy environment. With a uniform environmental policy, based on performance standards applicable to all activities, no further environmental protection from mining as such would be necessary. A monetary price for the rights to use the environment would ensure that those costs were borne by the beneficiaries. No bureaucratic or judicial process would be necessary to decide 'wisely' on the environmental use of activities. Instead, environmental considerations would automatically be incorporated into production decisions through the market mechanism.

The Resource Management Bill currently before Parliament does propose the separation of environmental controls from the allocation of minerals. This is an important and necessary first step in expanding the use of tradable property rights. However, the Bill continues to place undue reliance on the control of activities, while acknowledging the potential for greater use of performance standards to avoid unwanted outcomes.

Mineral rights are at present allocated on a first-come-first-served basis, a system that does not necessarily result in mineral licences going to the most efficient companies. Companies have strong incentives to expend real resources in competing for licences. These expenditures form part of the resource rent otherwise payable to the community as owners. In contrast, an auction of mineral rights would allocate them to those who valued the resource the most, and would compensate the owner for the sale of the asset.

Mineral resources are exhaustible and non-renewable. Any resource that is in fixed supply will give rise to a potential resource rent. This is the additional profit accruing from the exploitation of the resource over and above the full costs of production. These include the risk-adjusted returns on capital invested in exploration, prospecting, development, extraction, environmental protection, processing and marketing. The resource rent is the price that a mining company would

be prepared to pay for the rights to bring the resource into production. The resource owner is legitimately entitled to this true rent.

The value of the mineral estate is largely created through investment in exploration and prospecting which yields information about the location, nature and magnitude of deposits. The return to the investment in exploration and prospecting is the legitimate due of the investors. Where mining companies carry out exploration and prospecting for Crown-owned minerals, this return does not form part of the true resource rent payable to the Crown.

Ore bodies are location-specific and unknown. They must be discovered and proved before they acquire a value, and must be valued in order that rational judgments about the allocation of land to competing uses can be made. Access to land for exploration is an essential precondition for making rational land use decisions. The facility to evaluate minerals is necessary to reveal the values of alternative uses of land and permit its efficient allocation. Closure of land to exploration precludes access to information on which to base the allocation.

The price bid at auction is the true rent due to the owner of the resource for the use of the asset. All revenues (or losses) thereafter accrue to the mining company. No further amounts, such as royalties, should be payable. The payment may be a cash bid, or may be paid in several instalments. Competitive bidding equitably distributes the returns due to the owner of the resource (the true rent) and the return to exploration and prospecting. Competitive bidding allocates mineral rights efficiently to those who value them the most. A subsequent royalty levied on a successful development would be neither efficient nor equitable and would divert investment away from mining. It would represent a tax on the value of the asset created in large part by the investment in the risky process of exploration and prospecting.

Trade in private property rights to natural resources, including land, the environment and minerals, is likely to result in more efficient and equitable outcomes than the present bureaucratic and regulatory system. Property rights are created by negotiation, custom, legislation, regulation, and the courts. A major role for the government is to provide a framework in which these market forces can operate. There is scope for the government to extend the system of tradable property rights. Where the government itself owns the assets, more efficient allocation will generally follow where the government emulates the market rather than resorting to regulatory schemes.

Mineral rights to explore, prospect and mine can be defined and traded. A system of tradable mineral rights would permit minerals to

be efficiently allocated; would resolve conflicts between mining companies and landowners; and would compensate the community for the use of its assets through the resource rent. Continued Crown ownership of the minerals with the adoption of flexible mechanisms to allow bureaucrats to emulate the market could achieve these outcomes. The sale of Crown-owned mineral rights through the market also achieves the goal of private ownership without the potential equity problems associated with vesting landowners with mineral rights.

The use of tradable property rights would permit the Crown and local or regional government to act like any other resource owner, selling less valuable resources in order to acquire more valuable resources or to raise revenue for other purposes. This facility would apply to land rights (where the Crown owned the land); mineral rights (where the Crown owned the minerals); and environmental rights (where the local community 'owns' the local environment). Such a system would also facilitate flexible, responsible management by the Department of Conservation of its stewardship of Crown-owned land.

A system of tradable property rights explicitly allows for public participation where the preferences of individuals or groups can be met in the market. Individuals, firms, groups, communities and governments can express those preferences in the purchase of property rights. Negotiation and trade in property rights resolves conflicts. Trade permits the parties to an exchange to negotiate until a mutually satisfactory agreement is reached. The needs of future generations are explicitly met through the operation of the market. If property rights to any resource, including minerals, are considered to be more valuable (for both monetary or non-monetary values) in the future than in the present, they can be bought and conserved.

Property rights are crucial in determining incentives that govern individual decisions regarding resource use. Property rights are social constructs, emerging in response to the presence of externalities and evolving over time in response to society's needs. The definition, allocation and enforcement of property rights will therefore have a bearing on how a market operates, and on the level of efficiency it achieves in allocating resources. There is considerable scope for the definition and use of property rights to permit market forces to operate to allocate the resources of minerals and the environment efficiently. Increased reliance on economic incentives and the use of the market would represent a movement towards increased efficiency in the use of those resources.

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