mineral exploration in APEC economies

a framework for investment

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foreword

Asia Pacific Economic Cooperation (APEC) member economies are significant producers and consumers of mineral commodities and are among the major destinations for global mineral exploration expenditure. Of the global top ten destinations for mineral exploration expenditure in 2006, eight were APEC economies.

Investment in mineral exploration is required to maintain and expand the minerals sector. As well as prices and geological prospectivity, the decision to invest in mineral exploration is strongly influenced by the regulatory and institutional framework of an economy, as this determines the environment in which companies operate. While almost every economy has specific mining legislation, the regulatory and institutional frameworks for mineral exploration and extraction vary widely across APEC.

The study aims to contribute to mineral policy making in the region by analysing the existing regulatory and institutional frameworks for exploration, and recommending actions to facilitate ongoing investment in the sector.

The study was undertaken by ABARE for the APEC Energy Working Group.

Phillip Glyde
Executive Director

December 2007

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summary

- Asia Pacific Economic Cooperation (APEC) member economies are significant producers and consumers of mineral commodities and are among the major destinations for global mineral exploration expenditure. Between 1996 and 2006, APEC economies received more than two-thirds of global expenditure on mineral exploration.
- Development of mineral resources can be an important driver of economic growth. Investment in finding and gathering information about these resources – mineral exploration – is required in order to discover and develop mineral resources, and to maintain and expand the sector.
- While factors such as mineral prices may determine the global quantity of exploration expenditure, the destination of that expenditure is determined largely by geological prospectivity and the relative attractiveness of regulatory and institutional frameworks for mineral exploration and extraction.
- Given the current resource endowment of many APEC economies and the geological prospectivity of the region, there is significant potential for high levels of mineral exploration in APEC economies to continue. By providing an environment that encourages increased investment in mineral exploration in a sustainable manner, APEC economies will be able to take further advantage of mineral resources as a potential source of economic growth.
- The focus in the report is on high value globally traded mineral commodities relevant to the APEC region. These include metallic minerals, such as bauxite, alumina, aluminium, copper, gold, iron ore, lead, nickel, silver, tin and zinc. Diamonds and other gemstones, as well as energy commodities, including oil, coal and uranium, are not considered in this report.

mineral exploration process

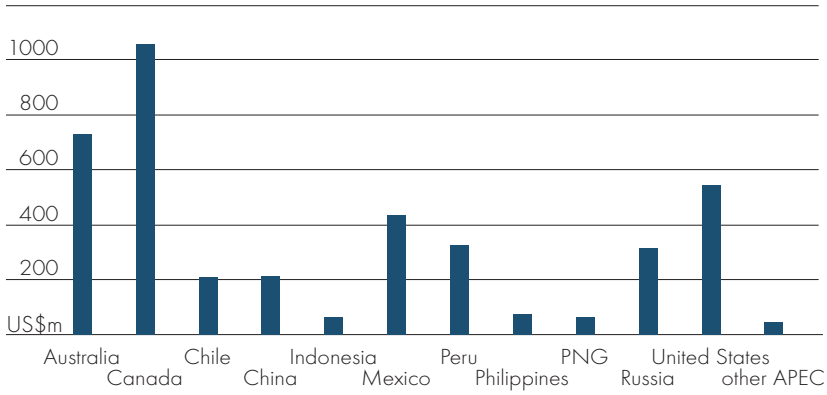
- Mineral exploration is the process by which companies or organisations find and compile information about mineral resources. Exploration covers activities from the preliminary collection of existing geological data through to drilling and sample assays.

- The results of exploration provide the information required to evaluate the potential profitability of developing or expanding mining operations at a particular site or area. However, as only a small proportion of investment in mineral exploration leads to the discovery of mineral deposits that can be economically developed, exploration is a risky activity.
- A number of factors play an important role in influencing mineral exploration expenditure. Typically, the most important factor underlying the funds available globally for mineral exploration is the prevailing price of mineral commodities. Higher prices tend to encourage exploration, while lower prices do the opposite.
- The geological prospectivity of a region plays a critical role in determining mineral exploration expenditure at the regional level. The higher the perceived chances of discovering mineral deposits that can be economically developed the more exploration expenditure that an economy is likely to receive. Governments have the ability to influence the perception of prospectivity through the collection and provision of precompetitive geoscientific information.
- Economy specific factors such as government policies and regulations, the transparency of approval processes, the perceived level of political risk, the availability of skilled geologists and service contractors, the quality of infrastructure, and environmental and social considerations are also important determinants of the direction of exploration expenditure.
- Mineral exploration companies may be unwilling to undertake mineral exploration in regions with high geological prospectivity during periods of high prices if other economy specific factors are considered to be unfavourable.

APEC minerals sector

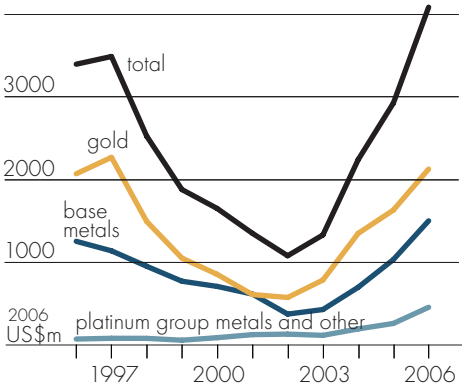
- APEC economies hold more than half of the world's copper, lead, nickel, silver, tin and zinc reserves. For example, the region accounts for 81 per cent of the world's tin reserves and 78 per cent of the world's copper reserves.
- Of the top ten destinations for mineral exploration expenditure in 2006, eight – Canada, Australia, the United States, Mexico, the Russian Federation, Peru, China and Chile – were APEC economies (figure A; MEG 2006).
- In 2006, mineral exploration expenditure on gold, base metals and other metallic minerals in APEC economies was US$4.1 billion, accounting for two-thirds of global expenditure. Gold and base metals, particularly copper, received the largest proportion of mineral exploration expenditure in 2006 (MEG 2006).

fig A **mineral exploration expenditure, APEC economies, 2006**



- The volume of exploration spending is closely related to mineral prices. Between 1997 and 2002, exploration spending declined by 69 per cent in real terms in line with lower prices of gold, copper, lead, nickel, zinc and others. However, as prices have increased since 2002, spending on mineral exploration has risen (figure B; MEG 2006).
- As with the overall level of exploration expenditure, spending on specific minerals is highly correlated with price. As the price of one metal increases relative to another, it receives a larger proportion of spending.
- Canada and Australia receive the highest proportion of mineral exploration expenditure in APEC, together accounting for 44 per cent of total APEC expenditure in 2006. Reflecting lower prices, exploration expenditure declined in all economies between 1997 and 2002. However, spending on exploration in most economies has since recovered. Canada, the

fig B **mineral exploration expenditure, by mineral** APEC economies



Russian Federation, China and Mexico have increased their shares of APEC mineral exploration expenditure over the past decade, while the shares of Australia, Indonesia and Chile have declined (MEG 2006).

frameworks for mineral exploration in APEC economies

» For most APEC economies, the basic framework for mineral exploration is provided by the applicable mining law and may be supplemented by other legislation and institutions. This framework is specific to each economy.

» Mineral exploration is also influenced by arrangements for mineral extraction – if the mining framework is unattractive then exploration has little value to a company. The framework for mineral exploration includes:

- ownership of mineral resources
- granting of licences to explore and mine
- financial arrangements for companies
- environmental requirements for projects
- other legislation affecting the minerals sector
- availability of useful and relevant geological information
- governance and perceived political risk
- transparency of arrangements
- quality and availability of appropriate infrastructure
- ability of companies to access capital.

» Geological information in APEC economies ranges from being available online at no cost in Canada, Australia, Mexico and Thailand to being available at a cost and only in hard copy in some other economies.

» Exploration licensing arrangements vary from being uncertain and sometimes seemingly arbitrary in some APEC economies to being transparent with clear outcomes that ensure mining rights if exploration is successful in others.

» Mineral royalties are imposed in nearly all APEC economies. The most common type of royalty used by APEC economies, and by most economies worldwide, is the ad valorem or value of production based royalty.

» Most APEC economies have few restrictions on foreign direct investment in the minerals sector. The Republic of Korea does not allow majority foreign ownership in the minerals sector and significant restrictions on foreign ownership exist in China and the Russian Federation.

case studies in mineral exploration frameworks

» A summary of some of the key elements of the mineral exploration framework in four case study economies – Australia, Indonesia, China and Peru – is provided in table A.

Australia

» Mineral exploration expenditure in Australia accounted for 18 per cent of total APEC expenditure in 2006 and increased in real terms by 128 per cent between 2002 and 2006 (MEG 2006).

» Australia has a very competitive regulatory environment that encourages mineral exploration. Areas where Australia rates well include:

- the provision of precompetitive geoscience information
- clear legislative and regulatory frameworks and
- security of tenure.

» However, some concerns have been raised around access to land, including issues related to native title and pastoral leases.

Indonesia

» Indonesia accounted for 2 per cent of APEC mineral exploration expenditure in 2006, and expenditure increased in real terms by 101 per cent between 2002 and 2006 (MEG 2006).

table A **key elements of the mineral exploration framework – case study economies**

	unrestricted access to geoscientific information	unrestricted foreign ownership	mining licence assured	environmental approvals required	royalties on minerals	exploration expenditure tax deductible
Australia	✓	✓	✓	✓	✓	✓
Indonesia	✓	✓	✓	✓	✓	✓
China	×	×	×	✓	✓	✓
Peru	✓	✓	✓	✓	✓	✓

Source: ABARE consultations and research.

- The contract of work system in Indonesia has been successful in encouraging mineral exploration because of:
  - the granting of conjunctive title to the contractor – this provides the right to perform consecutive activities from exploration to mine development, production, processing and marketing of the final product and
  - the granting of lex specialis status – this ensures that the contract is not subject to changes in government laws or policies after signing for the period that the contract is in force.
- However, some potential issues include:
  - uncertainty associated with the lengthy delay in passing of the new Mining Law
  - uncertain regulatory processes at the regional and district levels
  - access to land and compensation for use of protected land under the Forestry Law and
  - impacts of illegal small scale mining.

China

- Mineral exploration expenditure in China rose more than twenty-five fold in real terms between 2002 and 2006, albeit from a low base, to account for 5 per cent of total APEC expenditure in 2006 (MEG 2006).
- While exploration in China is largely undertaken by domestic companies or joint ventures, foreign investment in China's highly prospective western provinces is being promoted by the central government.
- Reflecting its early stage of development, the functionality of China's regulatory framework lags behind that of APEC economies with more developed minerals sectors. Some issues to consider include:
  - a lack of certainty and administrative transparency, particularly at the provincial level
  - restrictive licence conditions and
  - lack of consistency in approvals processes across different minerals and company structures.

Peru

» Peru accounted for 8 per cent of mineral exploration expenditure in APEC in 2006, and exploration expenditure in real terms increased by 182 per cent between 2002 and 2006 (MEG 2006).

» Recent reforms to mining laws and a stable investment environment have contributed to the recent growth in exploration expenditure in Peru. Positive factors include:

- good geological information
- clear processes and information for investors and
- a liberal foreign investment regime.

» The main potential barriers to investment in exploration and mining are generally social issues and relations with the community, with projects in Peru increasingly subject to disputes with local communities.

sustainable development and the minerals sector

» Sustainable development is an important consideration for the minerals sector, including at the exploration and planning stages of mineral projects. While mineral development may be advantageous to companies, local communities and an economy, it has also been associated with social and environmental problems in some instances.

» The exploration stage of a project is important as it is the first opportunity for companies to develop relationships with local communities. It provides a chance to identify potential social and environmental concerns that the community may have with any development and to establish ways to manage these issues.

» There is growing acceptance by companies that mining projects have economic, social and environmental impacts on the community and that there may be significant business advantages associated with early community engagement and sustainable development practices.

best practice principles

- A set of 'best practice principles' at the economywide and minerals sector levels is proposed to identify ways to improve incentives to invest and, consequently, ways in which investment in mineral exploration in APEC economies could be increased and the value of an economy's minerals wealth maximised (box 1).
- These principles take into account the different roles of government and the private sector in developing the minerals sector.
- These principles should only be taken as a guide to achieving best practice, as it is up to each economy to determine the importance it places on minerals investment, which policies to adopt, and how suited they are to the economy's stage of development and individual circumstances.

economywide recommendations

on governance — it is recommended that APEC economies:

- continue to invest in capacity building programs to strengthen the technical, regulatory, legal, commercial and administrative skills of public sector agencies involved in regulation of the minerals and other sectors.
- support capacity building at the local government level in terms of personnel, financial resource management, and intra and intergovernmental relationships.
- ensure enforcement and consistent application of regulations.
- deliver accountable, participative and results oriented governance outcomes in economies where significant policy reform initiatives are already in place.
- develop property rights that are clearly defined, actively enforced, and consistently applied throughout the economy.

on competitive neutrality — it is recommended that APEC economies:

- have a clear sense of direction, vision and purposeful commitment to ensure that fiscal and other economic conditions are equivalent across competing sectors, taking into account the role of government in specific aspects of the minerals sector (such as royalties).
- convey and demonstrate commitment to the community through targeted and sustained education programs designed to enhance the profile of the minerals sector in terms of its potential economic benefits and environmental performance.

box 1 **best practice principles for the APEC minerals sector**

The concept of best practice is the most efficient and effective way of ensuring that the minerals sector operates within a framework that is economically, environmentally, and socially sustainable. The implementation of best practice principles provides the foundation for improving the incentives to invest in mineral exploration in an economically, environmentally and socially sustainable manner. These principles are:

economywide

1 good governance that incorporates consistency, accountability and administrative capacity at all levels of government
2 competitive neutrality across all sectors of the economy
3 the facilitation of flexible business structures
4 a non restrictive foreign investment environment
5 a market free from barriers to trade
6 unrestricted access to domestic and global capital markets
7 adequate investment in infrastructure

minerals sector specific

8 the provision of basic up to date geoscientific information
9 optimal allocation of land, taking into account economic, environmental and social issues
10 clear, efficient and transparent licensing and approvals processes
11 security of tenure
12 internationally competitive taxation regimes
13 adequate supply of qualified professionals
14 appropriate and consistent environmental rules
15 effective stakeholder engagement and
16 optimal distribution of the benefits of resource development.

» minimise the involvement of state owned enterprises in the exploration, extraction and processing of minerals and remove any conflict of interest between the government as a regulator and developer of mineral resources, taking into account the role of government in the provision of basic geoscientific information.

on business formation – it is recommended that APEC economies:

» permit investors to form flexible corporate structures that enhance exploration and mining activity and do not inhibit investors from operating in a competitive market environment.

on foreign direct investment – it is recommended that APEC economies:

» remove restrictions on and actively promote foreign direct investment to facilitate further development of the minerals sector.

on trading rights – it is recommended that APEC economies:

» remove all barriers to trade affecting the minerals sector both directly and indirectly.

on access to finance – it is recommended that APEC economies:

» strengthen domestic capital markets through the provision of stable and unambiguous regulatory environments.

» remove any policies that restrict access to global financial markets.

on the quality of infrastructure – it is recommended that APEC economies:

» create and maintain an environment characterised by a liberal trade and investment regime and stable macroeconomic conditions, to ensure that they attract private provision of infrastructure services.

» reduce the commercial and political risks faced by potential investors.

» where capacity constraints or lack of infrastructure exist, identify and/or address the infrastructure needs of the industry and improve coordination along the supply chain.

» consider the role of government provision of infrastructure, particularly where market failure is impeding the development of the minerals sector, and take into account the net economic benefits of different policy options.

minerals sector recommendations

on geological information– it is recommended that APEC economies:

- provide basic, up to date geological information, geophysical data (such as aeromagnetic data) and topographical maps at a level of detail that enables potential investors to make informed assessments of mineral prospectivity.
- seek to develop and maintain national databases that catalogue all existing and historical exploration and mining activity as well as mineralisation and reserves/resources.
- when government resources are limited, explore the opportunities for partnerships with industry, academia and community organisations to provide geological information.
- generate support for collaborative research programs designed to add to the region's mineral reserves by developing ways of finding new ores and extracting currently uneconomic resources in a sustainable manner.
- investigate the potential for donor funding to improve the capacity of some APEC economies to collect, compile and disseminate geological information.
- encourage the accurate reporting of reserves against national or international reporting standards.

on land access – it is recommended that APEC economies:

- adopt a market based system for determining the optimal allocation of land resources in cases where property rights can be assigned to particular land uses.
- devote additional resources to the development of regulatory frameworks for allocating and securing property rights over land resources where property rights are not clearly defined.
- adopt transparent and consistent administrative processes and procedures to remove uncertainty over access to land resources in cases where property rights cannot be defined.
- ensure that these processes and procedures are flexible enough to allow new information on mining technologies, for example, as well as changes in economic factors, such as minerals prices, to be taken into account.

on regulatory certainty – it is recommended that APEC economies:

- ensure that the licensing process is clear, efficient and transparent, while acknowledging that improving regulatory certainty in the minerals sector requires an enhancement of both regulations themselves and institutions that carry out their implementation.
- pay attention to improving the clarity and broadening the scope of laws that are vague or incomplete.
- strengthen institutions to ensure that government agencies are consistent in their application of regulations, acknowledging that improving regulatory certainty in the minerals sector is closely linked to the broader issues of improving governance generally and reducing sovereign risk.
- provide clear information about existing regulations and procedures, including licensing processes, to potential investors in a readily accessible form.
- consider the establishment of a 'one stop shop' for minerals sector investment.
- consider the potential contribution of the private sector in identifying the weaknesses in existing regulations and procedures and in designing and delivering appropriate capacity building programs.

on security of tenure – it is recommended that APEC economies:

- ensure that the period of the licence is long enough to allow meaningful and constructive exploration activity to occur.
- ensure that licence conditions permit exploration activity that enables the mineral potential of the tenement to be adequately investigated, possibly through a variety of modern exploration techniques, such as exploratory drilling, trial mining, bulk sampling and aerial surveying.
- ensure that holders of exploration rights are given first right of refusal to mine any economic deposits found.
- ensure that the requirements for investors to proceed from an exploration licence to a mining licence are clear and transparent, to reduce the actual and perceived risks involved in allocating substantial capital resources at the high risk exploration stage.
- ensure that the existence of overlapping tenements is minimised or, if present, is able to be dealt with systematically and fairly.
- specify the conditions under which a title can be revoked.

- allow exploration and mining rights to cover multiple minerals, even if these minerals were not specifically factored into the initial project planning phase.
- ensure that mineral rights are exclusive, and transferable to other enterprises, provided that all technical, financial, environmental and other requirements are met.

on competitive taxation regimes – it is recommended that APEC economies:

- consider their minerals sector taxation regimes in comparison with those of economies with more established minerals sectors and economies that have had recent success in attracting substantial capital inflows to their minerals sector, taking into consideration that the mix of minerals produced, the degree of decentralisation and the level of economic development will affect the composition of mineral taxation regimes across economies.
- develop taxation regimes for the minerals sector that have a full understanding of the international context in which exploration and mining companies operate.
- given the cyclical nature of mineral markets, move toward the adoption of royalty arrangements that are linked to profitability.

on technical skills – it is recommended that APEC economies:

- seek to improve technical skills in geology, mine engineering, environmental sciences and other disciplines related to the mining sector through regional cooperation initiatives and public private sector partnerships.

on environmentally and socially sustainable mineral development – it is recommended that APEC economies:

- demonstrate their commitment and ability to set appropriate and reliable environmental rules, at acceptable international standards, and to monitor these standards in a credible manner.
- where legal and institutional settings are not in place, initiate a process of gradually establishing a legal basis for environmental regulation; basic institutional responsibilities; essential regulatory frameworks; monitoring and enforcement procedures, including public disclosure; and human and financial resources to address priority issues, taking into account that the methods employed for achieving environmental objectives will vary considerably on the basis of different local, natural, socioeconomic and cultural conditions.

- where legal and related institutional mechanisms are already in place, focus on the implementation of these frameworks and in finding pragmatic solutions that take into account resource and capacity constraints.
- work with the private sector to address the environmental liabilities that the mining sector has inherited from past operations.
- provide strong underlying regulatory regimes to encourage the development of, participation in, and continued evolution of effective voluntary initiatives.
- consider more explicitly the social impact of mining, particularly on local communities that rely on the natural environment for their livelihoods.

1

introduction

The APEC region has abundant mineral resources and is a world leader in minerals production and processing. Eight APEC member economies – Canada, Australia, the United States, Mexico, the Russian Federation, Peru, China and Chile – were in the top ten global destinations for mineral exploration expenditure in 2006. The region also has some of the world's most dynamic economies where there have been substantial increases in minerals consumption in recent years.

APEC economies have a diverse mix of mineral endowments as well as wide ranging economic and political structures. In terms of the minerals sector, APEC economies can be classified as:

- resource rich economies with mature minerals sectors – including Australia, Canada and the United States
- resource rich economies with underdeveloped minerals sectors – including Indonesia, the Philippines and the Russian Federation
- resource poor economies with limited or no minerals production – including Japan, the Republic of Korea and Singapore.

Mineral exploration is the process by which organisations invest in finding and gathering information about mineral deposits. Ongoing investment in exploration is required to develop and sustain the minerals sector. Exploration covers all activities from the initial collection of geological data to the completion of exploration and evaluation of the deposit if found, which usually involves drilling and analysis of samples. While this report focuses on exploration, the decision to explore will be heavily influenced by arrangements for mineral extraction, and any analysis of exploration prospects needs to consider all of these factors.

There is a wide range of factors that determine an economy's ability to attract investment in the minerals sector. Some factors are common to investment decisions across all sectors. Typically, these relate to the maturity and stability of the political, economic and legal systems in a host economy, and the availability of infrastructure. Other factors are more specific to the minerals sector and include geological potential or prospectivity, access to credible geoscientific information, security of tenure, taxation and royalty regimes, and access to technologies and skilled labour.

Environmental and social considerations also have a strong bearing on investment decisions pertaining to the minerals sector. In general the key determinant of mineral exploration investment is geological prospectivity, however, companies may be reluctant to invest if these other factors are not attractive.

Following a period of stagnation in the early part of this decade, investment in global mineral exploration has increased strongly in the past few years, led by APEC economies. In 2006, APEC economies accounted for two-thirds of global mineral exploration expenditure. The increase in exploration expenditure has followed a strong rise in minerals prices, which has been supported by rapid growth in demand, particularly in China. Despite the recent growth in exploration expenditure, it is recognised that more can be done in many APEC economies to facilitate ongoing investment and development in the minerals sector.

The specific objectives in this report are to:

- explain the key concepts and stages of mineral exploration, and identify the main factors that influence and impede investment in exploration
- provide an overview of the minerals sector and recent exploration trends in APEC economies
- review the regulatory and institutional frameworks governing mineral exploration in APEC economies, including a more detailed comparative analysis of these frameworks in four selected economies
- highlight some of the issues around sustainable development that are increasingly affecting exploration investment and
- provide a set of best practice principles and recommendations to secure and facilitate investment in mineral exploration in the APEC region.

The four economies chosen as case studies – Australia, Indonesia, China and Peru – are representative of the economic diversity across the APEC region, including the level of development of the minerals sector, as well as different institutional and policy settings.

The focus of the report is on high value globally traded metallic mineral commodities relevant to the APEC region. These include bauxite, alumina, aluminium, copper, gold, iron ore, lead, nickel, silver, tin and zinc. Non metallic minerals such as diamonds and other gemstones are not included in this report because of the limited availability of data. Energy commodities, including oil, coal and uranium, are also not included.

2

the mineral exploration process

Companies undertake mineral exploration to identify or delineate economic deposits of minerals for future extraction. Mineral exploration is the process undertaken by companies in the search for ore deposits. Exploration covers all activities from the initial collection of publicly available geological data to the evaluation of discovered deposits. The results of exploration provide information on the likely presence or absence of ore which might be mined. Only a very small percentage of exploration expenditure leads directly to the discovery of an economic ore body and the development of a mine, making exploration a risky activity.

Exploration activities can be categorised by the exploration stage at which they take place or by the degree of exploration that has previously taken place in the area. Expenditure is usually classified as either brownfield or greenfield exploration depending on whether it takes place in regions in which mining has previously taken place or not (box 2). Mineral exploration in greenfield areas is usually higher risk because there is no certainty that economic mineral deposits occur in the area – this can only be established through successful exploration and discovery. Despite its higher risk, exploration in greenfield areas can lead to the discovery of significant new mineral provinces containing one or more major deposits.

Exploration is an ongoing process. Expenditure on exploration represents investment in knowledge about the size, location and quality of mineral deposits or potential mineral deposits and is required to maintain the minerals industry. Exploration is important to both developing new mining operations and sustaining existing mines by replacing ore reserves as they are mined out (Hogan et al. 2002).

the decision to explore

Before physical mineral exploration takes place, companies must evaluate the expected value of exploration. Given that few exploratory projects lead to the discovery of ore bodies that are economically viable to extract, the decision to undertake or continue exploration requires that the expected benefits from collecting more information are greater than the expected costs.

The earliest stage of exploration involves selection of a prospective area in which to undertake further investigation. Information can be collected either indirectly by collating existing geological data and surveys and searching for characteristics common to other mineral deposits, or directly by analysing samples collected from outcropping deposits or core and chip samples from drilled holes that intersect mineralisation. Area selection is a critical step in exploration and, as a consequence, companies generally spend a great deal of time selecting the area(s) for more detailed exploration. A decision to initiate an exploration program or to

box 2 **key terms in mineral exploration**

brownfield
an area where mining is currently or has previously taken place

economic mineral resource
a mineral resource that is expected to be profitable to develop and generate net benefits if mined

geoscientific information
information regarding any of the earth sciences; in the minerals sector it usually refers to geological or geophysical information

grassroots
the very early stages of exploration to discover new mineral deposits

greenfield
an area where mining has not yet taken place (and which usually has no known mineral resources)

major, midsize, junior
the size of a company; categorised by the size of the market capitalisation of the company (the price of a share multiplied by the number of shares outstanding). Major companies are the largest, followed by midsize and then junior

precompetitive
prior to commercial involvement

prospectivity
the likelihood that a region houses substantial economic mineralisation

reserve; ore reserve
an economic asset; a statistically qualified resource. A reserve is a resource that has been more rigorously proven. It has a grade and tonnage

resource
an estimated mineral deposit. A resource will have an estimated grade and tonnage

proceed to the next stage of an existing program implies that the expected benefits of obtaining additional information outweigh the expected costs, taking into account the risks (Hogan et al. 2002).

Estimating the expected profitability of an investment in mineral exploration is particularly difficult because discoveries occur so infrequently. Usually, only a few exploration programs result in the discovery of economic mineral resources and even if a prospective deposit is discovered, there is still a high degree of uncertainty regarding the final size and grade of the deposit. The expected profitability of a project is affected by a range of factors, including mineral prices, the nature of the ore body, the metallurgy of the deposit, infrastructure requirements, taxes and royalties, mining costs, and the costs of mine development.

The key stages in mineral exploration and development are outlined in box 3 and figure 1.

box 3 **key stages in mineral exploration and development**

project generation – occurs once the decision to undertake private mineral exploration has been made. Companies collect publicly available maps, geoscientific information and previous exploration results. Once this information has been collated, a broad area for exploration is chosen (area selection), exploration licences are sought and the project progresses to the target definition stage.

target definition – involves private data collection by the company through a variety of investigations typically involving surveys. These can include new geophysical (for example, magnetic, gravity and/or electromagnetic) or geochemical surveys that are more detailed than those publicly available. Geophysical surveys are typically high resolution airborne surveys in the early stages of target generation but these may be supplemented by ground geophysical surveys, geological mapping, geochemical sampling and even reconnaissance drilling to collect geochemical samples. These surveys are aimed at generating targets for testing and evaluation.

Identified targets are tested by drilling, pitting, trenching and/or surface sampling as appropriate and samples undergo geochemical analysis and other tests to determine and delineate zones of likely mineralisation. This targeted exploration may identify zones of economic mineralisation. If an economic ore body is discovered at this stage, further drilling and sampling takes place to fully map and define the size, grade and geometry of the deposit. When this is completed, the project is evaluated.

continued...

box 3 **key stages in mineral exploration and development** *continued*

evaluation – involves reserve delineation, mine planning, metallurgical testing, feasibility or scoping studies and predevelopment planning, including financing and government approvals and an assessment of the least cost method of mining. The evaluation concludes with a decision of whether or not it is profitable to develop the ore body.

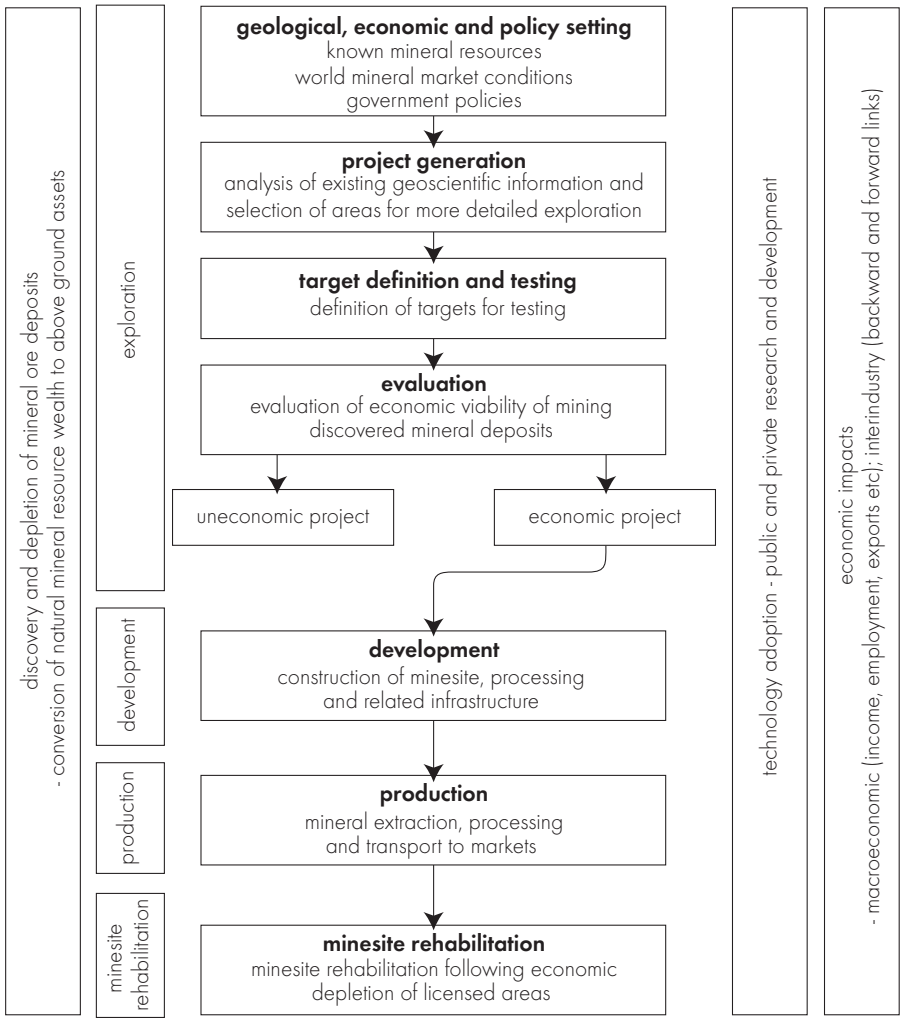
project development – involves the construction and development of the mine-site and related facilities. The requirements at this stage will be influenced by the availability and cost of infrastructure and services. Critical infrastructure and services include power, water and transport. Accommodation of workers close to the minesite is also an important consideration. Mining companies may choose to expand an existing town or urban centre where the mine is close enough for workers to commute. Where the minesite is more remote, a 'company town' may be established, or, in cases where establishing a town is not feasible, the company may provide temporary accommodation on site and run fly in fly out operations where workers commute long distance to the mine site on a roster. Long distance commuting has become more popular, particularly for remote projects, or where companies employ workers from one region to work in a neighbouring or close region.

extraction, processing and marketing – occurs as minerals production and processing progresses. Depending on the results of the evaluation, companies may choose to sell the extracted ores directly, undertake processing of ores into concentrates or process the ore to the metal cathode, ingot or basic form themselves. Mineral processing at or close to the minesite reduces transport costs, however, since final processing can be energy intensive, it may be more cost effective to locate the plants closer to other inputs such as electricity generators.

Further targets for exploration may be defined as mining takes place, resulting in primary exploration during production in order to increase the mine's resources and extend the life of the mine and processing facilities.

minesite rehabilitation – takes place once the ore body has been mined out and evaluation of further exploration has determined that further development is not possible or not economic. The strategy for rehabilitation might have been established at the evaluation stage or as part of the mine approval process. Alternatively, governments may have a defined strategy for rehabilitation. Whichever is the case, environmental restoration takes place depending on the nature of the mining operation (Hogan et al. 2002).

fig 1 **stages in mineral exploration and development**



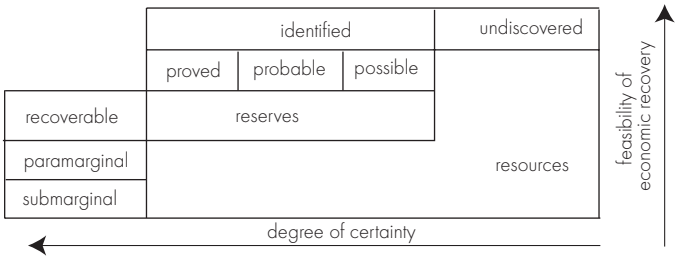
classification of mineral resources

Mineral classification takes place in order to differentiate known and recoverable resources from undiscovered and uneconomic resources (McKelvey 1972), and as such, any system of classification needs to take both economic and geological factors into consideration. Classification is therefore based on the degree of certainty of the existence of and the economic feasibility of recovering materials. The geological assessment takes the quantity (tonnage) and grade (chemical composition) of the resource into account while the economic assessment looks at recovery costs, commodity prices and time discount rates.

Most national classification systems are based on the McKelvey Box, which ranks resources from undiscovered, subeconomic resources to measured, economic resources and provides an indication of both surety of the existence of mineral deposits and the profitability of recovering the deposit (figure 2; box 4; McKelvey 1972).

However, companies are typically required to report under a commercial classification system. The Joint Ore Reserves Committee Code (JORC Code) is widely accepted internationally as a standard for professional reporting purposes (see the Australian case study in chapter 5 for further details). The JORC Code has been incorporated in the listing rules of the Australian and New Zealand Stock Exchanges, making compliance mandatory for listed companies in Australia and New Zealand. The JORC Code has also been used as a template for modern codes in other economies, including the recently revised Canadian reporting code, the United States, United Kingdom, South African and Chilean codes. The JORC Code is also being promoted as a potential model in emerging mining economies such as China. The modern codes, although based on the McKelvey

fig 2 **McKelvey Box**



box 4 **classification of mineral resources**

Geological classifications are made based on the level of certainty of the existence of resources:

undiscovered resources – presumed to exist based on geological theory and other knowledge.

speculative resources – those in known geological regions and conditions where no previous discoveries have been made.

hypothetical resources – those in areas with known geological characteristics or conditions where discoveries have been made before.

identified or discovered resources – may be inferred or possible if they are known to exist from specific geological evidence and the area in which they are located can be clearly described, even if little or no sampling has taken place.

Demonstrated resources fall into two categories:

measured or **proved resources** – have been measured from detailed onsite sampling.

indicated or **probable resources** – have been identified by less detailed sampling. No allowance is made for mineral deposits in unknown geological structures and conditions in undiscovered districts.

Economic classifications are made based on the profitability of recovering resources under current market and technological conditions:

economic or **recoverable resources** – can be feasibly recovered at current prices.

paramarginal resources – cannot be feasibly recovered at currently prevailing prices but could be at prices up to one and a half times those currently prevailing.

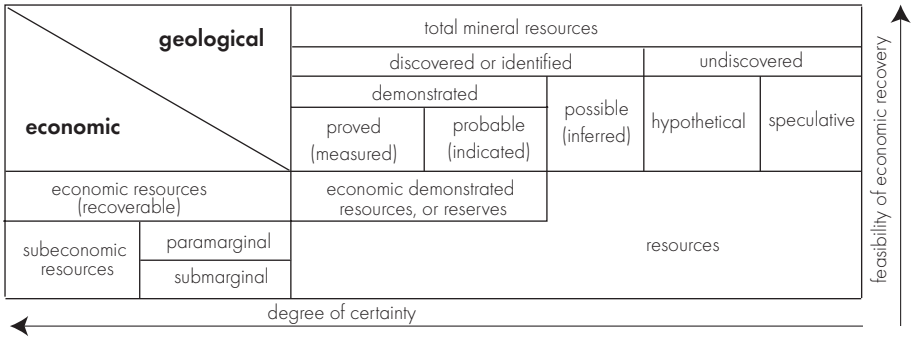
submarginal resources – not feasibly recoverable except at prices more than one and a half times those currently prevailing (Hogan et al. 2002).

Both technological changes that reduce the cost of extracting minerals and increases in prices can change the classification of resources in a relatively short period of time. In the past five years, the prices of many mineral commodities have increased dramatically. At the end of 2002, the copper price was under US$1550 a tonne and the nickel price was US$7100 a tonne. However, by the end of June 2007, their prices had increased approximately fivefold to US$7650 a tonne and US$35 850 a tonne respectively. Even ignoring any cost reductions to extraction from improvements to technology, copper and nickel resources that were paramarginal at the end of 2002 were recoverable at the end of June 2007, and some submarginal resources may even have been recoverable at those prices. High cost deposits, developed in times of high prices, usually close prematurely when prices begin to decline.

system, include important more rigorous definitions of categories of resources and require their certification by a 'competent person'.

Figure 2 (McKelvey 1972) is a reproduction of McKelvey's original classification system, while figure 3 (Hogan et al. 2002) incorporates a number of the other terms used to classify minerals.

fig 3 **mineral classification, based on the McKelvey Box**



factors that influence exploration expenditure

As mentioned earlier, a range of factors influence the benefits and costs, and therefore the expected profitability, of investing in mineral exploration. Some of these factors are common to investment decisions across all sectors of the economy. Typically these relate to the maturity and stability of the political, legal and economic systems. Other factors are more specific to the minerals sector, such as mineral prospectivity, royalty arrangements and security of tenure.

Investment in mineral exploration involves risk and, as a consequence, assessment and/or perceptions of risk determine where mineral exploration occurs. Risk includes the geological risk associated with the potential of a region to host an economic ore deposit and the risks associated with the exploration and development of that deposit that relate to the political, legal and economic systems. The level of expenditure on mineral exploration activity in an economy depends therefore on the assessment of these risk factors.

A survey of international mining companies undertaken by the United Nations identified mining companies' criteria for assessing investment conditions for exploration and mining (table 1). The major factors that influence exploration expenditure are outlined briefly below and discussed in relation to APEC member economies in chapter 4.

mineral prices

The prevailing price of mineral commodities is typically the most important factor underlying the overall level of expenditure in mineral exploration, as it influences a company's perceptions of the likely returns from conducting mineral exploration. In general, the level of exploration activity tends to lag commodity prices by around a year or more (Jaques and Huleatt 2005; USGS 2006) (figure 4; MEG 2006).

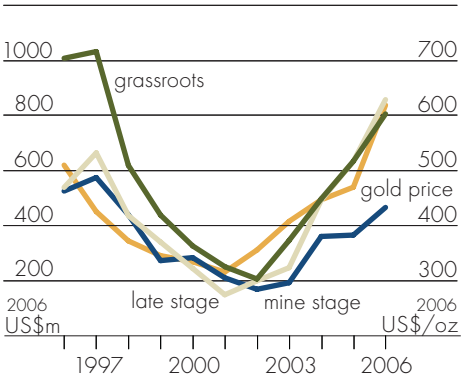
When mineral prices are low (in real terms) the internal cash flows of major mining companies are typically low and exploration expenditure by major companies is typically lower than when mineral prices are high. Further, because junior mining companies typically do not have a regular source of income they must finance their exploration activities by issuing shares. Mineral prices have a significant impact on the potential income of a mining venture and therefore also the desirability of owning shares in a company involved in a mining venture. As a result, the ability

table 1 **ranking of investment decision factors for exploration and mining**

	ranking (out of a total of 60 criteria)	
	exploration	**mining**
decision criteria		
geological potential for target mineral	1	–
security of tenure	2	1
ability to repatriate profits	3	2
measure of profitability	–	3
consistency and constancy of minerals policies	4	9
company has management control	5	7
minerals ownership	6	11
realistic foreign exchange regulations	7	6
stability of exploration/mining terms	8	4
ability to predetermine tax liability	9	5
ability to predetermine environmental obligations	10	8
stability of fiscal regime	11	10
ability to raise external financing	12	12
long term national stability	13	16
established minerals titles system	14	17
ability to apply geological assessment techniques	15	–
method and level of tax levies	16	13
import/export policies	17	15
majority equity ownership held by company	18	18
right to transfer ownership	19	21
internal (armed) conflicts	20	20
permitted external accounts	21	14
modern minerals legislation	22	19

Sources: Morgan (2002); Otto (1992).

fig 4 **gold price and exploration expenditure by stage** APEC economies



of junior companies to raise the capital necessary to conduct exploration is heavily influenced by prevailing mineral prices. Generally, when mineral prices are high junior mining companies will find it easier to raise capital as investors will anticipate greater returns from their investment.

During the period of low real mineral prices in 2001-02, it was difficult for junior exploration companies to obtain access to the capital necessary to fund exploration programs because of competition for capital from biotechnology, communications and information technology companies that offered relatively better prospects for capital growth (House of Representatives Standing Committee 2003). The increasing role of junior mining companies in driving global exploration expenditure in recent years is discussed in chapter 3.

economywide factors

governance

An important influence on exploration activity within a particular economy is the perceived degree of political risk in that economy (PricewaterhouseCoopers 2006a). Political risk is considered to be the risk that the government of a particular economy changes its policy or legislation. Historically, perceived political risk in an economy has had a large influence on the investment decision making of exploration companies. That is, for a given level of geological prospectivity, economies with lower perceived levels of political risk typically have had higher levels of exploration.

However, exploration activity is increasingly being conducted in regions or economies that have traditionally been perceived to have high levels of political risk (MEG 2006). These regions historically have had relatively less exploration activity and, as a result, they are often viewed as having a higher probability of hosting large scale mineral deposits.

Companies can minimise political risk by involving other investors who are unlikely to be expropriated, by conducting exploration in economies with lower political risk or by requiring a higher rate of return on an investment (Singer and Kouda 1999). Generally the higher the risk, political or otherwise, the more the exploration will target high value deposits (Peters 1969).

transparency

Exploration expenditure is likely to increase when regulations and procedures are clear, efficient, and transparent and when all levels of government are consistent in their application of regulations. Regardless of a government's policies and regulations, it is important that information on these is transparent. Increased transparency allows companies to make an informed judgment on conducting exploration in a jurisdiction.

competitive neutrality

The competitive neutrality of an economy, where government businesses do not benefit from advantages over private sector competitors because of their public sector ownership, can have a significant influence on minerals exploration. An uneven playing field, either actual or perceived, impedes the ability of private investors to invest in exploration activities.

business formation

Exploration expenditure is likely to increase when economies allow investors to form flexible corporate structures to suit the operating environment. The ability of private investors to invest in exploration activities is impeded when they cannot alter their business structure to suit their changing needs (for example joint ventures to share risk).

foreign direct investment

Foreign direct investment (FDI) is a category of international investment made by a resident entity in one economy with the objective of establishing a lasting interest in an enterprise resident in another economy. FDI by transnational mining companies can increase domestic investment by creating links with domestic firms. These links can facilitate the transfer of technology, assets and corporate knowledge to domestic firms, allowing them to become more productive. Restrictions to FDI will impede the ability of investors to explore for minerals.

trading rights

The minerals sector is trade focused. As such, general trade restrictions that affect the minerals sector will impede investment in mineral exploration and extraction. While it is understandable that governments wish to support value adding activities, it is unlikely to be in the best interest of the economy unless it is based on competitive advantage. In addition, any trade restrictions on the import of capital equipment required for mineral exploration is also likely to affect exploration expenditure.

quality of infrastructure

The existing infrastructure of a particular economy or region – such as water, electricity and roads – influences the level of exploration. Minerals are often found in remote or regional locations which cannot support a workforce. These areas generally have limited access to hospitals, schools, roads, airstrips, and other infrastructure. Inadequate infrastructure will typically increase the cost of developing a deposit and, therefore, reduce the expected profitability of the mine development, especially if the full development costs of transport, water, power, and housing are borne by the company developing the mineral. Similarly, a lack of basic infrastructure can impede access to exploration areas and increase the cost of conducting exploration.

access to finance

Mineral exploration is a risky and capital intensive activity. Large capital investments are usually required to find a mineral deposit which can be viably mined. However, the risk that a deposit will not be found is high enough such that companies often find it difficult to raise funds through debt financing. The majority of funds used for mineral exploration are raised on the Australian, London, Toronto or Johannesburg Stock Exchanges from the sale of shares. In economies where financial and capital markets are not well developed, investment in mineral exploration by smaller domestic companies is limited and any exploration is usually undertaken by foreign investors.

minerals sector specific

geological prospectivity and information

Geological prospectivity has a major influence on the level of exploration activity as it defines the likelihood that a company will discover an economic deposit.

The geological prospectivity of a region is determined by its geology and known mineral endowment. The geology determines whether any and what types of mineral deposit are likely to occur in any particular region. A lack of adequate geological information can result in a downgrading of assessments of a region's potential to host mineral deposits. Similarly, prospectivity can be enhanced by new discoveries of mineralisation.

In the minerals sector, transparency in minerals information is important. An essential element to increasing the transparency of minerals related information (such as geological information and statistical data) is the availability of a credible and publicly accessible geological database. This information will facilitate and promote private exploration in the minerals sector by reducing the costs and risks associated with mineral exploration (PMSEIC 2001).

government policies and regulation

A range of government policies and regulations are relevant to mineral exploration, from sector specific policies such as licensing, approval processes, royalties and other taxation, to broader policy processes such as microeconomic reform and macroeconomic policy settings (Hogan et al. 2002). For instance, exploration expenditure is likely to be enhanced by mineral taxation regimes that are simple, transparent, equitable, efficient and competitive. Mineral exploration is a high cost activity and the profitability of a project can be significantly influenced by a government's fiscal regime.

A high level of cooperation between government departments or the existence of a 'one stop shop' to manage the regulatory process can reduce the time required and cost of obtaining approvals, which may encourage mineral exploration in a jurisdiction.

availability of skilled geologists and exploration services

The availability of skilled geologists and individuals who can be employed to conduct mineral exploration and project evaluation will also influence the level of mineral exploration conducted. Further, the availability of drill rigs, assaying services and geophysical and remote sensing equipment can also influence the ability of companies to conduct exploration, particularly in geographically remote regions. Reduced availability of skilled labour and equipment is likely to result in an increase in the cost of exploration through greater expenditure and costs and inefficiencies associated with delays in obtaining critical skills and services.

improvements in exploration technology

The adoption of new or more advanced exploration technologies can have a significant influence on exploration activity by altering the expected profitability of investing in mineral exploration. More advanced exploration technology can increase the probability that major mineral deposits will be discovered and/or reduce the costs of exploration by allowing for the more rapid acquisition of data and accelerating the identification or sterilisation of exploration areas. Reducing the cost of exploration or increasing the likelihood of the success of mineral exploration results in an increase in the expected profitability of the exploration.

As ore bodies have become increasingly difficult to find, there has been a trend to a more integrated approach to discovery which employs several techniques (Blain 2000). Discovery of buried ore deposits requires a greater use of tools able to image and map the subsurface geology. New geoscience technologies have been developed to provide more information on subsurface geology. An example is the FALCON™ airborne gravity gradiometer system developed by BHP Billiton, that has allowed access to new terrains, faster target identification and better target screening (PMSEIC 2001). Other new exploration technologies include the TEMPEST airborne electromagnetic system and the GeoFerret deep penetrating ground geophysics system (GeoFerretTMEM Array) that is capable of identifying conductive structures under 400 metres of cover. These and other new technologies can significantly reduce the time and cost of identifying mineral deposits and improve the efficiency of exploration.

industry consolidation

Increasingly, major mining companies are conducting much of their exploration through strategic alliances and joint ventures with junior exploration companies. Consolidation in the minerals sector, through mergers and acquisitions, can have an adverse impact on exploration expenditure. Over the past few years large portions of an acquired organisation's exploration budgets have been reduced following an acquisition, as the surviving companies' budgets either remained the same as before the acquisition or were reduced (MEG 2007).

From 1997 to 2004, 55 large mining and exploration companies were acquired, erasing a cumulative US$555 million from global exploration budgets (table 2). Consolidation of major companies in 2000 and 2001 accounted for more than half of the decline in budgets over this period. In 2005, minerals sector consolidation increased significantly as companies attempted to replace depleted minerals

reserves through acquisitions. Despite this, the effect on 2006 exploration budgets was relatively small – the average decline in 2006 budgets was US$0.6 million by companies newly combined in 2005, compared with an average cut of US$10 million per merger or acquisition in the preceding eight years.

sustainable development considerations

Exploration expenditure is increasingly being affected by the application of sustainable development principles. In a number of economies, the legal right to explore or mine does not result in a community's consent for a project. If the local community is opposed to exploration or mineral extraction, then a project proponent will generally not gain access to the required land. As such, companies are placing greater emphasis on their 'social licence' to operate and are seeking alternative ways of gaining social acceptance of the minerals sector.

To do this companies are looking at ways to internalise the potential environmental and social costs of their activities. Community engagement is particularly important in the exploration stage as this is when the relationship between the community and mining company is first established and can set a precedent for future activities.

table 2 **effect of consolidation on exploration budgets in the year following an acquisition**

year of acquisition	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	total
	US$m	US$m	US$m	US$m	US$m	US$m	US$m	US$m	US$m	US$m	US$m
number of companies acquired with substantial budgets	7	9	7	9	9	7	3	4	16	24	95
acquired companies' total budgets in acquisition year	100.4	115.8	78.1	100.2	171.4	44.5	33.4	50.0	238.3	424.1	1 356.2
buyers' total budgets in acquisition year	293.8	298.1	341.3	448.1	249.7	74.7	66.5	51.8	545.7	453.9	2 823.6
combined budgets in all companies in acquisition year	394.2	413.9	419.4	548.3	421.1	119.2	99.9	101.8	784.0	878.0	4 179.8
merged companies total budgets in year following acquisition	304.8	346.8	371.5	406.9	281.6	113.0	86.9	51.0	775.3	na	2 737.8
decline in budgets by merged company	-89.4	-67.1	-47.9	-141.4	-139.5	-6.2	-13.0	-50.8	-8.7	na	-564.0

na Not available.
Source: MEG (2007).

Increased costs associated with consultations with all stakeholders and social and environmental impact assessments can increase the costs associated with minerals exploration. In some instances the higher costs of exploring in a particular area may exceed the expected benefit of mining and processing, and encourage companies to explore in other locations. However, the consultation process will become more efficient and less costly as industry demonstrates good outcomes, including establishing good will and quality assurance about commercial operations and environmental/social impacts.

3

overview of the APEC minerals sector

APEC economies are major producers and consumers of mineral commodities. The region accounts for a significant proportion of world production and consumption of bauxite, copper, gold, iron ore, lead, nickel, tin, silver and zinc.

The contribution of the minerals sector to the economy varies significantly across the APEC region, reflecting the large variation in the mineral prospectivity, and size and maturity of the minerals sector. The minerals sector makes a significant contribution to a number of the smaller APEC economies. For example, the minerals sector contributed around 19 per cent of Chile's gross domestic product (GDP) in 2004 (figure 5 and table 3).

In line with the evolution of economic structures toward the services sector as economies develop, the contribution of the minerals sector to GDP is generally lower in developed economies. Nonetheless, the minerals sector continues to contribute significantly to the Australian and Canadian economies (5 per cent and 4 per cent respectively in 2006).

fig 5 **contribution of mining sector to GDP**
selected APEC economies

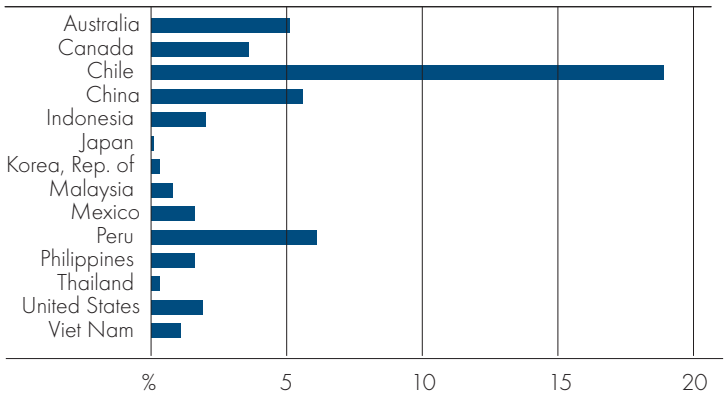


table 3 key economic indicators, 2006 – APEC economies

	area '000 sq km	population million	GDP US$b	GDP per person US$	mining sector contribution to GDP [a] %
Australia	7 692	20.7	755.6	36 546	5.1
Brunei Darussalam	6	0.4	11.4	30 298	na
Canada	9 971	32.6	1 269.1	38 951	3.6
Chile	757	16.4	145.2	8 864	18.9
China	9 561	1 314.1	2 630.1	2 001	5.6
Chinese Taipei	36	23.0	355.7	15 482	na
Hong Kong, China	1	6.9	189.5	27 466	na
Indonesia	1 905	222.1	364.2	1 640	2.0
Japan	378	127.7	4 367.5	34 188	0.1
Korea, Republic of	99	48.3	888.3	18 392	0.3
Malaysia	330	26.4	150.9	5 718	0.8
Mexico	1 958	104.1	840.0	8 066	1.6
New Zealand	271	4.1	103.4	24 943	na
Papua New Guinea	463	6.1	4.3	708	na
Peru	1 285	27.5	93.2	3 390	6.1
Philippines	300	87.0	116.9	1 345	1.6
Russian Federation	17 098	142.8	979.0	6 856	na
Singapore	1	4.4	132.2	29 917	na
Thailand	513	65.8	206.3	3 136	0.3
United States	9 364	299.7	13 244.6	44 190	1.9
Viet Nam	332	84.4	61.0	723	1.1

a May include oil, gas and coal extraction. Australia, Canada, the United States and Peru are for 2006; Indonesia and China are for 2005; Chile, Japan, Korea, Malaysia, Thailand and Viet Nam are for 2004; Mexico and the Philippines are for 2003. **na** Not available.
Sources: APEC (2007a) and data provided by individual APEC economies.

mineral reserves

The APEC region is endowed with a large volume and variety of metallic mineral resources. While reserves data are incomplete, it is evident that APEC economies account for an extensive share of world reserves. APEC accounts for more than half of the world's reserves of copper, lead, nickel, silver, tin and zinc (figure 6; USGS 2007a). A number of economies, including Australia, Canada, Chile, China, Indonesia, Malaysia, Peru, the Philippines, the Russian Federation and the United States, have significant economic reserves of mineral resources (table 4).

The lack of comprehensive and consistent data on reserves across APEC economies makes it challenging to provide definitive estimates for the region as a whole. Existing data suggest that, within APEC, Australia contains the largest reserves of bauxite, gold, lead, nickel, silver and zinc. Chile holds the largest copper reserves,

fig 6 **APEC share of world mineral reserves**

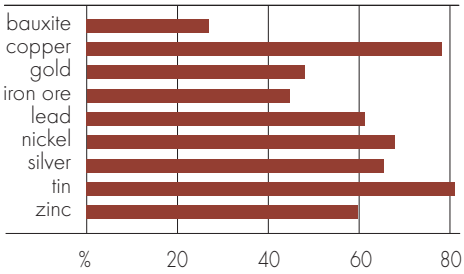


table 4 **mineral reserves** [ab] **– APEC economies**

	bauxite	copper	gold	iron ore	lead	nickel	silver	tin	zinc
	Mt	Mt	t	Mt	Mt	Mt	kt	Mt	Mt
Australia	5 800	24	5 000	15 000	15.0	24.0	31	0.15	33
Canada		9.0	1 300	1 700	2.0	4.9	16		11
Chile	×	150	×	×	×	×	×	×	×
China	700	26	1 200	21 000	11.0	1.1	26	1.7	33
Indonesia	5.7	35	1 800	×	×	3.2	5.9	0.8	×
Japan		×	×		×				×
Korea, Rep. of				×					
Malaysia	18	0.8	106	50				1.0	
Mexico		30	×	700	1.5		37		8.0
New Zealand			×	×					
Papua New Guinea		×	×						
Peru		30	3 500	×	3.5		36	0.71	16
Philippines	×	9.4	1 564	4.5	×	0.9			0.3
Russian Federation	200	20	3 000	25 000	×	6.6		0.3	×
Thailand				×	×			0.17	×
United States	20	35	2 700	6 900	8.1		25	0.02	30
Viet Nam	4.0	6.8	×	1 200	×	0.1		0.10	×
total APEC	6 748	376	20 170	71 555	41.1	41.0	177	4.95	131.3
total world	25 000	480	42 000	160 000	67	64	270	6.10	220
APEC share of world total (%)	27.0	78.3	48.0	44.7	61.3	63.6	65.5	81.1	59.7

a That part of the reserve base that can be economically extracted or produced at the time of determination. **b** For consistency reserves data are based on USGS data and may not reflect reserves reported by individual APEC economies. Where USGS data do not exist, information from individual APEC economies has been used. **×** Occurrence of resource, but no data available.

Sources: USGS (2007a) and data provided by individual APEC economies.

the Russian Federation has the largest iron ore reserves and China has the largest reserves of tin (table 5).

table 5 **world ranking, by size of mineral reserves**

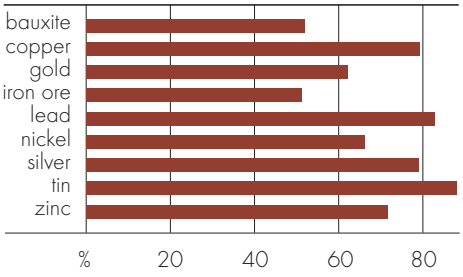
rank	bauxite	copper	gold	iron ore	lead	nickel	silver	tin	zinc
1	Guinea	Chile	South Africa	Ukraine	Australia	Australia	Poland	China	Australia
2	Australia	Australia	Australia	Russian Federation	China	Russian Federation	Australia	Malaysia	China
3	Jamaica	United, States Indonesia	Peru	Brazil	United States	Cuba	Mexico	Indonesia	United States, Kazakhstan
4	Brazil	Mexico, Peru, Poland	Russian Federation	China	Kazakhstan	Canada	Peru	Peru	Peru
5	India	China	United States	Australia	Peru	Brazil	China	Brazil	Canada

Source: USGS (2007a).

minerals production

Reflecting its large reserves, the APEC region accounts for a major share of the world's production of bauxite, copper, gold, iron ore, lead, nickel, tin, silver and zinc. In 2006, APEC economies accounted for more than 70 per cent of global production of tin, silver, zinc, lead and copper (figure 7).

fig 7 **APEC share of world mine production, 2006**



Major producers of minerals in APEC include Australia, Canada, Chile, China, Indonesia, the Russian Federation and the United States (table 6, 7). In 2006, the United States, China and Australia were APEC's largest producers of gold, together accounting for 30 per cent of global gold mine production. Chile was the world's largest producer of copper,

accounting for 35 per cent of global mine production. China was the world's largest producer of lead and zinc (36 per cent and 27 per cent of global mine production, respectively), while the Russian Federation was the world's largest producer of nickel (19 per cent of global mine production). Peru was the world's largest producer of silver, accounting for 17 per cent of global mine production. Indonesia and China were the largest producers of tin, accounting for almost 72 per cent of global mine production. Australia was the world's largest producer of bauxite, and APEC's largest producer of iron ore.

table 6 **minerals (mine) production, 2006 – APEC economies**

	bauxite kt	copper kt	gold t	iron ore Mt	lead kt	nickel kt	silver t	tin kt	zinc kt
Australia	68 292	875	245	275	621	185	1 729	2	1 338
Canada	0	607	104	34	82	234	970	0	638
Chile	0	5 361	41	8	0	0	1 602	0	32
China	23 000	755	247	276	1 251	69	2 345	114	2 837
Indonesia	10 500	817	114	0	0	150	239	118	0
Japan	0	0	9	0	1	0	12	0	7
Korea, Rep. of	0	0	0	0	0	0	0	0	0
Malaysia	5	0	5	1	0	0	0	2	0
Mexico	0	334	38	11	120	0	2 998	0	432
New Zealand	0	0	10	2	0	0	44	0	0
Papua New Guinea	0	194	60	0	0	0	50	0	0
Peru	0	1 050	203	8	313	0	3 471	39	1 202
Philippines	0	18	30	0	0	59	25	0	3
Russian Federation	6 399	779	173	104	34	277	1 232	5	178
Thailand	0	0	4	1	0	0	16	0	42
United States	221	1 220	252	53	435	0	1 141	0	727
Viet Nam	0	11	3	1	0	0	0	5	45
other APEC	0	0	0	0	0	0	0	0	0
APEC total	108 417	12 021	1 538	774	2 857	974	15 874	285	7 481
world total	209 045	15 167	2 471	1 483	3 446	1 474	20 096	324	10 427
APEC share of world total (%)	51.9	79.3	62.2	52.2	82.9	66.1	79.0	88.0	71.7

Sources: WBMS (2007); GFMS (2007); INSG (2007); ILZSG (2007); King (2007); UNCTAD (2007); Silver Institute (2007); ABARE estimates.

World minerals production has increased over the past ten years, in line with rising global demand for minerals (figure 8). Growth in minerals production has been more rapid since 2002, because of accelerating demand within economies such as China and India. Nickel production has increased in Asia and north America, particularly Indonesia and Canada, stimulated by strong global demand for stainless steel and copper nickel alloys. Zinc mine production growth has ben driven by increases in the use of galvanised steel in the automotive and housing construction industries in developed economies, and more recently in China. Copper mine production has grown as a result of the development of new mines in Chile and Peru, in response to strong demand for copper in Chinese infrastructure development, housing construction and the expansion of electricity grids. Tin mine production has also accelerated in recent

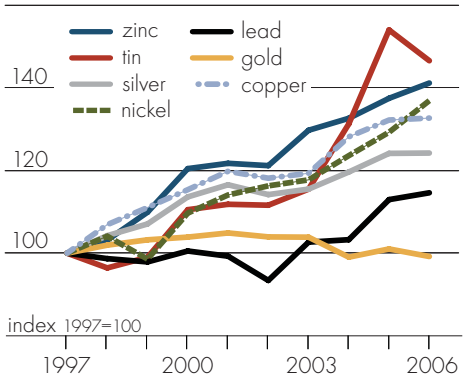
table 7 **minerals (refined) production, 2006 – APEC economies**

	alumina	aluminium [a]	copper	lead	nickel	tin	zinc
	kt	kt	kt	kt	kt	kt	kt
Australia	18 341	1 932	429	241	114	1	466
Canada	1 225	3 051	501	250	154	0	824
Chile	0	0	2 811	0	0	0	0
China	12 918	9 349	2 999	2 680	137	129	3 207
Chinese Taipei	0	0	0	54	0	0	0
Indonesia	0	250	218	18	15	77	0
Japan	14	6	1 532	280	153	1	614
Korea, Rep. of	0	0	576	240	0	0	667
Malaysia	0	0	0	44	0	23	0
Mexico	0	0	351	255	0	0	285
New Zealand	0	338	0	7	0	0	0
Peru	0	0	508	120	0	41	175
Philippines	0	0	181	30	0	0	0
Russian Federation	2 802	3 718	959	80	277	5	230
Singapore	0	0	0	0	0	9	0
Thailand	0	0	36	61	0	26	84
United States	4 704	2 281	1 250	1 297	0	0	248
Viet Nam	0	0	0	0	0	2	12
other APEC	0	0	0	0	0	0	0
APEC total	40 004	20 925	12 351	5 657	850	314	6 812
world total	68 437	33 967	17 328	7 914	1 350	350	10 677
APEC share of world total (%)	58.5	61.6	71.3	71.5	63.4	89.7	63.8

a Smelted.
Sources: WBMS (2007); GFMS (2007); INSG (2007); ILZSG (2007); King (2007); ABARE estimates.

years, largely in response to Chinese manufacturing of electrical items and the banning of lead for use in solder in the European Union.

fig 8 **world minerals (mine) production**

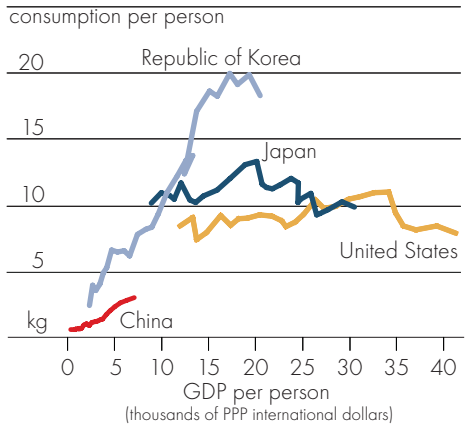


In contrast, gold production has remained constant since 1996, largely as a result of a lack of discoveries of high grade deposits. A substantial decline in South African gold production was offset by increases in Peru, Argentina, Indonesia, China and the Russian Federation. While Chinese lead production has grown strongly since 2002, world lead production has been relatively constant since 1996, with safety concerns resulting in a substitution away from the use of lead in manufacturing.

minerals consumption

Over the past decade, expansion of the minerals intensive construction and manufacturing sectors, the development of energy and transport infrastructure, rising household incomes and the associated rise in demand for consumer durables (such as motor vehicles, white goods and home electronics) have been key drivers of minerals consumption growth. During this time, strong economic growth in APEC economies, particularly in less developed economies with traditionally low per person minerals consumption (figure 9), has resulted in a significant increase in the global and regional consumption of mineral commodities.

fig 9 **copper intensity of use 1980–2005**
selected APEC economies



The distribution of minerals consumption in APEC economies

is largely independent of the pattern of minerals production. Instead, minerals consumption is related to the structure of economic activity, particularly the significance of the construction, manufacturing and minerals processing sectors. The majority of minerals produced in APEC economies such as Australia, Chile, Peru, Papua New Guinea and Indonesia are exported for consumption or further processing in other markets in APEC and beyond. Conversely, minor mineral producers, such as Japan, Chinese Taipei and the Republic of Korea are major consumers of mineral commodities (table 8).

table 8 minerals (refined) consumption, 2006 – APEC economies

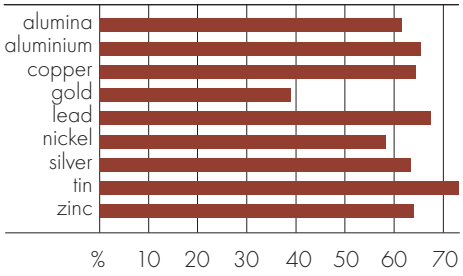
	alumina	aluminium	copper	gold	lead	nickel	silver	tin	zinc
	kt	kt	kt	t	kt	kt	t	kt	kt
Australia	3 767	312	144	10	27	3	134	1	255
Canada	5 950	846	302	22	41	9	184	4	181
Chile	0	21	111	4	2	0	12	1	11
China	18 231	8 648	3 610	269	2 179	255	2 103	115	3 200
Chinese Taipei	0	422	643	31	135	88	398	18	282
Hong Kong, China	0	30	5	13	0	5	118	2	5
Indonesia	488	288	185	65	80	0	177	2	74
Japan	12	2 323	1 282	175	303	183	4 264	39	594
Korea, Rep. of	0	1 153	828	77	337	93	650	17	534
Malaysia	0	193	224	58	90	0	22	4	68
Mexico	0	164	335	27	273	3	585	3	250
New Zealand	659	62	0	0	2	0	0	0	14
Peru	0	0	55	4	11	0	22	0	69
Philippines	0	26	34	3	33	0	0	0	13
Russian Federation	7 250	1 047	792	65	80	27	964	5	181
Singapore	0	60	10	27	14	0	0	2	17
Thailand	0	407	254	52	141	3	1 151	5	104
United States	4 448	6 150	2 130	213	1 608	145	5 779	47	1 168
Viet Nam	0	88	74	23	18	0	34	2	50
other APEC	0	0	0	0	0	0	0	0	0
APEC total	40 805	22 240	11 018	1 138	5 374	814	16 597	267	7 070
world total	66 227	33 970	17 147	2 919	7 976	1 396	26 142	365	11 064
APEC share of world total (%)	61.6	65.5	64.3	39.0	67.4	58.3	63.5	73.2	63.9

Sources: WBMS (2007); GFMS (2007); INSG (2007); ILZSG (2007); King (2007); Silver Institute (2007); ABARE estimates.

There is substantial mineral processing capacity within the APEC region, including economies with minimal resources such as Japan (copper and zinc), the Republic of Korea (copper and lead), and Thailand (zinc). China is the largest producer of refined metal in APEC, including aluminium, copper, zinc and lead. Mineral processing also occurs in mineral resource rich economies such as Australia (alumina), Canada (aluminium and zinc), the Russian Federation (nickel), and the United States (lead).

In 2006, the APEC region accounted for more than 60 per cent of global consumption of alumina, aluminium, tin, copper, lead, silver and zinc (figure 10). Within APEC, the United States, China and Japan were the largest consumers of minerals. China, in particular, has become a major consumer of minerals such as copper, lead and zinc, reflecting its rapid economic growth and the associated increase in manufacturing and construction. Over the past decade, growth in metals consumption in APEC, such as aluminium (figure 11), has been driven primarily by China, as well as the Russian Federation, Indonesia and Mexico. In contrast, minerals consumption growth in developed economies such as Australia, Canada, Japan and the United States has been relatively flat.

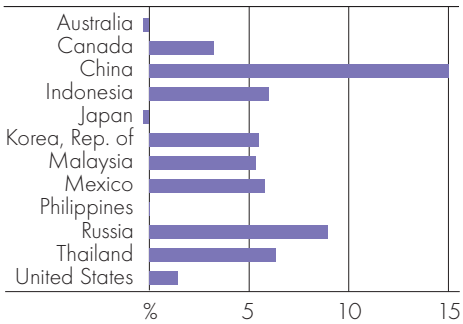
fig 10 **APEC share of world minerals (refined) consumption, 2006**



minerals trade

The APEC region is a significant exporter of a wide range of mineral commodities (table 9). In 2006, the region accounted for more than 80 per cent of global exports of refined tin and copper ores and concentrates, over 70 per cent of zinc ores and concentrates, and almost 70 per cent of refined copper, lead and nickel. A number of APEC economies export the majority of their minerals production. For example, in 2006, Australia exported over 90

fig 11 **aluminium consumption**
annual average growth 1996–2006
selected APEC economies



per cent of its production of iron ore and refined lead, while Indonesia exported more than half of its refined copper production.

A significant proportion of minerals exports from APEC economies are destined for markets in the APEC region. For example, in 2006, almost 90 per cent of China's exports of refined lead and 42 per cent of Chile's exports of refined copper were destined for APEC economies.

table 9 **exports of minerals, 2006 – APEC economies**

	aluminium a	copper		iron ore	lead		nickel	tin	zinc	
		ores and concentrates	refined		ores and concentrates	refined	refined	refined	ores and concentrates	refined
	kt	kt	kt	Mt	kt	kt	kt	kt	kt	kt
Australia	1 624	394	287	247	280	218	73	0	886	357
Canada	2 360	231	280	28	0	184	143	0	109	631
Chile	0	2 171	2 606	6	0	0	0	0	0	0
China	1 213	0	243	0	0	538	24	20	0	325
Chinese Taipei	118	0	0	0	0	20	0	0	0	0
Hong Kong, China	80	0	21	0	0	21	13	3	0	0
Indonesia	186	583	111	2	0	0	0	113	0	0
Japan	24	0	320	0	0	4	2	0	0	73
Korea, Rep. of	51	0	144	0	0	26	14	1	0	215
Malaysia	0	0	0	0	0	0	0	19	0	0
Mexico	22	28	62	1	0	22	0	0	139	148
New Zealand	309	0	0	1	0	0	0	0	0	0
Papua New Guinea	0	174	0	0	0	0	0	0	0	0
Peru	0	462	449	7	209	117	0	30	920	106
Philippines	0	15	177	6	0	0	0	0	0	0
Russian Federation b	3 183	0	268	23	33	0	245	0	8	75
Singapore c	107	0	94	0	0	52	0	55	0	0
Thailand	11	0	0	0	0	0	0	20	0	0
United States	420	383	124	8	0	53	3	5	827	0
other APEC	0	0	0	0	0	0	0	0	0	0
APEC total	9 708	4 441	5 190	329	522	1 255	527	266	2 889	1 932
world total	17 736	5 106	7 478	787	837	1 870	757	330	4 041	3 715
APEC share of world total (%)	54.7	87.0	69.4	41.8	62.4	67.1	69.6	80.6	71.5	52.0

a Unwrought aluminium and aluminium alloys. **b** nickel exports for 2004. **c** lead exports for 2005.
Sources: WBMS (2007); GFMS (2007); INSG (2007); ILZSG (2007); King (2007); UNCTAD (2007); ABARE estimates.

Within APEC, Japan, the Republic of Korea and the United States are major importers of mineral commodities (table 10). China has emerged as an important market for mineral commodities over the past decade. Despite its significant production of iron ore, China is now the world's largest importer of iron ore, with imports increasing from 44 million tonnes in 1996 to 326 million tonnes in 2006. China also imports significant volumes of refined copper and nickel.

table 10 **imports of minerals, 2006 – APEC economies**

	aluminium [a]	copper		iron ore	lead		nickel	tin	zinc	
		ores and concentrates	refined		ores and concentrates	refined	refined	refined	ores and concentrates	refined
	kt	kt	kt	Mt	kt	kt	kt	kt	kt	kt
Australia	5	0	1	2	0	0	89	0	0	0
Canada	155	106	59	8	38	4	3	4	278	0
Chile	0	29	0	0	0	0	0	0	0	0
China	512	908	827	326	662	0	101	0	0	318
Chinese Taipei	540	0	647	15	0	101	53	18	0	286
Hong Kong, China	115	0	37	0	0	23	22	8	0	25
Indonesia	156	0	18	2	0	61	0	0	0	74
Japan	3 036	1 327	75	134	94	32	57	37	595	41
Korea. Rep. of	1 204	364	380	44	145	121	37	17	654	60
Malaysia	0	0	186	2	0	44	0	0	0	56
Mexico	440	23	46	4	21	0	2	3	0	0
New Zealand [b]	17	0	0	0	0	0	0	0	0	14
Philippines	0	127	7	3	0	3	0	0	0	13
Russian Federation [c]	15	19	2	11	0	22	2	0	35	0
Singapore [d]	293	0	110	0	0	50	9	58	0	12
Thailand	418	3	268	0	0	81	0	0	51	23
United States	3 461	0	1 076	11	0	333	133	43	203	895
other APEC	0	0	0	0	0	0	0	0	0	0
APEC total	10 367	2 906	3 739	562	960	875	508	188	1 816	1 817
world total	19 252	4 614	6 891	765	1 271	1 730	860	260	4 342	3 399
APEC share of world total (%)	53.8	63.0	54.3	73.5	75.5	50.6	59.1	72.3	41.8	53.5

a Unwrought aluminium and aluminium alloys. **b** nickel exports for 2004. **c** nickel and refined zinc exports for 2005. **d** lead exports for 2005.
Sources: WBMS (2007); GFMS (2007); INSG (2007); ILZSG (2007); King (2007); UNCTAD (2007); ABARE estimates.

mineral exploration trends in APEC

The analysis of exploration expenditure trends in APEC economies in this report is based on data from the Metals Economics Group (MEG 2006) survey of mining companies. The MEG data classification system for exploration budgets is described in box 5.

box 5 MEG classification of exploration budgets by mineral and stage of development

The MEG data refer to exploration budgets. In this study, exploration budgets are used as an estimate for exploration expenditure.

mineral

gold – primary gold prospects (for coproduct projects the allocation is split proportionally between products).

base metals – primary copper, zinc, lead, or nickel prospects, including polymetallic prospects, and those where gold is a significant but not the primary economic mineral.

platinum group metals – primary platinum group metal prospects, which include platinum and palladium.

other – all other minerals, such as silver, cobalt, molybdenum, mineral sands, tin, and some industrial minerals.

stage of development

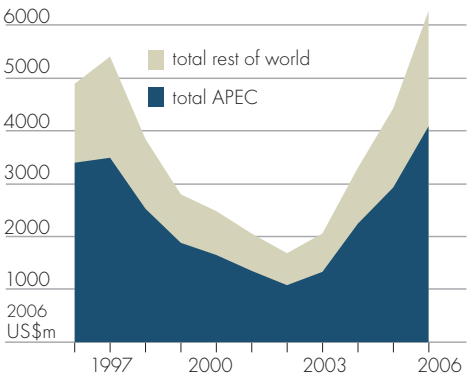
grassroots – exploration from the earliest stage through perimeter drilling to the quantification of initial resources; also includes reconnaissance and evaluation forays.

late stage and feasibility – exploration to further quantify and define a previously identified ore body once the target outline stage has been completed. Also includes all feasibility work up to the point of a production decision.

mine site – all exploration (regardless of stage) that is at or immediately around an existing mine site held by the organisation, including the search for satellite ore bodies that, if found, would feed an existing mine. Also includes exploration at or immediately around a project that has been committed to development (MEG 2006).

Within the APEC region, there are a number of areas with high mineral prospectivity. Many APEC economies have a low perceived investment risk which has encouraged exploration activity and mineral investment. According to the latest survey of mining companies undertaken by the Fraser Institute (2007), the United States, Canada, Australia, Mexico and Chile are regarded as being in the top ten investment destinations based on geological potential and existing regulatory regimes. Reflecting this, there has been considerable mineral exploration expenditure in APEC economies in recent years. During the period 1996–2006, more than 60 per cent of global mineral exploration expenditure was accounted for by APEC economies (MEG 2006; figure 12).

fig 12 **world mineral exploration expenditure**



Exploration expenditure for 2006 in APEC was US$4.1 billion. Among APEC economies, mineral exploration expenditure in 2006 was largest in Canada and Australia, followed by the United States, Mexico, Peru, the Russian Federation, China and Chile (MEG 2006; figure 13).

fig 13 **mineral exploration expenditure, 2006**
APEC economies

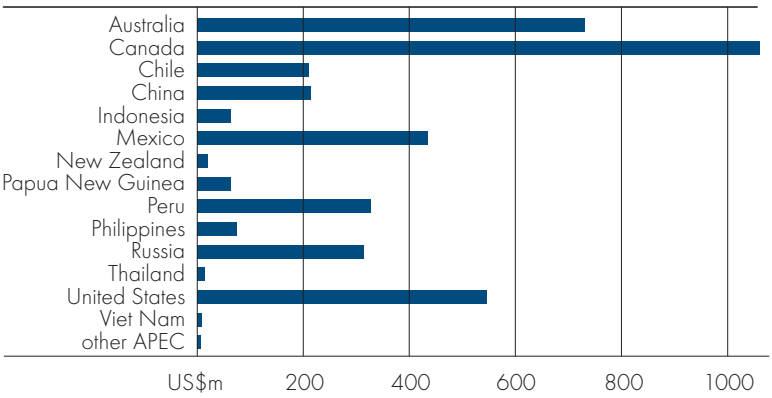
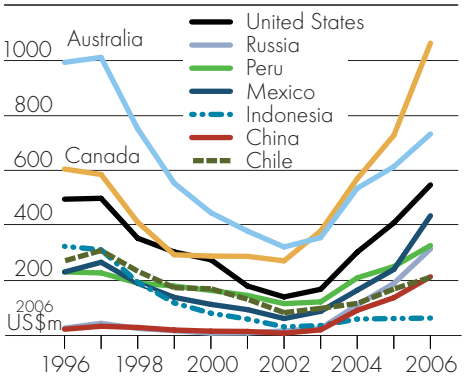


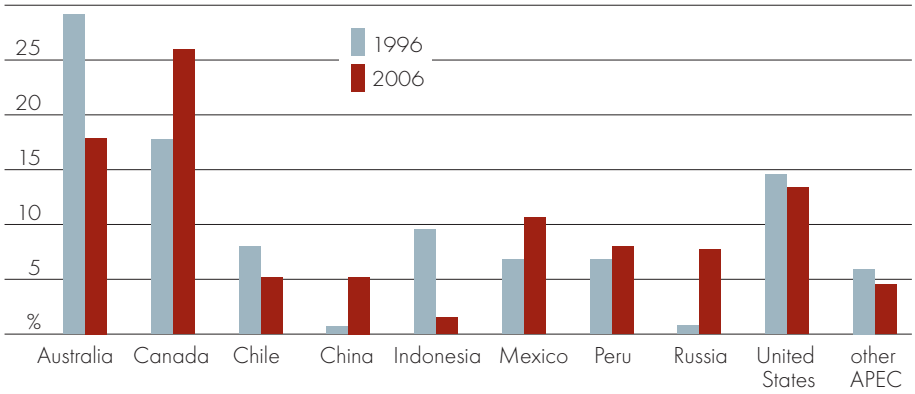
fig 14 **mineral exploration expenditure**
selected APEC economies



Most APEC economies have experienced a pattern of investment in mineral exploration similar to that observed globally, with recent strong growth in expenditure following a period of low activity during the late 1990s and early 2000s. In Canada and Australia, exploration expenditure increased by 292 per cent and 128 per cent respectively between 2002 and 2006. (MEG 2006; figure 14). Developing APEC economies are assuming a greater proportion of overall exploration expenditure (MEG 2006; figure 15). The Russian Federation increased its share of APEC expenditure from 1 per cent in 1996 to 8 per cent in 2006, while China increased from 1 per cent to 5 per cent over the same period. Canada also increased its share significantly, while Australia and Chile experienced a declining share of world exploration expenditure.

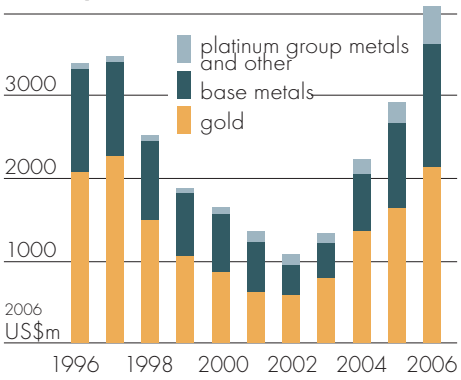
Between 1996 and 2001, total mineral exploration expenditure in APEC economies declined by 60 per cent (MEG 2006; figure 16). Over the same period, metals prices declined considerably, with gold, copper, nickel, zinc and lead prices declining by 38 per cent, 31 per cent, 21 per cent, 14 per cent and 39 per

fig 15 **share of mineral exploration expenditure**
APEC economies



cent respectively. This reflects the strong relationship between investment in new minerals projects and metal prices. From 2002, stronger global economic growth, led by China and other emerging economies in Asia, resulted in demand for metals exceeding production with stocks being drawn down (in some cases to historic lows). As a result, metal prices increased significantly, particularly for nickel, copper and zinc (figure 17). Reflecting this, APEC exploration expenditure increased by 279 per cent between 2002 and 2006.

fig 16 **mineral exploration expenditure, by mineral** APEC economies



During the period 1996-2006, most exploration expenditure was directed at gold (MEG 2006; figure 18). APEC exploration expenditure for gold increased by 270 per cent between 2002 and 2006, to reach US$2.1 billion in 2006 or more than half of total spending. The popularity of gold can be largely attributed to its use in aesthetic and technological applications, its common occurrence (in small, easy to mine deposits) and high profitability. Canada accounted for almost one quarter of gold exploration in 2006, followed by Australia and the United States.

fig 17 **world metal prices index**

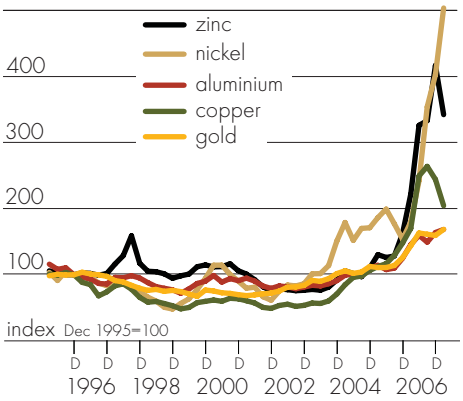


fig 18 **mineral exploration expenditure, by mineral** APEC economies

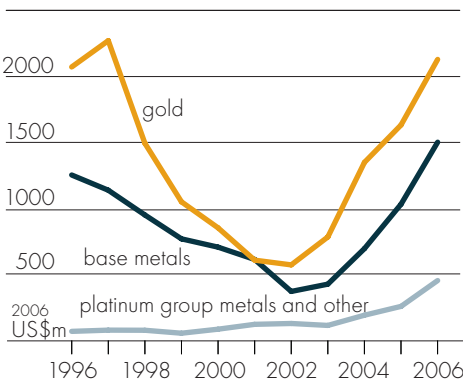
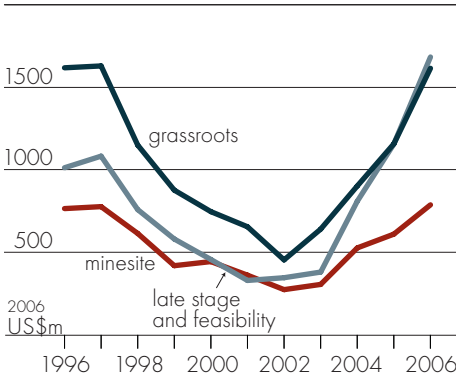


fig 19 **mineral exploration expenditure, by stage** APEC economies

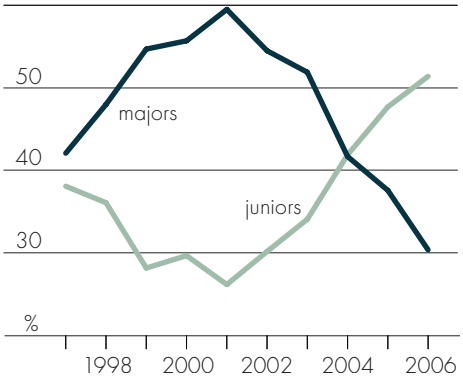


Copper received the second largest amount of exploration expenditure, because of its high perceived value and its frequent colocation with gold in mineral deposits.

The lack of large new projects expected to come on line in the medium term, reflecting declining investment between 1996 and 2002, has, together with high prices for mineral commodities, encouraged greater exploration expenditure across all stages of development (MEG 2006; figure 19). However, in an environment of strong prices, companies have an incentive to maximise output, resulting in a focus on brownfield projects that are closer to development (late to mine stage). For example, exploration expenditure for late stage projects increased from 25 per cent of total expenditure in 2001 to 41 per cent in 2006, while grassroots expenditure declined from 49 per cent in 2001 to 40 per cent in 2006.

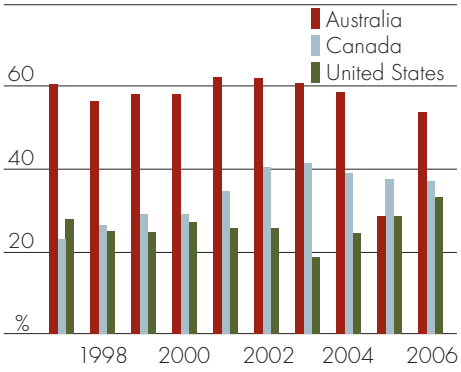
In response to increasing prices and investor funding, junior exploration companies (financed largely through equity and with mining related revenues of less than US$50 million) have increased their activities and have accounted for a significant proportion of growth in global mineral exploration expenditure since 2002. From a low of 26 per cent in 2001, exploration expenditure of junior companies increased to over 50 per cent of total exploration expenditure in 2006 (figure 20; MEG 2006). The exploration expenditure of midsized companies has maintained a relatively constant share of exploration expenditure, averaging 14 per cent between 2001 and 2006.

fig 20 **share of global mineral exploration expenditure, by company type**



Global mineral exploration budgets are largely sourced from companies based in Canada, Australia, and the United States. The share of domestic exploration by these companies in part reflects their geographic proximity to deposits in other economies (MEG 2006; figure 21). Australian companies tended to conduct non domestic exploration for gold within Asia and copper worldwide. Companies based in Canada and US tended to focus non domestic exploration for gold and base metals in Latin America. Canadian companies also explored in China, the Russian Federation and Mongolia.

fig 21 **share of mineral exploration expenditure allocated to domestic expenditure for Australian, Canadian and US based companies**



4

frameworks governing mineral exploration in APEC

Mineral exploration activities are governed by a number of institutional and regulatory arrangements. While almost every economy has specific mining legislation, the regulatory or legislative framework for minerals sector activities in APEC economies varies widely. In most APEC economies, the basic framework for mineral exploration is determined by the mining legislation. However, the degree to which this legislation provides clear guidelines in relation to exploration and mining activities varies significantly.

In addition to specific mining laws, a number of economywide legislations are applicable to activity in the minerals sector. These legislations cover areas which may include, but are not limited to taxation, foreign investment, the environment, occupational health and safety, labour and industrial relations, and land rights.

The key aspects of the regulatory and institutional framework governing mineral exploration can be divided into economywide factors such as governance, transparency, foreign direct investment and access to infrastructure, and minerals sector specific such as geoscientific information, mining legislation and approval processes, and royalties.

Not all the regulatory and institutional arrangements covered here are directly related to mineral exploration; some focus more on mining itself or other stages of the supply chain. This reflects the important consideration that the decision to explore is contingent on a range of factors that extend beyond the exploration process, and affect the expected profitability of an exploration program.

economywide

governance

Governance can generally be considered to be the set of political, economic and social institutions by which authority in an economy is measured. The World Bank measures good governance against six indicators:

- voice and accountability – the extent to which an economy's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association and free media
- political stability and absence of violence – perceptions of the likelihood that the government will be destabilised or overthrown by unconstitutional or violent means, including domestic violence and terrorism
- government effectiveness – the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formation and implementation, and the credibility of the government's commitment to such policies
- regulatory quality – the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development
- rule of law – the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, the police, and the courts as well as the likelihood of crime and violence
- control of corruption – the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private enterprise (World Bank 2007).

It should be noted that these indicators are subjective, since they are based on perceptions. Further, the results do not represent absolute but rather relative measures of how economies are performing (box 6).

Within APEC, there is a positive correlation between each measure of governance and mineral exploration expenditure. This correlation indicates that better governance and increased exploration expenditure go hand in hand. The following charts demonstrate the comparative performance of APEC economies against the political stability, government effectiveness, regulatory quality and rule of law

indicators. These indicators are considered to have the most direct influence on mineral exploration as they have a direct effect on the confidence exploration companies have in their security of tenure, investment and staff safety.

The political stability of an economy is an important consideration for mineral exploration companies because it plays a role in determining the risk of a project. Figure 22 (World Bank 2007) indicates that political stability and violence varies considerably among APEC economies, with Canada, Chile and Australia ranking

box 6 World Bank 'Governance Matters' and the Fraser Institute 'Annual Survey of Mining Companies'

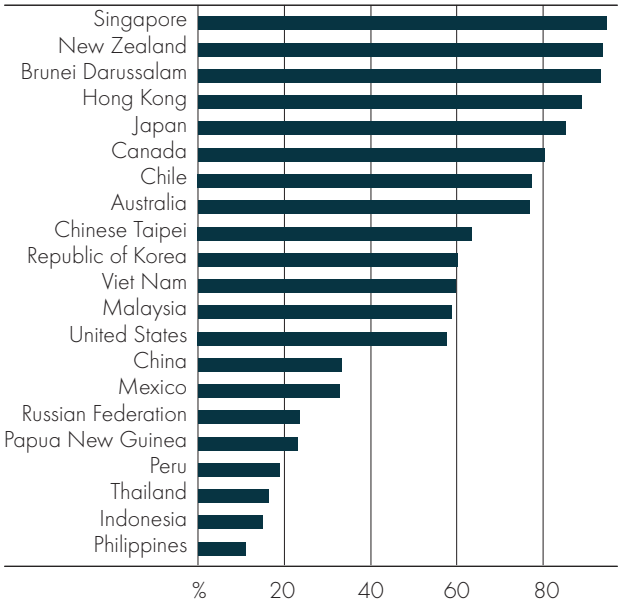
The World Bank's 'Governance Matters 2007' report collates the Worldwide Governance Indicators, which have been published by the World Bank every second year from 1996 to 2002 and annually from 2002. These indicators capture six dimensions of governance, and make it possible to evaluate the quality of an economy's governance in comparison with other economies over time. Over two hundred economies were surveyed in the report.

Scores for each economy are reported as percentile ranks, where higher values indicate better governance rankings. Percentile ranks indicate the percentage of economies worldwide that score below each economy. For example, an economy with a percentile rank of 80 has 80 per cent of economies scoring worse and 20 per cent of economies scoring better.

The Fraser Institute is an independent research and educational organisation based in Canada, funded by contributions from individuals, organisations and foundations. Each year since 1997, the Fraser Institute has conducted an annual survey of mining and exploration companies. The survey aims to assess how mineral endowments and public policy factors such as taxation and regulation affect exploration investment (Fraser Institute 2007). In 2006-07, the survey covered a total of 65 jurisdictions (economies, states or territories).

Survey results illustrate the opinions of executives and exploration managers from exploration and mining companies. The companies who responded in 2006-07 represent around 14.5 per cent of total non ferrous mineral exploration budgets in 2006 as reported by the Metals Economics Group (2006). This survey is generally regarded as one of the more independent available sources of information on issues affecting the minerals sector. The results are presented as a proportion of respondents who regard the factor as a deterrent, or does not encourage investment.

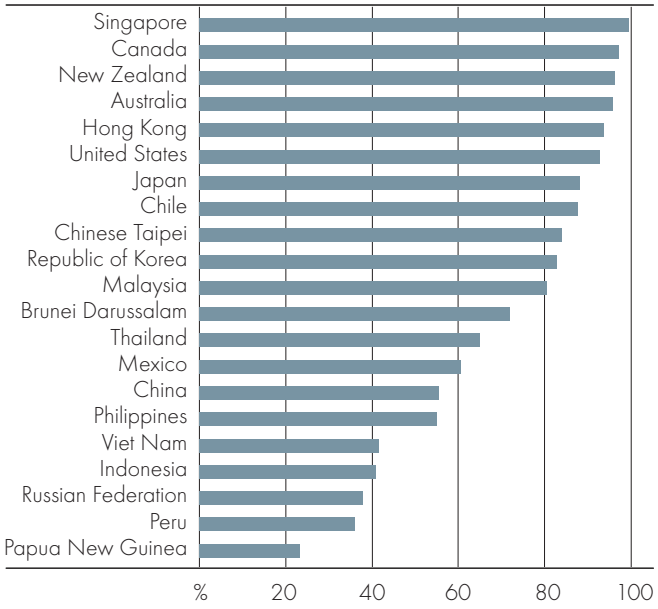
fig 22 **political stability and absence of violence**
percentage of economies worldwide that score below that economy



well among economies with significant exploration expenditure. Lack of political stability and frequent incidences of violence have a number of impacts on mineral exploration companies. A stable political environment reduces the risk to companies of regulations changing without warning, and licences being revoked. It also increases security of tenure and investors' confidence in an economy. Companies will also be concerned with the safety and security of their employees, equipment and tenements. Where violence is rife, companies need to increase their spending on security measures for land holdings, mining equipment and staff, which increases operating costs.

Government effectiveness in APEC economies is generally high relative to non APEC economies with only five APEC economies not in the top 50 per cent (figure 23; World Bank 2007). This is encouraging for other governance indicators such as regulatory quality and is important for mineral exploration investment. High quality policy formation and implementation, combined with government commitment to such policies, provides investors in the minerals sector with confidence that the regulations they are acting within are not unduly restrictive and that the

fig 23 **government effectiveness**
percentage of economies worldwide that score below that economy

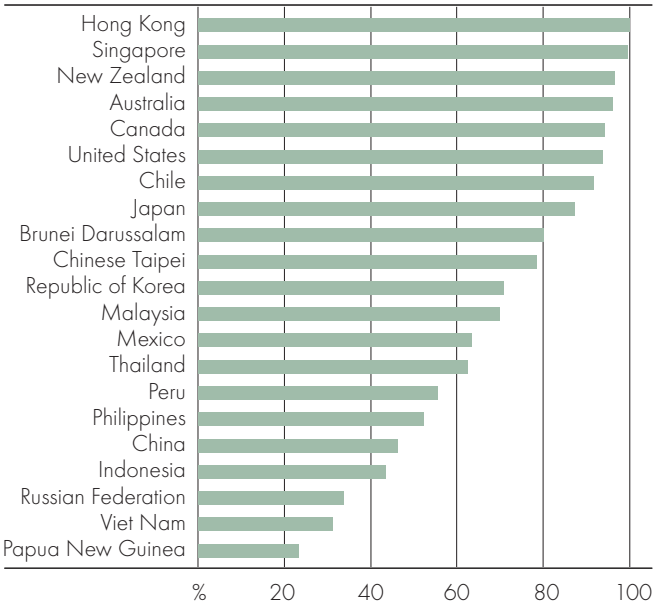


regulations are unlikely to change frequently or unnecessarily. Peru and Indonesia, for instance, offer contracts which insulate the investor from changes to certain regulations for the life of the contract.

APEC economies as a whole also performed well in terms of regulatory quality, again with only five APEC economies not in the top 50 per cent (figure 24; World Bank 2007). Regulatory quality is an important consideration for mineral exploration. If a government is able to develop effective policies and regulations, companies will be more willing to invest. Generally, minerals sector investors favour policies that are outcomes based rather than process based because these enable investors to find the least cost way of achieving a specific outcome, and reward innovative companies. High quality policies provide a strong foundation for other governance measures and support investment in the minerals sector over the medium to long term.

Rule of law is also an important element of governance that has implications for private sector investment by determining the safety and security of the investment. If investors have confidence that contracts will be enforced, that police and the

fig 24 **regulatory quality**
percentage of economies worldwide that score below that economy



courts will act to enforce laws, and that crime and violence will be kept to a minimum, then they will be more confident investing in an economy. APEC economies have a relatively strong rule of law with all but four economies in the top 60 per cent (figure 25; World Bank 2007).

transparency

The transparency of regulations, institutions and processes can provide companies with important information in order to make decisions about investment in mineral exploration. Transparency reduces uncertainty and increases commercial confidence. The ability to access relevant information can make investors more willing to undertake exploration. If companies cannot determine what the relevant policies and processes are, they are unlikely to invest in mineral exploration in an economy irrespective of the quality of these policies and processes.

The value of investment in economies by improving governance, developing high quality policies and regulations, providing access to infrastructure and capital is

fig 25 **rule of law**

percentage of economies worldwide that score below that economy

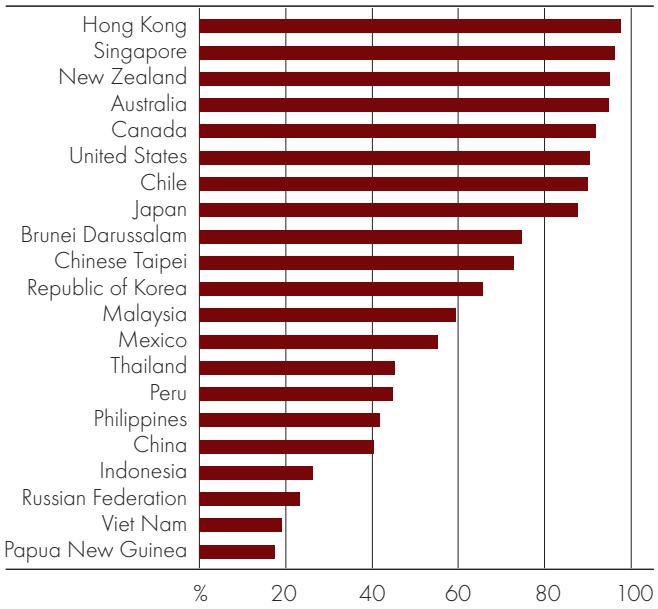
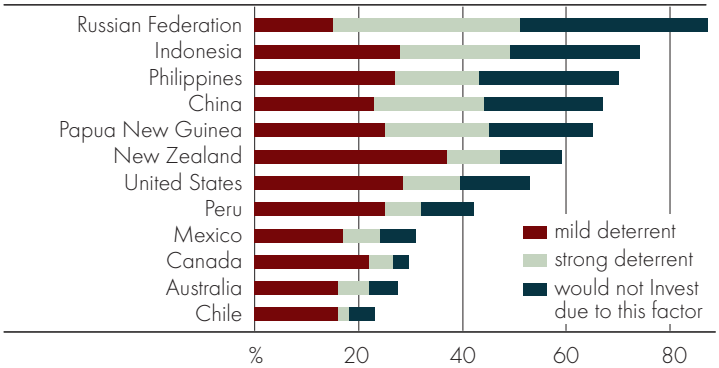


fig 26 **uncertainty concerning existing regulations**

proportion who consider this factor as a deterrent to, or does not encourage investment



Note: figures for Australia, Canada and the United States are calculated as simple averages across several mining jurisdictions within those economies. As such, these figures should be interpreted as indicative only.

unlikely to be maximised if companies cannot access information about the operating environment. While this investment is important, it must be combined with a high degree of transparency to facilitate companies' decision making processes.

The results of the 2006-07 Fraser Institute survey of mining companies indicate that transparency and certainty of regulations is potentially one of the largest single deterrents to investment in the minerals sector in all APEC economies. Chile and Australia had the fewest respondents citing this factor as a deterrent to investment, and of those who did consider it a deterrent, most considered it only a mild deterrent (figure 26; Fraser Institute 2007). It demonstrates that companies are sensitive to regulatory uncertainty and that transparency of regulatory arrangements could be improved by all APEC economies.

environmental and other legislation

Environmental regulations are present in all APEC economies to some extent (table 11). Regulations relevant to mining and mineral exploration most commonly cover forestry issues such as land clearing, water quality and use, and other more general environmental protection and biodiversity conservation issues. A number of APEC economies have introduced legislation to ensure that companies engage in community consultation and gain permission to explore and extract mineral resources.

As with other sectors of an economy, the minerals sector is subject to a number of other regulations including industrial relations, occupational health and safety, competition policy, and financial reporting. To the extent that these regulations affect the profitability of the mining sector generally, these can be expected to have an impact on the incentives for mineral exploration.

foreign direct investment

The United States, Japan and Canada are the largest sources of FDI within APEC. Between 1996 and 2005, Singapore and Hong Kong had the largest inflows and outflows of FDI as a share of gross domestic product (GDP). However, these values are likely to be overstated as both economies are financial centres and the transfer of investment flows through these economies can distort the reporting of FDI flows (APEC 2006).

The APEC region is a net FDI donor (figure 27; UNCTAD 2006). Chile, Viet Nam and Malaysia have attracted significant FDI inflows relative to the size of their economies over the past decade. Conversely, Japan has attracted limited FDI inflows.

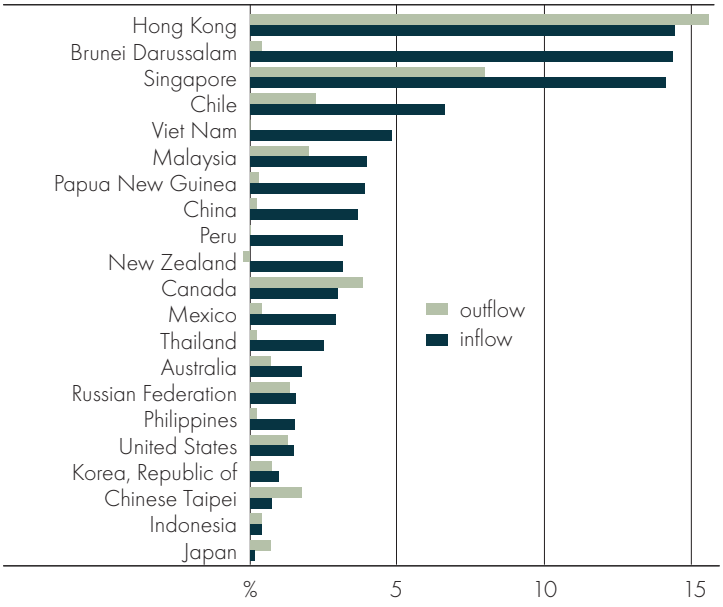
table 11 **environmental, labour and other regulations that affect the minerals sector – APEC economies**

	environmental regulations			labour regulations		native land holdings
	forestry	water	other	occupational health and safety	workers compensation for workplace injuries	
Australia	✓	✓	✓	✓	✓	✓
Brunei Darussalam	✓	✓	✓	✓	✓	×
Canada	✓	✓	✓	✓	✓	✓
Chile	✓	✓	✓	✓	✓	✓
China	✓	✓	✓	✓	✓	×
Chinese Taipei	✓	✓	✓	✓	✓	×
Hong Kong, China	✓	✓	✓	✓	✓	✓
Indonesia	✓	✓	✓	✓	✓	×
Japan	✓	✓	✓	✓	✓	×
Malaysia	✓	✓	✓	✓	✓	✓
Mexico	✓	✓	✓	✓	✓	✓
New Zealand	✓	✓	✓	✓	✓	✓
Papua New Guinea	✓	✓	✓	✓	✓	✓
Peru	✓	✓	✓	✓	✓	✓
Philippines	✓	✓	✓	✓	✓	✓
Republic of Korea	✓	✓	✓	✓	✓	×
Russian Federation	✓	✓	✓	✓	✓	✓
Singapore	✓	✓	✓	✓	✓	×
Thailand	✓	✓	✓	✓	✓	×
United States	✓	✓	✓	✓	✓	✓
Viet Nam	✓	✓	✓	✓	✓	×

Source: ABARE research.

Distortions to investment exist in a number of APEC economies. The 2007 Guide to the Investment Regimes of APEC Member Economies (APEC 2007b) indicated that governments in all APEC economies either ban or restrict foreign ownership of domestic assets in selected sectors (table 12). In most instances these bans or restrictions apply to transport and communication services, and in some cases the development of natural and energy resources. In addition, a number of APEC economies identify priority sectors, generally those that are export oriented, and use regulation to attract investment into these sectors. To encourage investment flows, many governments of APEC economies use fiscal or taxation incentives, such as investment promotion and tax concessions involving research and development.

fig 27 **FDI inflows and outflows as a percentage of GDP for APEC economies (average 1996 to 2005)**



Some APEC economies impose certain equity requirements or requirements on foreign investors to take a local joint venture partner. This acts as an impediment to potential FDI. In other cases, constraints are imposed on the timing and magnitude of transactions to repatriate foreign investors' profits. Again, this places a discriminatory burden on foreign investors. APEC economies have been implementing institutional reform to encourage FDI. For example, Viet Nam and Indonesia have continuously implemented reforms in line with the OECD's Policy Framework for Investment (OECD 2006).

competitive neutrality

There are a number of state owned enterprises in APEC (box 7). In some APEC economies, private investors are disadvantaged relative to other investors, in particular state owned enterprises. In addition, in some economies the minerals sector has languished as a low priority sector and has been disadvantaged relative to other sectors in the economy, such as manufacturing. In the minerals sector of some APEC economies, there are instances where projects are encouraged, permitted

or restricted, depending on the mineral resource. However, these issues are less of a concern in the more developed APEC economies where state ownership is limited and a more level playing field has been established (Mélanie et al. 2007).

infrastructure

Access to infrastructure is a key consideration for exploration and mineral development. While a lack of infrastructure is not a real barrier to exploration (for example, drill rigs can be flown in by helicopter), it is a significant factor in area selection as the cost of infrastructure may be so large as to make potential discoveries uneconomic.

table 12 foreign investment regulations and restrictions – APEC economies

	foreign investment legislation	agency to promote foreign investment	screening/ notification required	restricted/ closed sectors	non-tax fiscal incentives	taxation incentives	priority sectors	exchange controls	restrictions on repatriation of profits
Australia	✓	✓	✓	✓	×	✓	✓	×	×
Brunei Darussalam	ni	✓	✓	✓	✓	✓	✓	×	×
Canada	✓	✓	✓	✓	×	×	×	×	×
Chile	✓	ni	✓	✓	✓	✓	✓	×	×
China	✓	✓	✓	✓	×	✓	✓	✓	✓
Chinese Taipei	✓	✓	✓	✓	✓	✓	✓	✓	×
Hong Kong, China	×	✓	×	✓	✓	×	×	×	×
Indonesia	✓	✓	✓	✓	×	✓	✓	×	×
Japan	✓	✓	✓	✓	✓	✓	ni	×	×
Malaysia	×	✓	✓	✓	✓	✓	✓	×	×
Mexico	✓	✓	✓	✓	✓	✓	✓	×	×
New Zealand	✓	✓	✓	✓	✓	ni	✓	×	ni
Papua New Guinea	ni	✓	✓	✓	✓	✓	✓	✓	×
Peru	✓	✓	×	✓	✓	✓	✓	×	×
Philippines	✓	✓	✓	✓	×	✓	✓	×	×
Republic of Korea	✓	✓	✓	✓	ni	✓	✓	×	×
Russian Federation	✓	✓	✓	✓	✓	✓	✓	✓	×
Singapore	ni	✓	×	✓	✓	✓	×	×	×
Thailand	✓	✓	✓	✓	✓	✓	✓	×	×
United States	×	×	×	✓	✓	✓	×	×	✓
Viet Nam	✓	ni	×	✓	✓	✓	✓	ni	×

ni Not indicated.
Source: APEC (2007b) and McDonald et al (2005).

Exploration for new mineral deposits is increasingly based in remote locations where access by drill rigs and other heavy equipment is more difficult. In instances where exploration is successful, mining operations require access to reliable utilities such as water and electricity as well as transport and communications infrastructure. Poor or underdeveloped infrastructure makes investing in mineral exploration less attractive since the cost of developing and extracting any discovered deposit will be higher than in an area where infrastructure is well developed and maintained.

The 2006-07 Fraser Institute survey indicates that infrastructure is a significant factor in investment decisions by companies. In many APEC economies, infrastructure is only a mild deterrent to investment (figure 28; Fraser Institute 2007). However, for every economy a number of respondents reported that they would not invest due to the poor quality of infrastructure. Underdeveloped infrastructure in APEC economies can therefore be expected to have a negative influence on investment in the minerals sector.

box 7 **state owned enterprises in APEC – the example of Codelco**

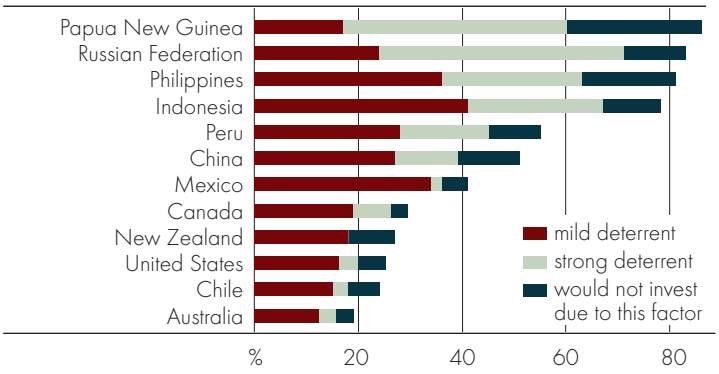
One of the largest state owned enterprises in APEC, and indeed the world, is the Corpoarción Nacional del Cobre de Chile – Codelco. After nationalising copper in Chile in 1971, Law Decree 1350 of 1976 created Codelco as a mining, industrial and commercial organisation owned by the Chilean State.

Currently, copper production in Chile comes from both Codelco and from private corporations. Codelco is the largest copper producer in the world. However, its production is expected to decline toward the end of the decade due to aging mines.

State owned enterprises such as Codelco often face challenges not experienced by private investors. These include:

- the inability to raise capital through securities markets
- the use of public funds for exploration. State owned enterprises have to compete with other government agencies and services, such as health and education, and may not be able to obtain funding required to undertake mineral exploration
- outcomes are not necessarily driven by market based principles such as profit
- other restrictions on approval processes and operating conditions. Approval processes are the same for Codelco as private investors, but this is not necessarily the case throughout APEC.

fig 28 **quality of infrastructure**
proportion who consider this factor as a deterrent to, or does not encourage investment



Note: figures for Australia, Canada and the United States are calculated as simple averages across several mining jurisdictions within those economies. As such, these figures should be interpreted as indicative only.

fiscal regime

corporate taxes

Every economy in APEC levies a corporate tax, although some provide special deductions and concessions for mining companies. In economies where the taxation system is progressive for corporations, the tax rate may be as low as zero for companies earning below the first income threshold. However, where companies earn above the threshold or the tax is a fixed percentage of taxable income, the corporate tax rate ranges between 14 and 50 per cent. The rate of corporate tax is most commonly set at around 30 per cent in APEC economies (table 13).

box 8 **domestic value adding and exports**

Market decisions on value adding are usually made by individual mining companies based on labour costs, capital expenditure required to set up processing facilities, and a comparison of the cost of processing the minerals elsewhere.

Policies and regulations that mandate domestic value adding or discourage the export of raw materials in favour of domestic processing usually discourage initial investment and are rarely successful. Increasing the value of a product through domestic processing does not necessarily translate to value adding. If processing could take place elsewhere at a comparatively lower cost, then the additional processing domestically simply increases the cost of the product rather than its value and makes the producer less competitive internationally. This can be expected to have an adverse flow on effect on investment in mineral exploration expenditure.

export and import taxes

Export taxes are not widespread in APEC economies. Currently, APEC economies that levy an export tax on minerals include China and Viet Nam (table 13). However, Indonesia is considering levying export taxes on unprocessed minerals. In China, export taxes are aimed at preventing disproportionate exports of non renewable resources, while Indonesia is considering an export tax to encourage domestic mineral processing (box 8).

table 13 fiscal regulations affecting the minerals sector – APEC economies

	corporate tax	corporate tax rate [a]	royalties	loss carrying	profit/ production sharing	export taxes	deductibility of exploration expenditure
Australia	✓	30%	✓	✓	×	×	✓
Brunei Darussalam	✓	30%	na	✓	na	×	×
Canada	✓	21% [b]	✓	✓	×	×	✓
Chile	✓	17%	✓	✓	×	×	×
China	✓	33%	✓	✓	×	✓	✓
Chinese Taipei	✓	25%	✓	✓	✓	✓	×
Hong Kong, China	✓	17.5% [c]	✓	✓	×	×	×
Indonesia	✓	30%	✓	✓	✓	×	✓
Japan	✓	41%	✓	✓	✓	×	×
Malaysia	✓	28%	✓	✓	✓	×	×
Mexico	✓	28%	×	✓	✓	×	×
New Zealand	✓	33%	✓	✓	✓	×	✓
Papua New Guinea	✓	35%	✓	✓	×	×	✓
Peru	✓	30%	✓	✓	×	×	✓[d]
Philippines	✓	32%	✓	✓	✓	×	✓
Republic of Korea	✓	prog.	×[e]	✓	✓	×	×
Russian Federation	✓	24%	✓	✓	✓	×	✓
Singapore	✓	20%	na	na	na	na	×
Thailand	✓	30%	✓	✓	×	×	×
United States	✓	prog.	✓	✓	×	×	✓
Viet Nam	✓	28%	✓	✓	×	✓	✓[f]

a The most applicable rate. **b** Canada's corporate tax rate of 21% does not take into account provincial corporate income taxes. For the mining industry, combined federal/provincial corporate tax rates in Canada range from 31.01% to 36.61%. **c** One percentage point cut to 16.5% in financial year of 2008-09. **d** There is an incentive to mining exploration that involves deducting the value added tax if the exploration expenditure is above US$500 000. **e** ROK does not have mining royalties, PSAs are used in the petroleum industry only. **f** Only direct and reasonable exploration expenditure (drilling works, materials used etc) is counted toward capital investment of the subsequent mining operation. From here, relevant financial regulations apply. **na** Not applicable. **prog**. – progressive tax rate

Source: ABARE research.

An important consideration for all economies that are desirous of encouraging mineral exploration is the ability of corporations to freely move equipment internationally. In most APEC economies, special arrangements exist such that imports of mining equipment are exempt from duties.

box 9 **flow-through shares**

The flow-through share scheme is a fiscal arrangement unique to Canada. Flow-through shares are used to encourage mineral exploration by allowing corporations to pass on their rights to cost deductions of eligible exploration expenses to taxpayers.

Conventional fiscal regimes limit the ability of exploration companies, particularly junior exploration companies, to deduct the expenses they incur from undertaking exploration. The deductibility of expenses is usually limited to the taxable income generated by the organisation itself. Because junior companies undertaking exploration often generate little or no income, they cannot deduct all of their expenses.

Flow-through shares avoid this problem and work in the following way:

- The company issues a 'bundle' including shares and tax deductions to a taxpayer in exchange for cash. The tax deduction portion of the bundle allocates the right to deduct exploration expenditure to the taxpayer in the current financial year (the company forfeits this right).
- The company agrees to incur exploration and development expenses up to the amount paid for the shares at the earlier of the period that ends 24 months after the end of the month the agreement was signed or by the end of the calendar year following the effective year of renunciation.
- The expenses incurred by the company are then considered for tax purposes to be expenses of the taxpayer who purchased the shares.
- The shareholder/taxpayer can then deduct the expenses from their taxable income as though they had been incurred directly.

The system allows companies to use the funds for up to twelve months after the end of the financial year in which they were raised. Taxpayers can reduce their tax liability by investing in a participating organisation. Once the flow-through portion of the share has been used, the share remains valid as though issued as an ordinary share. If the company's exploration is successful and minerals are discovered, the value of the shares increases making the investment more profitable (PricewaterhouseCoopers 2007).

deductions

As well as the other fiscal arrangements discussed above, many APEC economies allow companies to deduct some or all of their mineral exploration expenditure from their taxable income, offset losses backward or forward, or deduct expenditure on research and development (table 13). For example, Canada uses flow-through shares (box 9).

minerals sector specific

geological information

The geological potential of an area is one of the key considerations when a company decides to explore for minerals. As a result, the precompetitive geological database of an economy is critical for companies considering mineral exploration. Without a basic level of geological information about an area or region, companies face a large financial outlay to do their own geological surveys which may simply show that the region is unlikely to contain minerals or at least the minerals they are interested in looking for. If economies can provide or at least facilitate the availability of this information, the geological uncertainty is reduced and companies are more likely to consider exploration in that region (table 14).

Variability in the quantity and quality of geological information across APEC economies is high. The quality of geological databases in the APEC economies as indicated by the 2006-07 Fraser Institute survey is mixed (figure 29; Fraser Institute 2007). This reflects differences in the development of the minerals sector and the capability of governments to provide this information across APEC economies. Improvements to geological databases may encourage, or at least not act as a deterrent to, greater investment in mineral exploration as it reduces the uncertainty inherent is assessing the mineral prospectivity and the costs to private explorers of undertaking mineral exploration.

Governments invest in basic geoscientific information to facilitate exploration investment by industry. The public provision of geoscientific information reduces both the costs and risks of private mineral exploration (Hogan 2003). Public geoscientific information allows private explorers access to information about the regional geological framework at lower cost than would otherwise be the case. Such data are also used to underpin informed decision making in relation to regional infrastructure development, water resources, and land resource management.

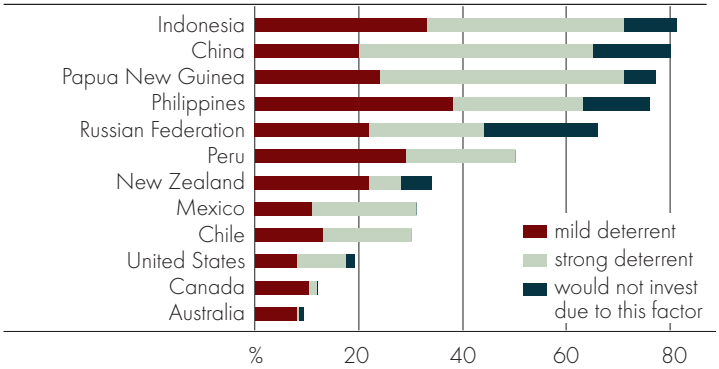
table 14 availability of geological information – APEC economies

	restrictions on who can access data	data is available online	data is available free of charge	smallest scale at which data available	name of agency
Australia	×	✓	✓	1:100 000	Geoscience Australia, various state and territory agencies
Brunei Darussalam	✓	×	×	1:1000	Survey Department
Canada	×	✓	✓	1:50 000	Geological Survey of Canada, various provincial agencies
Chile	ni	×	ni	1:50 000	Sevicio Nacional de Geologia y Mineria (Sernageomin)
China	✓	×	ni	1:50 000	China Geological Survey
Chinese Taipei	×	✓	✓	1: 25 000	Central Geological Survey
Hong Kong, China	×	✓	✓	1:5000	Hong Kong Geological Survey Section, Civil Engineering and Development Department
Indonesia	×	×	ni	1:100 000	Geological Agency
Japan	ni	×	ni	ni	Geological Survey of Japan
Malaysia	ni	ni	ni	ni	Minerals and Geoscience Department
Mexico	×	✓	✓	1:50 000	Servicio Geológico Mexicano (Mexican Geological Survey)
New Zealand	×	×	×	1:50 000	Institute of Geological and Nuclear Science
Papua New Guinea	✓	×	✓	1:250 000	Mineral Resource Authority, Geological Survey of Papua New Guinea
Peru	×	✓	×	1:100 000	Instituto Geologica Minero y Metalurgicc – INGEMMET (Geological, Mining and Metallurgical Institute)
Philippines	×	×	×	1:50 000	Mines and Geosciences Bureau
Republic of Korea	×	✓	✓	1:50 000	Korea Institute of Geology, Mining and Materials **a**
Russian Federation	✓	×	ni	ni	Institute of Geology
Singapore	✓	×	×	na	No applicable body
Thailand	×	✓	✓	1:50 000	Department of Mineral Resources
United States	×	×	✓	1:24 000	United States Geological Survey
Viet Nam	✓	×	×	1:50 000	Department of Geology and Minerals of Viet Nam

a KIGAM handles pure geological information. Information relating to the location of mineral and petroleum resources is managed by the Korea Resources Corporation (Kores). **na** Not applicable. **ni** Not indicated.
Source: ABARE research.

fig 29 **quality of geological database**

proportion who consider this factor as a deterrent to, or does not encourage investment



Note: figures for Australia, Canada and the United States are calculated as simple averages across several mining jurisdictions within those economies. As such, these figures should be interpreted as indicative only.

Geological mapping needs to be continuously repeated as geological maps that are more than 25 years old are considered substandard because of changes in the underlying mapping methods, topographic maps and remotely sensed imagery. Similarly airborne geophysical surveys conducted 25 years ago would be distinctly substandard by today's standards because of major advances in navigational systems and location of flight lines, improvements in instrument sensitivity and computer processing.

mining legislation

Mining legislations, where they exist, typically specify mineral ownership, a framework for the provision of licences to explore or extract mineral deposits, the rights and responsibilities of those holding licences, and the other legislations that exploration and mining entities are subject to, or exempt from. The degree of detail of this legislation is often dependent on the prospectivity of the respective economy and how recently the legislation has been developed.

In some APEC economies exploration and mining activities may fall under the jurisdiction of more than one branch of the legislature. This is particularly the case in the United States, where exploration and mining activities are governed at both national and state or provincial levels. Some exploration activities in APEC economies may also be regulated at a regional level by restrictions regarding water use and land zoning. Environmental approvals, taxation and land use and access laws may also vary across branches of government.

minerals ownership

In every APEC economy except the United States, the national or provincial governments own the rights to all discovered and undiscovered minerals. Mining or exploration licences are granted to individuals or corporations to allow them to lease some or all of these rights subject to various conditions. However, in the United States, the rights to underground minerals are given to the surface land holder.

In Canada all discovered and undiscovered minerals generally belong to either the federal (national) government, when they are on federal crown land, or the provincial governments, when they are on provincial crown land. In addition, the federal government is responsible for the management of land use, water and mineral resources and the administration of mining lands in the Northwest Territories and Nunavut. Furthermore, some mineral deposits may be owned by individual First Nations as a result of settlement of land claims.

Most APEC economies allow foreign companies to hold exploration or mining licences without restriction (table 15). A number of economies place restrictions on holding licences, either through mandating some proportion of domestic ownership or through other indirect requirements. However, no APEC economy entirely precludes foreign ownership or investment in mineral exploration. Where domestic participation in the venture is required, the domestic company is usually required to be the controlling shareholder in the operation. Other restrictions that are placed on foreign ownership tend to be conditional, which is the case in Hong Kong. While there is no restriction on foreign ownership, the mining company must have a legal representative with the power to act on behalf of the company when the holder of the mining title is not resident in Hong Kong.

licensing

The terms and conditions that apply to exploration and mining licences are also divergent among APEC economies (table 15). The length of time for which a licence is valid, the conditions that must be met in order for a licence to apply, the size and basis of the payment for a licence and the specific rights granted by each licence are different for each economy. In Australia, Canada and the United States, there are also variations across different states or provinces.

In most APEC economies where exploration licences cannot be held for an indefinite period, provisions are made for licences to be renewed in fixed blocks

of years up to a maximum term. In some economies including Australia, Canada, Chile and the United States, an annual fee is charged per unit of the area held under an exploration licence in order to discourage companies from holding land which is not being used for exploration. In Australia companies are also required to progressively reduce and relinquish their tenement areas and focus their exploration activities. This has the advantage of freeing up tenements for exploration by other companies. Some economies put a cap on the total area

table 15 ownership and licensing arrangements in the minerals sector – APEC economies

	ownership		licensing			
	allows foreign ownership [a]	mining licence assured [b]	restrictions apply on licence holders	licences are mineral specific	duration of exploration licences	transferability of mining licences
Australia	✓	✓	✓	×	up to 5 years	✓
Brunei Darussalam	✓	×	ni	ni	indefinite	✓
Canada	✓	✓	×	×	up to 10 years	✓
Chile	✓	✓	×	×	2 years	✓
China	✓	×	✓	✓	3 years	✓
Chinese Taipei	✓	✓	×	✓	up to 20 years	✓
Hong Kong, China	✓	✓	✓[c]	✓	up to 5 years	✓[d]
Indonesia	✓	✓	×	×	3 years	✓
Japan	✓	ni	×	ni	2 years	✓
Malaysia	✓	✓	✓	ni	10 years	✓
Mexico	✓	✓	×	×	50 years	✓
New Zealand	✓	✓	×	×	5 years	✓
Papua New Guinea	✓	✓	×	✓	2 years	✓
Peru	✓	✓	✓	×	indefinite	✓
Philippines	✓	✓	✓	×	2 years	✓
Republic of Korea	×	✓	✓	✓	3 years	✓
Russian Federation	✓	×	×	×	5 years	✓
Singapore	na	na	na	na	na	na
Thailand	✓[e]	✓	✓	✓	up to 5 years	✓
United States	✓	✓	×	×	up to 10 years	✓
Viet Nam	✓	✓	✓	✓	2 years	✓

a 'ownership' by foreign individuals or corporations where more than 50 per cent of shares are held by foreigners **b** If exploration is successful and subject to some reasonable conditions of mining (environmental, infrastructural etc requirements for mining project met). **c** mining company must have a legal representative with the power to act on behalf of the company when the holder of the mining title is not resident in Hong Kong. **d** prior consent of the commissioner of mines required. **e** Foreign ownership can be up to 60-75 per cent with the approval of cabinet. **na** Not applicable. **ni** Not indicated.

Source: ABARE research.

that can be claimed under a single exploration licence. However, companies are usually allowed to hold a number of licences which may or may not be adjoining one another. Some economies, such as China, may also limit licences to specific minerals, with multiple licences required for the different minerals in a deposit.

One of the most significant disincentives for mineral exploration in APEC economies is uncertainty over whether a mining licence will be granted if exploration is successful and mineral deposits are discovered. While all APEC economies require mining companies to obtain a mining licence, most economies effectively guarantee the granting of this licence subject to some requirements and provided that these requirements are met. However, in some economies, such as China and the Russian Federation, the granting of a mining licence is not always assured, and as a result, companies may be reluctant to undertake mineral exploration in these economies. The nature of mineral exploration, being inherently risky and capital intensive, requires that companies have security of tenure in the instance that recoverable minerals are found, if they are to invest initially.

Licences are generally issued by the government ministry in charge of the minerals sector. In some APEC economies, information regarding how to obtain prospecting/exploration and mining licences is readily available through the website of the appropriate government department. In the case of Malaysia, the Department of Land and Mines provides clear directions regarding application for exploration and mining licences and the appropriate forms are accessible through the website. There is also information about geoscience services and the availability of maps. Some other APEC economies also provide a compendium of information on licensing, such as in Peru and Papua New Guinea. However, in some APEC economies, it is difficult to determine what is required in order to be granted a minerals licence. It can also be difficult to ascertain what rents or royalties are payable to the government and get a clear understanding of the terms and conditions that may apply to each type of licence.

royalties

Mineral royalties are specifically designed to address some of the unique features of extractive industries. In particular, where ownership of mineral resources is vested in the state, mineral royalty payments represent a direct return to the community from the discovery and extraction of mineral resources by private enterprises (Melanie et al. 2005).

Mineral royalties apply in more than three quarters of APEC economies. The most common type of royalty used by APEC economies and by most economies worldwide is the ad valorem or value based royalty (table 16). These royalties are levied as either a fixed percentage of the value of the minerals or as a progressive percentage of the value. The main disparity between ad valorem royalties in different economies is how the value is measured and the point in the production process at which it is applied.

table 16 **types of royalties – APEC economies**

royalty type	basis of measurement	basis of charge	APEC examples
unit based (specific)	unit of volume; unit of weight	fixed charge per unit; progressive charge per unit	Indonesia
value based (ad valorem)	value at mine mouth; value of recoverable product; value of product sold » gross value » net market value » net smelter return determined by sales receipt, the government, an expert valuation, or the prevailing international price	» fixed percentage of the value; percentage of value that increases with the value of the product produced or sold » fixed percentage of profits; percentage of profits that increases with profits » fixed percentage of income; percentage of income that increases with income	Australia Canada China Japan Malaysia New Zealand Papua New Guinea Peru The Philippines Thailand United States Viet Nam
profit based (resource rent)	profit: » market or sales value less capital and operating costs		Australia Canada New Zealand United States
income based	net income: » firm income less selected capital and operating costs		Chile New Zealand Republic of Korea

Ad valorem royalties are a compromise between economic efficiency and both administrative simplicity and revenue stability (ABARE 2000; Hogan 2007). They ensure governments always receive some revenue from mining, even when profits are low. However, they do not distort investment and production decisions to the same degree as a unit based royalty (or specific royalty). In most economies where royalties are levied, the amount paid in royalties is deductible from the producer's taxable income.

5

case studies – australia

Australia has significant mineral resources and is the world's largest producer of bauxite and the second largest producer of gold, lead, zinc and iron ore. Australia was the second largest destination for mineral exploration expenditure in APEC in 2006, accounting for 18 per cent of total APEC expenditure, and exploration expenditure increased in real terms by 128 per cent between 2002 and 2006.

Australia has a very competitive regulatory environment that encourages mineral exploration. Areas where Australia rates well include:

- the provision of precompetitive geoscience information
- clear legislative and regulatory frameworks and
- security of tenure.

However, some concerns have been raised around access to land, including native title and pastoral leases.

overview of the minerals sector in Australia

contribution to the economy

The minerals sector – including mining and processing – is a substantial contributor to the Australian economy, accounting for 8.9 per cent of gross domestic product (GDP) in 2006-07 (table 17). The sector accounted for 4.0 per cent of total employment in Australia, and for 37.9 per cent of new capital expenditure in 2006-07. In particular, the sector provides employment and significant infrastructure development and broader net economic benefits in remote and regional areas.

The contribution of the minerals sector to Australia's states and territories is varied reflecting differences in mineral endowment. For example, the minerals sector makes a significant contribution to the economies of Western Australia, Northern Territory and Queensland (table 18).

table 17 contribution of the minerals sector to Australian output, employment and investment, 2006-07

	industry gross value added a		employment p		new capital expenditure b	
	level	share	level	share	level	share
	A$m	%	000	%	A$m	%
mining c	48 751	5.1	120	1.2	22 062	28.5
mineral processing						
– petroleum, coal and chemical product	11 973	1.3	89	0.9	1 961	2.5
– nonmetallic mineral product	5 303	0.6	35	0.3	719	0.9
– metal product	18 840	2.0	164	1.6	4 603	6.0
total mineral processing	36 116	3.8	288	2.8	7 283	9.4
total mining and mineral processing	84 867	8.9	408	4.0	29 345	37.9
Australian total, all sectors	952 723	100.0	10 123	100.0	77 341	100.0

a Chain volume measures, reference year 2004-05. **b** In current prices. **c** Includes services to mining and energy minerals.
p Preliminary
Source: ABARE (2007).

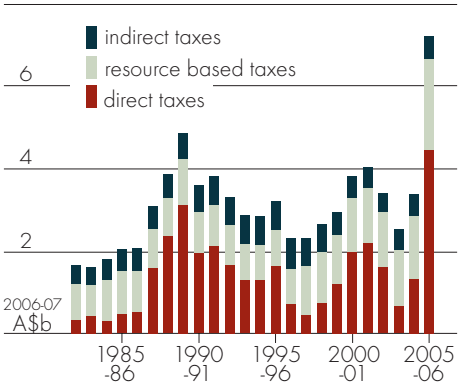
table 18 contribution of the mining sector by state/territory, 2005-06

	mining industry A$m	gross state product (GSP) A$m	mining share of GSP %
New South Wales	7 182	310 091	2
Victoria	3 477	228 198	2
Queensland	20 341	168 937	12
South Australia	1 792	60 737	3
Western Australia	29 799	107 910	28
Tasmania	332	16 546	2
Northern Territory	3 014	11 476	26
Australian Capital Territory	2	19 098	0
Australia	48 751	952 723	5

Source: ABS (2007a).

The Australian economy also benefits from taxes paid by the minerals sector. Taxation payments by the minerals sector for resource based taxes, direct taxes and indirect taxes are presented in figure 30 (PricewaterhouseCoopers 2006b). In 2005-06, total company tax payments by the minerals sector were just over A$7.2 billion, comprising A$4.5 billion in direct taxes, A$2.2 billion in resource based taxes and A$0.6 billion in indirect taxes (given in 2006-07 dollars). Total government revenue from the minerals sector accounted for 3 per cent of total taxation revenue for all levels of government in 2005-06.

fig 30 **tax payments in Australia's minerals sector**



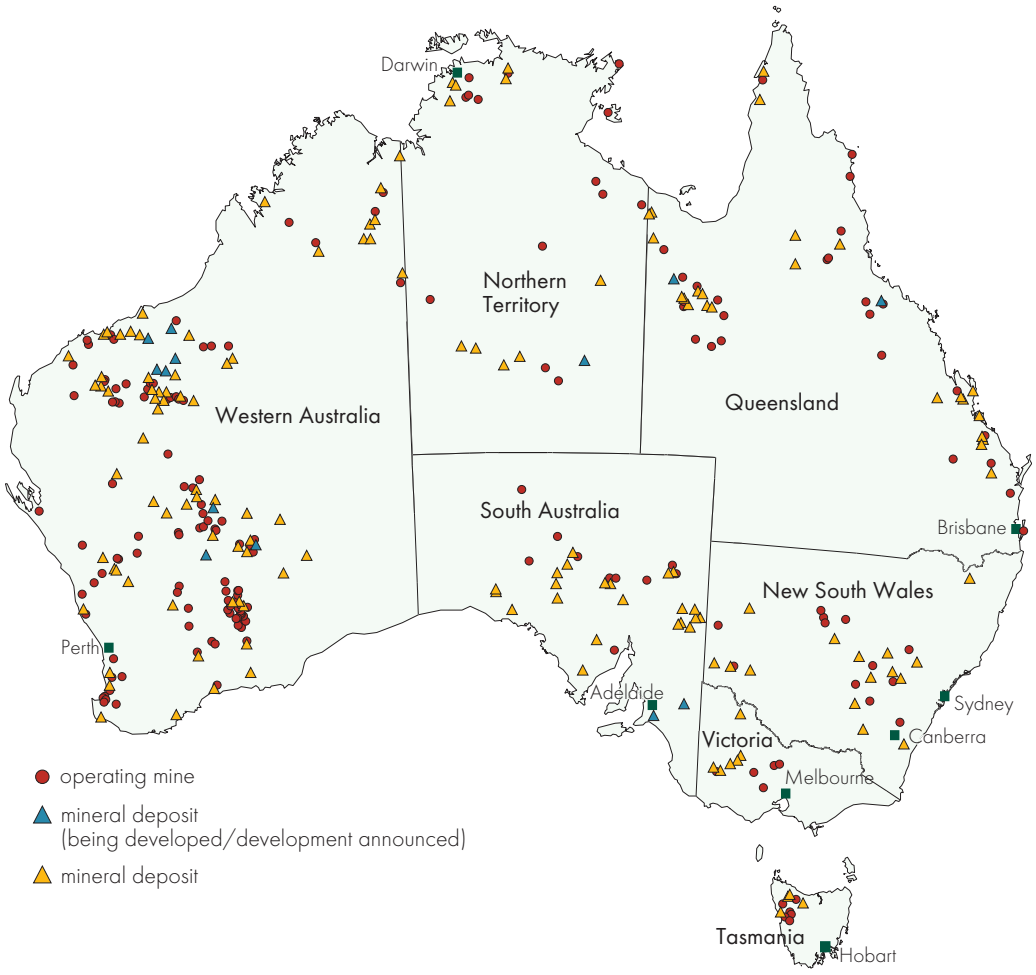
mineral resource base

Australia has the world's largest economic demonstrated resources of zinc, lead, nickel, and mineral sands (rutile and zircon) and significant resources of bauxite, copper, gold, iron ore, manganese ore and silver (table 19). A number of Australia's resources are concentrated within a particular region, for example gold in Western Australia – particularly around Kalgoorlie and the Eastern Goldfields – while other commodities are dispersed among the states and territories (map 1; Geoscience Australia 2007a).

Historically, major Australian mineral discoveries were in regions with high grade deposits and surface mineralisation. However, most of Australia's surface mineralisation has been discovered. As such, new exploration technologies and more detailed geoscientific information are required to find further resources (Blain 2000; Hogan et al. 2002).

The ratio of economic demonstrated resources to production, which provides an indication of resource life at current production rates, is generally higher for the bulk commodities such as iron ore and bauxite than for base and precious metals. The volume of economic demonstrated resources continuously fluctuates due to

map 1 **mines and mineral deposits – Australia**



new discoveries, reassessments of existing deposits, and extraction. In general resource life has either increased or remained constant through new discovery but large increases in mine production has decreased resource life for some minerals in recent years.

minerals production and trade

Australia is a major world producer of bauxite, base metals (copper, zinc and lead), precious metals (gold and silver), iron ore and nickel (table 19). Over the past decade, Australian production of metallic minerals has increased substantially, driven primarily by growth in iron ore production (figure 31). Between 1996-97 and 2006-07, iron ore production in Australia grew at an average annual rate of 7.3 per cent.

fig 31 **Australian mineral production**

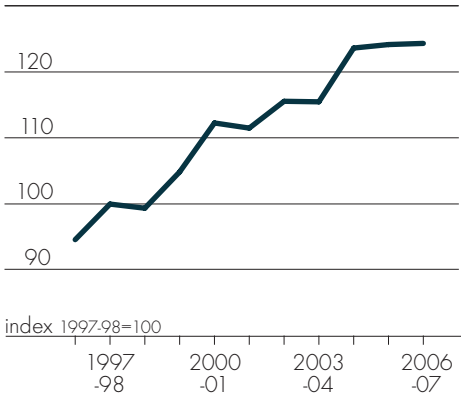


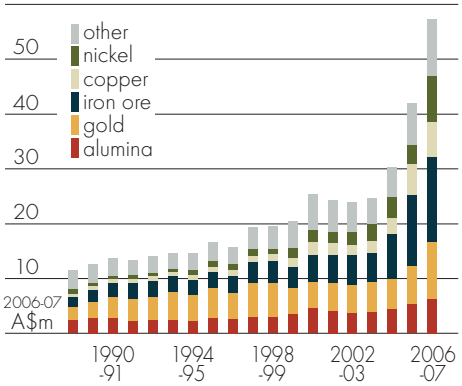
table 19 **economic demonstrated resources (EDR) and production, 2006 – Australia**

		Australia in world EDR			Australia in world mine production			Australia's EDR to production ratio [a]
	unit	EDR	rank	share	volume	rank	share	
			no.	%		no.	%	years
bauxite	Mt	5 700	2	22.8	61.8	1	33.8	92
gold	kt	5.5	2	12.0	0.2	3	10.0	22
silver	kt	45.6	2	16.0	1.7	4	9.1	26
copper	Mt	42.4	2	8.0	0.9	4	5.8	48
lead	Mt	23.5	1	32.0	0.6	2	17.9	38
zinc	Mt	40.6	1	18.0	1.3	2	12.8	30
nickel	Mt	23.7	1	37.1	0.2	3	12.5	128
tin	kt	247	8	2.5	1.5	10	0.5	167
iron ore	Mt	16 600	5	11.0	275.1	2	18.6	60

a EDR (end of calendar year data) as a share of production in the same calendar year.
Sources: Geoscience Australia (2007b); WBMS (2007); GFMS (2007); INSG (2007); ILZSG (2007); UNCTAD (2007); King (2007).

Australia's competitive advantage in mining and mineral processing is illustrated by its export performance (figure 32; ABS 2007b). Australia's exports of metallic minerals (in 2006-07 dollars) increased from A$15.7 billion in 1996-97 to A$57.3 billion in 2006-07. In 2006-07, the share of minerals and metals in Australia's total exports of goods and services reached 42 per cent, reflecting high world prices for a wide range of commodities.

fig 32 **Australian exports of minerals and metals**



trends in exploration expenditure

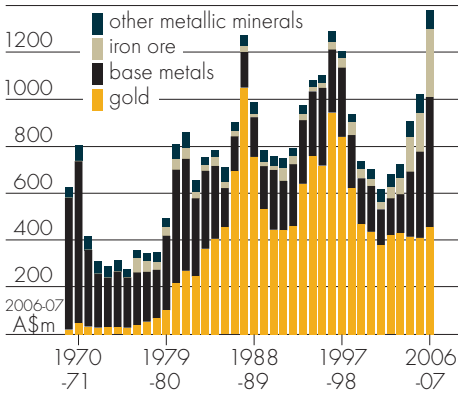
In line with global trends, mineral exploration activity in Australia is subject to cyclical fluctuations. Historically, peaks in Australian exploration expenditure have coincided with upturns in the global economy and increased demand for metals (particularly base metals); newly discovered prospective mineral provinces and the adoption of new technologies (Hogan et al. 2002).

There have been five distinct peaks in Australia's exploration expenditure since the 1970s (figure 33; ABS 2007c):

1 The nickel boom (peak 1970-71) – associated with higher nickel prices and the discovery of a new type of nickel deposit in Western Australia that improved the region's prospectivity. There were eleven major nickel discoveries between 1966 and 1970.

2 Resources boom (peak 1981-82) – associated with higher commodity prices following the second oil shock in the late

fig 33 **Australian mineral exploration expenditure**



1970s. An economic downturn in OECD economies placed downward pressure on world commodity prices in the early 1980s.

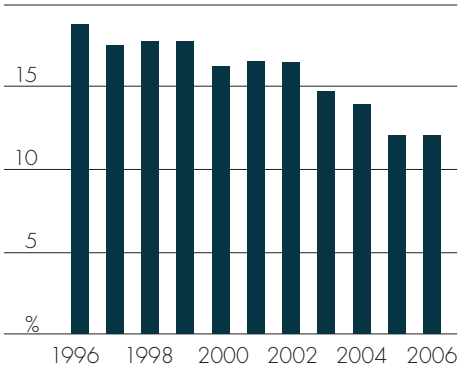
3 Gold boom (peak 1987-88) – associated with the adoption of a new gold ore processing technology that substantially lowered economic cut off grades. Higher gold prices during the 1970s are likely to have also stimulated increased interest in gold exploration.

4 Boom in gold and other resources (peak 1996-97) – associated with high commodity prices in the mid-1990s, the release of new government aeromagnetic data in prospective regions, several major gold and base metal discoveries and the adoption of new nickel processing technology (Hogan et al. 2002).

5 Current commodity boom – exploration expenditure has increased significantly since 2001 driven by the strong outlook for commodity prices. Gold exploration in Australia has remained relatively flat during this period. However, recent increases in other commodity prices (in particular base metals and iron ore), have encouraged increased exploration expenditure on other commodities.

Despite an increase in exploration expenditure in Australia, the discovery of new deposits, especially large, world class deposits has been limited over the past decade. This partly reflects an increased focus on brownfields exploration and in particular mine site exploration aimed at increasing resources at existing mines. Brownfields exploration has been encouraged by recent high commodity prices, which have made expanding production at existing mining operations in a short time frame very attractive. High commodity prices have also made mining at some previously subeconomic deposits economic at current prices. Mining at, or around, existing deposits is attractive for companies because projects can be started sooner and generally have a lower capital expenditure as a result of already existing infrastructure (Copeland et al. 2007).

fig 34 **Australian share of nonferrous mineral exploration budgets**



While exploration expenditure has increased, Australia's share of global aggregate exploration

expenditure has been declining. Exploration in Canada, Latin America, Africa and other key producing regions continues to outpace rising exploration expenditure in Australia (figure 34; MEG 2006). In response to this trend, governments at the Federal and State level have been implementing programs to encourage exploration expenditure (box 10).

box 10 **government initiatives to encourage exploration**

National

To address a decline in exploration in the late 1990s and early 2000s, the Mineral Exploration Action Agenda (MEAA) was announced in September 2002 with a vision of developing a sustainable mineral exploration industry that would be internationally competitive, efficient and environmentally and socially responsible. A Strategic Leaders Group of industry and government representatives identified the priority issues and indicated possible solutions. In July 2004 the *Road to Discovery: the Minerals Exploration Action Agenda* was released and identified four strategic areas to be addressed by joint government and industry action. The formal MEAA process was completed in December 2006. The strategic areas addressed in the MEAA included:

- Access to land: Within the MEAA, industry and governments worked cooperatively to remove impediments to land access while retaining the important Indigenous, environmental and social protection afforded by current legislation.
- Access to finance: The MEAA addressed a range of finance issues to improve the ability of Australian explorers to raise risk capital for exploration. These included consideration of a flow-through shares scheme as a mechanism to stimulate greenfields exploration. The MEAA successfully led to the reestablishment of a resources index on the Australian Securities Exchange.
- Access to precompetitive geoscience data: Members successfully advocated for increased geoscience funding with increases in most states. In August 2006, the Australian Government provided A$58.9 million to enable Geoscience Australia to pioneer innovative, integrated geoscientific onshore precompetitive geoscience research.
- Access to human and intellectual capital: The MEAA also recognised the importance of maintaining access to high quality human and intellectual capital for the future success of the mineral exploration sector and the wider resources industry in Australia. Governments and industry have continued efforts to attract and retain skilled workers, and ensure that the education system is producing graduates with the skills required for modern exploration (ITR 2007).

(www.industry.gov.au/minexpagenda)

continued...

box 10 government initiatives to encourage exploration *continued*

New South Wales

The New South Wales Government has established the New Frontiers initiative, which includes funding for new precompetitive geoscience mapping, geophysical surveys and geochemistry in greenfields areas; development of 3D geological models; seismic and subsurface geological mapping in frontier petroleum basins (NSW Government 2007).

(www.dpi.nsw.gov.au/minerals/geological/initiatives/new-frontiers)

South Australia

The plan for accelerating exploration (PACE) is directly linked to South Australia's strategic plan which targets economic growth; social wellbeing and support; indigenous wellbeing and support; and environmental standards. The program has exceeded initial expectations and now aims to maintain exploration expenditure in the state at A$100 million a year and grow minerals production and processing to A$4 billion a year by 2014. The PACE program considers strategies that are critical for accelerating exploration in South Australia through:

- improving information and policy approaches for land access decision making
- providing financial assistance for exploration
- surveying and collating existing geoscientific data
- making geoscientific data available using new methods and models and including greater detail for use in exploration
- utilising industry experts to increase the worldwide perception of mineral prospectivity in South Australia (PIRSA 2007).

Of particular note is the drilling collaboration between PIRSA and industry. Since the program's inception, A$2 million a year has been allocated to successful exploration projects. This element of PACE has focused exploration in greenfield areas – which assisted in the discovery of the Carrapateena and Beverly 4 Mile deposits – and has enabled junior explorers to obtain more funding for drilling.

The PACE program has also attempted to address the skills shortage by assisting in the establishment of a new School of Mining Engineering and the South Australian Centre for Exploration Under Cover.

(www.pir.sa.gov.au/minerals/initiatives/pace)

continued...

box 10 **government initiatives to encourage exploration** *continued*

Victoria

The Victorian Government has a number of initiatives to encourage exploration including:

- Victorian Initiative for Minerals and Petroleum – A$31 million has been dedicated to promoting mineral exploration in Victoria. This is supported by the gold undercover program.
- Gold undercover – A$9 million has been dedicated to develop new geoscience techniques to discover gold resources concealed under cover.
- Rediscover Victoria – A$5 million has been dedicated over four years to a new geoscience program that will encourage mineral exploration in parts of the state where little exploration has occurred (Victorian Department of Primary Industries 2007).

(www.dpi.vic.gov.au/dpi/nrenmp.nsf/LinkView/B1931C2501934DB54A2569C90007F73C555CBA5EA3034EAE4A256DEA0026DD80)

Queensland

The Smart Mining - Future Prosperity program is a four year program that commenced in September 2006 to provide new geoscientific data, provide financial assistance to explorers in frontier and under explored areas of Queensland, improve access to land and promote mining and non traditional careers among women. The program has three industry grants:

- collaborative drilling initiative – to accelerate testing by drilling in under explored areas of Queensland
- cluster formation initiative – to form groups of exploration companies that share resources by assisting with the cost of mobilisation of drilling equipment and geophysical resources to test exploration targets
- industry network initiative – to encourage the growth of junior exploration companies by assisting with access to technical and ancillary services to develop deposit models and generate drilling targets (Queensland Government Natural Resources and Water 2007).

The Smart Exploration program commenced in July 2005 as a four year A$20 million program to stimulate exploration investment in Queensland. The program targeted Mount Isa, Drummond Basin, Bowen and Surat Basins and the Rawdon Corridor, which are all considered to have high potential for the discovery of additional mineral and energy resources (Queensland Government Natural Resources and Water 2005).

(www.nrw.qld.gov.au/mines/smart_mining/smart_mining.html)

(www.nrw.qld.gov.au/science/geoscience/pdf/webbrochure.pdf)

continued...

box 10 **government initiatives to encourage exploration** *continued*

Western Australia

The Western Australian Government has allocated A$13.2 million to a geoscience information stimulation package consisting of A$12 million over four years and $1.2 million over three years for release of statutory mineral exploration reports. The program includes airborne geophysics, ground gravity, regolith geochemistry, geochronology, and geoscience mapping.

(www.doir.wa.gov.au/documents/gswa/gsdAR2003-04_mission_YIR.pdf)

Tasmania

The Tasmanian Government has dedicated A$5 million over four years, beginning in November 2006, to the TasExplore program to increase the level of precompetitive geoscience data. The program includes airborne geophysics, gravity surveys, field mapping; improvement of 3D geological model of the state; updating geoscience databases; and domestic and overseas prospectivity promotion (Tasmanian Government 2007).

(www.mrt.tas.gov.au/portal/page?_pageid=35,837094&_dad=portal&_schema=PORTAL)

Northern Territory

The Northern Territory Government has committed to a A$12 million exploration initiative – *Bringing Forward Discovery*. The program builds on the existing *Building the Territory's Resource Base* program. *Bringing Forward Discovery* comprises three broad elements – geoscience programs; project facilitation and promotion; and land access.

- Geoscience programs – the acquisition and delivery of new geoscience data with A$2.75 million dedicated a year.
- Project facilitation and promotion – the promotion of Bringing Forward Discovery to ensure that the Northern Territory is competitively positioned as a preferred location of exploration and mining investment.
- Land access – the Northern Territory government is committed to being proactive in assisting explorers gain land access in a timely fashion (Northern Territory Government 2007).

(www.nt.gov.au/dpifm/Minerals_Energy/Geoscience/index.cfm?header=Bringing%20Forward%20Discovery)

framework for mineral exploration

There are a number of factors that affect mineral exploration in Australia. This includes the widespread availability of geoscientific information, public economic and scientific research, and regulations affecting the minerals sector, including licensing, fiscal regime, environment, land access and native title.

geoscientific information

Precompetitive geoscience information is provided for the mineral exploration sector by the states and territories individually and in collaboration with Geoscience Australia. Geoscience Australia conducts targeted geoscientific surveys and research to provide information and new research methods and standards to support mineral exploration in Australia. In August 2006, the Australian Government announced a A$58.9 million funding package for Geoscience Australia to pioneer innovative, integrated geoscientific research to better understand the geological potential of onshore minerals (Geoscience Australia 2007c).

Geoscience Australia provides numerous geological and topographic maps and databases including mineral occurrences and deposits to assist mineral exploration. Much of this data is available free online. Geophysical data is available free online using GADDS, a data delivery system which provides magnetic, radiometric, gravity and digital elevation data.

The State and Northern Territory geological surveys also provide geological maps, databases and reports at regional and state scales, and have active geophysical and geological mapping programs to provide a modern framework for exploration. In addition, companies are required to provide the States and Northern Territory government with exploration results which after the confidentiality period is made open file and adds to the level of geoscientific information available and a record of past exploration activities undertaken and results obtained.

economic and scientific research

Ongoing economic and scientific research and development also contributes to Australia's strong minerals sector. ABARE is the Australian Government's applied economic research agency, which conducts research into issues affecting Australia's minerals sector and provides the Government with a better understanding of

policy options and their implications. For example, ABARE produced a number of reports linked to Australia's Mineral Exploration Action Agenda including: the role of public geological surveys in Australia; research and development in exploration and mining; native title and the minerals sector; and tax incentive options for junior explorers.

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) contributes to the sustainability of the minerals sector in Australia through innovative research to change the way mineral exploration is conducted in Australia. New exploration and mining technologies can influence private mineral exploration directly through technology adoption or indirectly through technology adoption by public geological survey organisations (Hogan 2004).

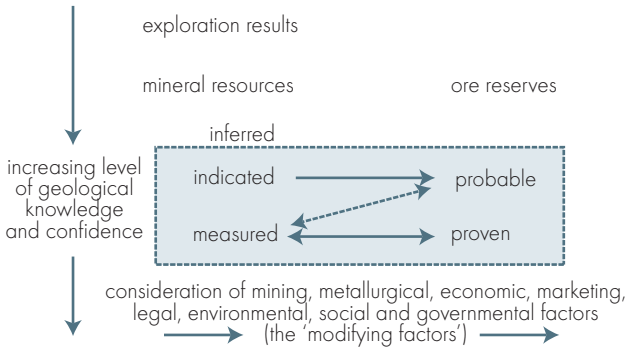
classification and reporting of resources

The resources of Australian Securities Exchange (ASX) listed companies are required to be classified under the Australasian Joint Ore Reserves Committee Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC code) to ensure transparency, materiality and competence in reporting. The JORC code outlines the minimum standards, recommendations and guidelines for the reporting of exploration results, mineral resources and ore reserves. The JORC code has been incorporated into the listing rules of the ASX since 1989 and has influenced the preparation of reporting codes in Canada, South Africa, the United States, the United Kingdom, Ireland and other European countries (JORC 2004; Hogan et al. 2002).

Companies are required to report data and information that may be of value to other investors. Examples of exploration results include the results of assays/drill-hole intercepts, outcrop sampling and geochemical and geophysical testing. Under the JORC code, reporting of exploration results must not give a false indication of the size and quality of the mineralisation.

Under the JORC code, a mineral resource is a concentration of mineralisation that, given its quality and size, has reasonable prospects for future economic extraction. The location, grade, quantity and geological characteristics of a mineral resource is known and is divided into subcategories of inferred, indicated and measured based on geological confidence (figure 35; JORC 2004). An ore reserve is the economically mineable part of a measured/indicated mineral resource, allowing for losses in the extraction process. Mining, metallurgical, economic, marketing,

fig 35 **relationship between exploration results, mineral resources and ore reserves**



legal, environmental, social and governmental factors are taken into consideration to sub divide reserves into the categories of proven and probable.

minerals legislation

ownership and authority over mineral resources

There are three tiers in Australia's federal system of government, including the Australian Government, the six state governments and two territories, and the local government sector. According to Australian legislation, mineral and petroleum resources are owned either by the Australian or state/territory governments rather than private individuals. None of the tiers of government engage in commercial exploration and development.

In the Australian federal system, the Australian and state/territory governments have separate roles and responsibilities with regard to resource exploration and development. The Australian Government sets national policy, including fiscal, monetary and taxation policy, foreign investment guidelines, immigration, competition policy, trade and customs, company law, international agreements, and native title. The states and territories manage and allocate mineral property rights, have primary responsibility for land administration, regulate operations (including environmental, and occupational health and safety), and collect royalties on the minerals produced.

The Australian Government has title and powers over the resources found outside the first three nautical miles of the territorial sea ('offshore'). The states and Northern Territory have jurisdictional involvement over resources found on their lands or inside the first three nautical miles of the territorial sea ('onshore').

The relevant state/territory departments for exploration and mining are:

- New South Wales Department of Primary Industries (www.dpi.nsw.gov.au/minerals)
- Primary Industries and Resources South Australia (www.pir.sa.gov.au/minerals)
- Queensland Department of Mines and Energy (www.dme.qld.gov.au)
- Western Australian Department of Industry and Resources (www.doir.wa.gov.au/mineralsandpetroleum/)
- Northern Territory Department of Primary Industry, Fisheries and Mines (www.nt.gov.au/dpifm/Minerals_Energy/)
- Victorian Department of Primary Industries (www.dpi.vic.gov.au/dpi/)
- Mineral Resources Tasmania – a division of the Department of Infrastructure, Energy and Resources (www.mrt.tas.gov.au).

Onshore mineral exploration and mining in Australia is governed by state/territory legislation (table 20). The legislation contains details on royalty arrangements, types of licences available, the processes to obtain these licences and the requirements to gain authority to conduct works, and processes for dispute resolution.

table 20 **Australia's state and territory mining legislation**

jurisdiction	relevant legislation
New South Wales	*Mining Act 1992*
Northern Territory	*Mining Act 2005*
Queensland	*Mineral Resources Act 1989*
South Australia	*Mining Act 1971*
Tasmania	*Mineral Resources Development Act 1995*
Victoria	*Mineral Resources (Sustainable Development) Act 1990*
Western Australia	*Mining Act 1978*
	Mining on Private Property Act 1978

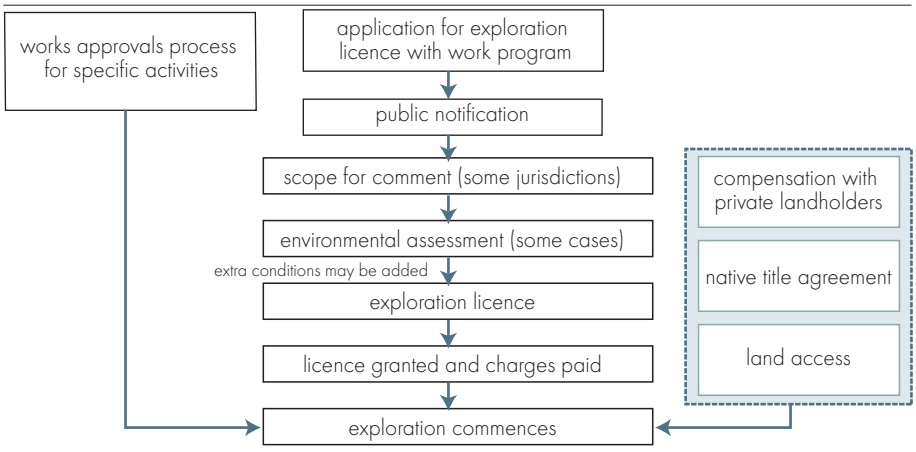
There are a number of key mining approval steps that are subject to legislation and regulation at the Australian, state/territory and local levels including:

- allocation of mineral resources and ensuring the public benefit from their utilisation (state/territory)
- land access for Crown and private land (state/territory)
- future act agreements on native title lands (Australian, state/territory)
- environmental protection (state/territory, Australian)
- planning approval (state/territory, local)
- heritage issues (state/territory, Australian)
- regional economic and social issues (all levels)
- water access (state/territory) (URS 2006).

exploration and mining licensing

State and territory governments are responsible for issuing mineral exploration and mining licences under the guidelines stipulated in their respective mining legislation. While processes differ across jurisdictions, generally, two key processes are required before exploration on private land can commence (figure 36). Works

fig 36 **general process for exploration approvals in Australian jurisdictions**



approval is required to allow activities such as land clearing; construction of access roads; water access and discharge; and noise and air emissions. In addition, an exploration licence must be obtained.

Exploration licences in Australia are issued by the state/territory mining department (on behalf of the Minister) and, where necessary, involve environmental assessment and public consultation. These licences last for up to six years and can be renewed for around the same period of time (table 21). A key requirement to obtain an exploration licence is the provision of an exploration program and demonstrated technical and financial resources to conduct exploration. In most states/territories, a company applying for a mineral exploration licence must physically peg the tenement for which the application applies (URS 2006).

Mining licences are also approved by the state/territory Minister responsible for minerals and can last for up to 21 years (table 22).

table 21 **Australian state and territory exploration licence conditions**

state	approved by	duration	renewal duration	maximum area
New South Wales	Minister	5 years	up to 2 years	343 km^2
Northern Territory	Minister	6 years	up to 2 years	1 716 km^2
Queensland	Minister	5 years	up to 5 years	343 km^2
South Australia	Minister	5 years	up to 5 years	1 000 km^2
Tasmania	Minister	5 years	Minister's discretion	250 km^2
Victoria	Minister	5 years	up to 5 years	1 716 km^2
Western Australia	Minister	5 years	1-2 years, then a further period of 1-2 years and in exceptional circumstances in periods of one year	240 km^2

table 22 **Australian state and territory mineral licence conditions**

state	approved by	duration	transferability
New South Wales	Minister	21 years	yes, requires Minister's approval
Northern Territory	Minister	Minister's discretion	yes
Queensland	Minister	Minister's discretion	yes, requires Minister's approval
South Australia	Minister	21 years	yes, requires Minister's approval
Tasmania	Minister	Minister's discretion	yes, requires Minister's approval
Victoria	Minister	20 years	yes, requires Minister's approval
Western Australia	Minister	21 years	yes, requires Minister's approval

There are typically three main stages in the process for obtaining mining project approvals. These are:

- the tenure process (where the mines department grants a mining lease)
- the environmental approvals process (where the likely environmental impact is assessed)
- gaining land access (where an agreement is made with landholder or through native title process).

There is more variation across states and territories in the mining approval process compared with the exploration approval process. This generally reflects the greater level of detail in the environmental assessment and other approvals required in the case of mining licences, such as the granting of planning permits and water licences. Depending on project size, it can take up to two years to obtain all relevant approvals for a mining project (URS 2006).

fiscal regime

corporate taxation and deductions

Corporations in Australia are taxed at a flat rate of 30 per cent. Some capital expenditures incurred by the minerals sector are given special treatment and are deductible. For example, royalty payments and expenditure on exploration, developing, operating and rehabilitating a mine is deductible in certain circumstances. In addition, companies are required to pay other indirect taxes, such as payroll, fringe benefits, fuel excise, and land taxes (ITR et al. 2007).

royalties

State and territory governments are responsible for collecting royalties for onshore mineral production. In 2004-05 the total value of mineral royalties and licence fees paid to state and territory governments was 3.5 per cent of the gross value of Australian mineral production. The basis for royalties varies between states and mineral type and are generally calculated based on production, sales or profit (table 23).

In South Australia, the Minister may declare that a mine may be taken as a 'new mine' where a reduced royalty rate applies. In particular, for a period of five years

table 23 **state royalties, selected minerals**

New South Wales	Northern Territory	Queensland
copper		
4% of ex mine value.	profit based royalty at 18% of the 'net royalty value' (where net royalty value exceeds $50 000) under the Mineral Royalty Act.	fixed rate of 2.7% or variable ad valorem rate (1.5–4.5%) as advised by the department each quarter applied to payable metal value. Rate applies to the revenue base less statutory exemption of $7500 per quarter [the producer can elect fixed or variable option for a period of 5 years]. A reduced royalty applies to the next $4 million a year. After 31 December 1997, processing discounts of 20% apply when processed in the state to 95% contained metal.
gold		
4% of ex mine value.	as for copper	fixed rate of 2.7% or variable ad valorem rate (1.5–4.5%) as advised by the department each quarter applied to payable metal value. Rate applies to the revenue base less statutory exemption of $7500 per quarter [the producer can elect fixed or variable option for a period of 5 years].
nickel		
4% of ex mine value.	as for copper	2% of the gross proceeds of the sale, disposal or use of the minerals for each year, after deducting $30 000.
zinc/lead		
cobar zinc – 4% of ex mine value. Broken Hill – 20% of profit with adjustments for grade of ore mined. Other mines – 4% of ex mine value.	profit based royalty at 18% of the 'net royalty value' (where net royalty value exceeds $50 000) under the Mineral Royalty Act.	fixed rate of 2.7% or variable ad valorem rate (1.5–4.5%) as advised by the department each quarter applied to payable metal value. Rate applies to the revenue base less Statutory exemption of $7500 per quarter [the producer can elect fixed or variable option for a period of 5 years]. A reduced royalty applies to the next $4 million a year. After 31 December 1997 processing discounts of 25% for lead and 35% for zinc apply when processed in the state to 95% contained metal.
tin (concentrate)		
4% of ex mine value.	as for copper	2% of the gross proceeds of the sale, disposal or use of the minerals for each year, after deducting $30 000.

table 23 **state royalties, selected minerals** *continued*

South Australia	Tasmania	Victoria	Western Australia
copper Olympic Dam – ad valorem rate of 3.5% of assessed value, with a sliding scale profit that increases when return on capital for a 5 year period exceeds 16%. The value of products is assessed ex mine lease.	profit based royalty equal to 1.6% on net sales plus a profit component. The royalty of 1.6% is only where net sales are less than $100 000 a year. The maximum royalty is limited to 5% of net sales.	2.75% of net value.	5% of royalty value for concentrates; 2.5% for metallic copper.
gold 2.5% of assessed value. Present rate for gold being $0.3/ gram. A special royalty is applicable to gold from Olympic Dam – see copper.	as for copper	NIL	2.5% of value. The royalty reverts to 1.25% if the average gold spot price for a quarter is less than $450 an ounce. The first 2500 ounces a year are exempt.
nickel not available – but would be 2.5% of assessed value.	as for copper	2.75% of value.	2.5% of value of contained nickel. 5% of royalty value for concentrates,
zinc/lead 2.5% of assessed value ex mine lease	as for copper	2.75% of value.	2.5% for metallic form.
tin (concentrate) not available – but would be 2.5% of assessed value.	as for copper	2.75% of value.	2.5% of realised value of tin metal.

commencing on the date of paying the first royalty payment, the royalty payable in relation to minerals (other than extractive minerals) recovered from a new mine is equivalent to 1.5 per cent of the value of the minerals.

other legislation affecting the minerals sector

Other major laws that affect the minerals sector in Australia relate to environmental and native vegetation protection; land rights and native title; planning and water.

environmental protection

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the Australian Government is responsible for the regulation of the environmental impact assessment of any company activities or actions by Australian Government departments that will have a significant impact on the environment. These situations generally relate to world and national heritage properties, Commonwealth marine environments, threatened or migratory species, nuclear actions and Ramsar wetlands of international importance.

Bilateral agreements have been made between the Australian Government and a state or territory in the EPBC Act. The bilateral agreements minimise duplication in the environmental assessment and approval process by enabling the Australian Government to rely on state or territory assessment processes and, in limited circumstances, state or territory approvals.

State and territory governments are responsible for assessing potential environmental impacts of activities and ways to manage these impacts before issuing mining titles. In all instances, land disturbed by mining must be rehabilitated to a high standard and returned to an agreed post-mining land use. The process for assessing environmental impact is generally consistent across all states and territories. Key common features are:

1 The mining company must describe the proposal, including its duration; infrastructure required; the proposed program of community consultation; potential environmental impacts, their significance and proposed methods to manage the impacts.

2 The appropriate government authority will determine whether an environmental impact assessment is necessary, and if so, the level of assessment and

the issues to be addressed – the level of assessment will differ according to the environmental significance and complexity of the proposed project. When further assessment is required for a project that only has a local/regional impact, a public environmental report (or similar document) is generated and is usually available for public comment for four to six weeks – otherwise, for issues of a wider interest an environmental impact statement (which is more comprehensive and detailed) is usually available for public comment for eight to twelve weeks.

3 A public inquiry may be used for exceptionally complex or controversial projects.

4 After this process, the government authority or appropriate minister will issue the project with an environmental approval (if considered to have an acceptable effect on the environment). This is generally linked to an environmental management system that addresses operational issues, such as tailings, noise, emissions controls and dust suppression.

Key items of environmental and rehabilitation outcomes that are addressed through environmental legislation include the prevention of air, water and noise pollution; protection of flora, fauna and habitats, particularly for threatened species; recognition and prevention of adverse impacts on indigenous, archaeological and geological sites; the effect on scenic amenity; public safety and progressive site rehabilitation (URS 2006).

land access

Land access is important to exploration activities because of the vast amount of land that is explored. State, territory and national legislation defines the processes for exploration and mining companies to obtain land access from respective owners.

1 private land access – state/territory legislation defines the arrangements for determining compensation to private landholders. In all jurisdictions compensation is payable for: land surface damage; severance from other land; restriction on right of way; damage to improvements and reasonable expenses to control damage.

2 crown land access – access will vary according to three broadly defined land categories: crown land exempt from exploration and mining (for example, national or state parks); crown land on which exploration and mining is restricted (for example, nature conservation reserves) and Crown land on which mining is not restricted (land without a conservation status).

There is a considerable proportion of Crown land that the mining sector has no access or restricted access to. For example, in Victoria, access is restricted on more than half of Crown land and in Tasmania mining is prohibited in 30 per cent of the state because of State Reserves and World Heritage Areas (URS 2006). The proportion of land that the industry has no access or restricted access to is increasing. For example, in Western Australia the government has purchased 54 pastoral leases which are to be converted into nature reserves.

native title

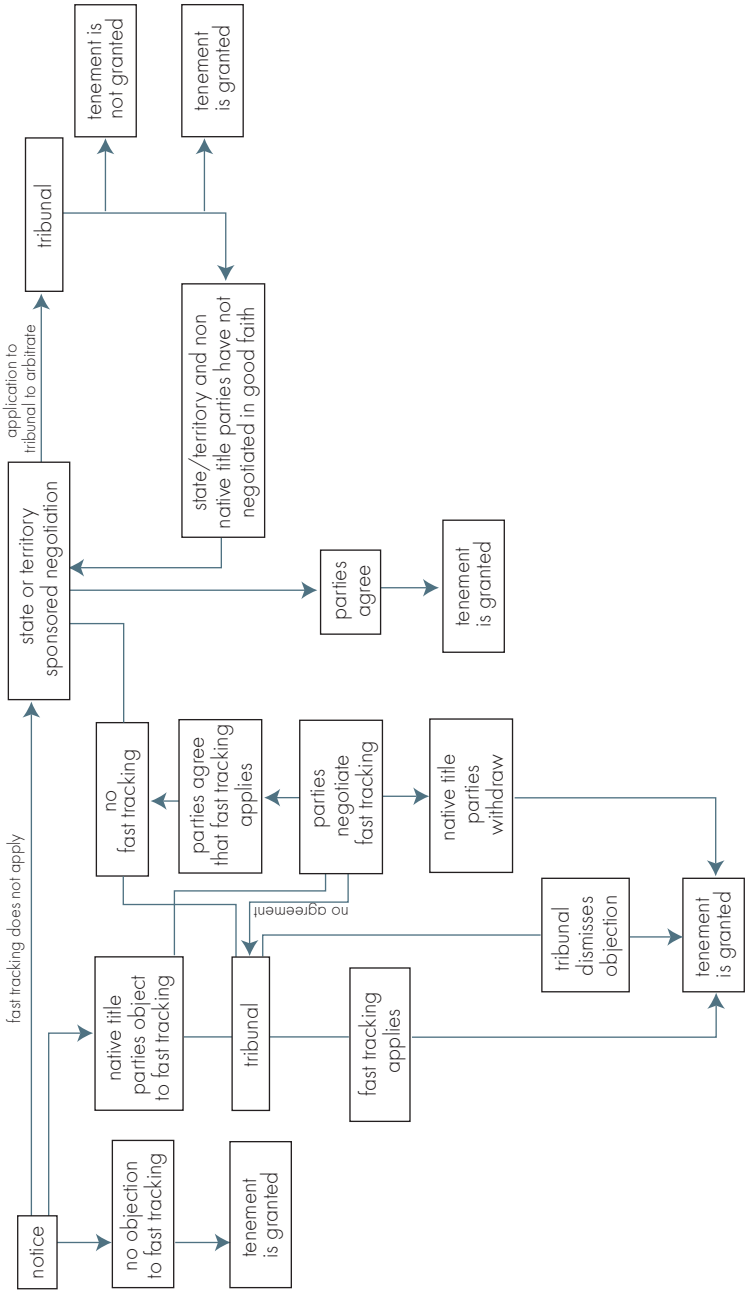
All applications for mineral tenements are subject to the consideration of *Native Title Act 1993*. Where the land may be subject to native title, property rights are assigned to native title parties. As a result, these parties are able to negotiate agreements with exploration and mining companies that involve the receipt of economic benefits in return for the temporary impairment of cultural and social rights (Hogan et al. 2002). The Act provides a regime for processing grants and acts affecting native title rights and interests such as the granting of an exploration or mining licence.

The native title process is relatively complex (figure 37; NNTT 2000). It begins with the state or territory publishing a notice about the granting of a tenement for a proposed development. The notice includes whether the state or territory considers that fast tracking (expedited procedure) applies. Potential claimants have three months to file a native title claim with the Federal Court. These claims must be accepted and registered with the National Native Title Tribunal (NNTT) within four months to have the right to negotiate. The project proponent must then negotiate with the claimant (URS 2006; NNTT 2000).

If it is deemed that a proposed activity is likely to have a minimal impact on community and social activities, unlikely to interfere with sites of significance or involve major land disturbance, the expedited procedure can apply. Native title parties have four months to object to the fast tracking process. In the absence of an objection, the proposed activity can be approved. If there is an objection all parties are encouraged to come to an agreement about the expedited procedure. If no agreement is reached the matter goes to the NNTT. If the objection is upheld, all parties must negotiate the granting of the tenement.

During formal negotiation, the state or territory government typically assists in the negotiations – parties may ask the NNTT to mediate. After six months of negotiations, either party can ask the NNTT to determine whether the project can

fig 37 **tenement applications and the native title process**



proceed. When arbitration proceeds, the NNTT decides whether the proposed project may proceed. If the NNTT cannot make a decision within six months it must advise the Australian Government Attorney General why the timeframe was not met. The Australian Government Attorney General can overrule the NNTT's decision within two months. Some states have negotiated agreements with Indigenous communities that can be used by exploration companies (see box 11).

The Australian Government has acknowledged that there have been problems with the Native Title process (Attorney-General's Department 2007). As a result, reforms to key aspects of the native title process were introduced in late 2006. The reforms are primarily aimed at identifying and implementing improvements to the processes for the recognition of native title and the resolution of disputes over land which may be subject to native title.

box 11 Native Title and exploration in South Australia

Regional Indigenous Land Use Agreements (ILUA) for exploration activities in South Australia have been negotiated between the government, the Chamber of Mines and Energy and the Aboriginal Legal Rights Movement representing the native title claimants. As a result, companies that wish to explore in a certain area can use a pre negotiated ILUA and reduce the level of negotiations with the claim group if they can comply with the terms of the agreement. The agreement also includes Aboriginal heritage clearance with pre negotiated costs and a timeframe for the process (URS 2006). The ILUA allows companies to use and develop land with certainty that is in accordance with the *Native Title Act 1993*.

Aboriginal Land Rights Act

The *Aboriginal Land Rights (Northern Territory) Act 1976* is Australian Government legislation, but only applies to the Northern Territory. Significant areas of the Northern Territory are subject to the Act. Under the Act, freehold title is conveyed to the Aboriginal landowners, giving them the power to veto any exploration activities.

The Act is a conjunctive process, typically negotiation and consultation applies at the exploration stage. If exploration proceeds to extraction, the company will not need to go through the negotiation process again, but will need to make a mining agreement with the Traditional owners and Land Council.

There are four stages in the Aboriginal Land Rights process including:

1 Issue of 'Consent to Negotiate' – comes under the *Mining Act*. The 'Consent to Negotiate' is issued after a two month public notification period has closed.

2 'Consent to Negotiate' – commences with the *Aboriginal Land Rights Act*. The project proponent has three months to lodge an application for consent for an exploration proposal.

3 Negotiating period under the *Aboriginal Land Rights Act* – once consent to negotiate has been obtained, the parties commence a twenty two month negotiation period which commences on 1 January in the year following the lodgement of the proposal with the Land Council. Extensions to this period are mutually agreed to between the applicant and Land Council.

4 Agreement under the *Aboriginal Land Rights Act* – when the agreement has been reached and formal documentation entered into by all parties, consent to the grant is given by the Federal Minister and the exploration licence may be granted by the Northern Territory Government (under the *Mining Act*).

Under the *Aboriginal Land Rights Act* the project proponent is entitled to attend the first meeting between the traditional owners and the Land Council to explain the exploration proposal. The proponent may also attend the final meeting to discuss the terms and conditions of the agreement.

If the traditional owners refuse consent to grant an exploration licence, the land subject to the application will go into moratorium for five years. This means that no further negotiations regarding that application can take place. At anytime during this five year period, at the instigation of the traditional owners (through the Land Council), negotiations may recommence over this area. However, this does not occur often (Hose 2006).

foreign ownership

Australia's foreign investment policy is designed to encourage investment consistent with the interests of the Australian community. The government recognises the substantial contribution foreign investment has made, and will continue to make, to the development of Australia's industries and resources. This policy, together with the *Foreign Acquisitions and Takeovers Act 1975* (FATA), provides a framework for government review of foreign investment proposals.

There are a number of situations where foreign investors seeking to invest in mineral exploration must obtain approval from the Foreign Investment Review Board (FIRB). Under foreign investment policy, proposals by foreign companies to develop a business involving an investment in excess of A$10 million are required to notify the FIRB and obtain relevant approvals. Foreign investment proposals are normally approved subject to them not being considered contrary to the national interest.

All direct investment by foreign governments, or their agencies, requires approval from the FIRB regardless of the size of investment. In addition, foreign investors wishing to obtain a substantial interest (more than 15 per cent) in an Australian company with total assets worth more than A$50 million must provide the government with notification. Generally, proposals of foreign investment in businesses with total assets of more than A$100 million will be examined more thoroughly.

In general, foreign investors that wish to acquire an interest in mineral exploration licences are not subject to the *Foreign Acquisitions and Takeovers Act 1975* unless the exploration rights are part of the assets of an acquired company. Foreign investors are not required to seek Australian participation in the exploration process.

planning and water approval

Planning approvals are managed by both state/territory and local governments, but are driven primarily by state/territory legislation and standards. Local governments typically formulate and administer planning schemes and issue permits accordingly. When issuing permits, local governments will consider the potential of the project to affect future uses of the land. Some states have a centralised government coordinating authority which can assist large scale projects (for example the Western Australian Office of Development Approvals Coordination (box 12) and the Queensland Coordinator General).

Water is required for all aspects of mining operations. In some instances, mining operations require the removal of water to ensure access to the mineral deposit. Water access – usually from groundwater or river systems – will typically require government approval. In addition, the development of water related infrastructure (such as water treatment facilities) will require some form of planning approval (URS 2006).

box 12 Office of Development Approvals Coordination

The Office of Development Approvals Coordination (ODAC) was established in 2005 to streamline approval processes and coordinate approvals for major projects in Western Australia. ODAC works with appropriate government agencies and project proponents to define what approvals are required; the information required to obtain those approvals; and a mutually agreed timeframe to complete all approvals. The ODAC monitors agency compliance with expected timelines. The ODAC also reviews new regulatory proposals so the government is aware of the impact on project approvals and timeframes.

duty concessions

Several Australian Government programs allow the entry of goods used by the minerals sector into Australia duty free or at a concession (table 24; ITR et al. 2007).

table 24 duty concessions – Australia

Certain Inputs to Manufacture (CIM)	Provides duty free entry for certain goods that are used in activities directly related to export enhancement or import replacement. Must demonstrate that the goods have a substantial performance advantage in producing the product over Australian made substitutes.
Enhanced Project By-law Scheme (EPBS)	Provides eligible goods for major projects in the mining, resource processing, agriculture, food processing, food packaging, manufacturing and gas supply industries with tariff duty concessions. Eligible goods include those that are not produced in Australia or are technologically superior to Australian made products. Projects must spend $10 million or more on capital goods to be eligible for the concession.
Tradex	Provides upfront exemptions from customs duty and goods and services tax (GST) on imported goods that are intended for direct re export or used, wasted or lost in the manufacture of goods that are intended to be exported. The export of imported goods must take place within one year of importation. Companies must keep detailed records that illustrate that the imported goods were incorporated into the goods that were exported.
Tariff Concession System	Provides a Tariff Concession Order (TCO) if, at the time of application, a substitutable good is not produced in Australia. A TCO can allow either the duty free importation of goods (as consumption goods for balance of payments statistics) or at a rate of 3 per cent.

other factors affecting mineral exploration

access to capital

Mineral exploration in Australia relies heavily on the ability to raise capital. The majority of capital is acquired through equity raisings on the Australian Securities Exchange – approximately 75 per cent of exploration expenditure in Australia is raised in Australia. There has been a strong increase in initial public offering (IPO) raisings over the past few years. As at August 2007, there were 839 resources companies listed on the Australian Securities Exchange (Geoscience Australia 2007b; Minmet 2007).

availability of skilled labour and equipment

Reflecting a global trend, Australia's mineral sector is experiencing difficulties in securing sufficient inputs, including materials, equipment, skilled labour and professionals. In this environment, where demand from developers for labour, equipment and materials is rising faster than supply, the impact on project development is being manifested in delays to scheduled completion dates for projects and in increases in project capital costs (Haine et al. 2006).

indonesia

Indonesia is a significant world producer of tin, copper, nickel and gold, although the full extent of mineral reserves in Indonesia is not well known. In 2006, Indonesia accounted for 4 per cent of APEC mineral exploration expenditure. Exploration expenditure in Indonesia has fallen dramatically since 1997, reaching a low point in 2002. While there has been a slight recovery since then, exploration expenditure in 2006 was only 20 per cent of previous highs.

The contract of work system which has been successful in encouraging mineral exploration in Indonesia because of:

- the granting of conjunctive title to the contractor, or the right to perform consecutive activities from survey and exploration to mine development, production, processing and marketing of the final product
- the granting of lex specialis status, or the provision that the contract is not subject to changes in government laws or policies after signing for the period that the contract is in force.

However, some issues include:

- uncertainty associated with the lengthy delay in passing of the new Mining Law
- uncertain regulatory process, particularly at the regional and district levels
- broader concerns relating to Indonesia's investment climate
- access to land and compensation for use of protected land under the Forestry Law
- impacts of the prevalence of illegal small scale mining.

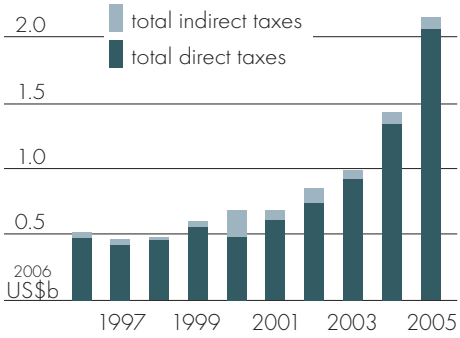
overview of the minerals sector in Indonesia

contribution to the economy

In 2005, the production of mineral commodities accounted for around 2 per cent of gross domestic product in Indonesia. The sector's contribution to economic activity varies significantly across different regions in Indonesia and represents a large component of the gross regional product of several provinces (PricewaterhouseCoopers 2006c).

The minerals sector provides a range of direct benefits to the Indonesian economy including employment in regional areas, government revenue in the form of royalties and taxes, and indirect benefits, including the development of the mining services industry. In 2005, the minerals sector contributed US$2.2 billion (in 2006 dollars) to the Indonesian economy in taxation revenue, comprising US$2.1 billion in direct taxes and US$0.1 billion in indirect taxes (figure 38; PricewaterhouseCoopers 2006c).

fig 38 **tax payments in Indonesia's minerals sector**



profitability

There is evidence that the average profitability of companies in Indonesia's minerals sector is relatively high compared with other economies. According to PricewaterhouseCoopers' 2006 survey of producing and exploration companies, which represents a significant proportion of Indonesia's mineral production, it is estimated that the ten year average return on capital in the minerals sector was 8.5 per cent, compared with 3.7 per cent in Australia. Similarly, the return on shareholder's funds was 17 per cent in Indonesia, compared with 9.4 per cent in Australia. However, profitability in the minerals sector is highly variable and is distorted by a few large, profitable mines with low shareholders' funds – the five largest companies accounted for 71 per cent of the total revenue reported by survey respondents (PricewaterhouseCoopers 2006c).

mineral resource base

Indonesia has significant mining potential, based on a wide mix of mineral resources. It is ranked as one of the most attractive regions in the world in terms of mineral prospectivity according to the 2006-07 Fraser Institute Survey of Mining Companies (Fraser Institute 2007). The full extent of mineral reserves is not known, with many areas yet to be explored comprehensively.

The major mineral reserves found in Indonesia are copper, gold, silver, nickel, tin and bauxite (table 25). Reserves of several metallic minerals, including gold and copper, are distributed evenly across Indonesia, while others are concentrated in particular regions. For example, bauxite is located in Riau, Bangka Island and West Kalimantan, and nickel and chromite is located in the south eastern part of Sulawesi, Halmahera and Papua (map 2).

production

Indonesia is a significant producer of tin, copper, nickel and gold. Mineral production in Indonesia varied over the past decade (figure 39). After growing steadily from 1997 to 2002, growth in copper and gold production declined. This resulted from a significant slippage at the Grasberg open pit mine and the closure of the Minhasa and Kelian mines. Gold and copper mine production also declined in 2006 because of supply disruptions, including as a result of protests, and the mining of lower grade ore. In contrast, nickel production has maintained steady

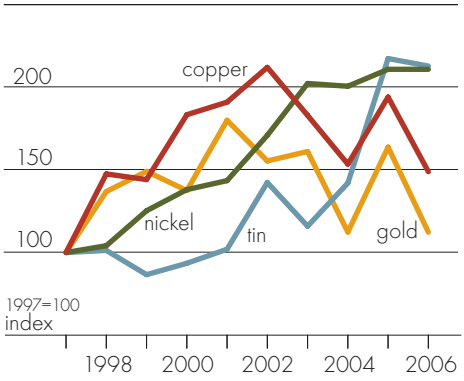
table 25 **selected mineral reserves, production and trade, 2006, Indonesia**

	reserves a		mine production			exports – refined	
	kt	reserve to production ratio (years)	kt	world share %	world rank	kt	world share %
Bauxite	5 700	2.4	10 500.0	5.0	6	0	na
Copper	30 400	28.6	816.6	5.4	5	110.9	1.5
Gold	2.6	15.4	0.1	4.7	7	na	na
Nickel	na	na	150.0	10.8	4	na	na
Tin	400	3.3	117.5	36.2	1	112.9	34.2

a Reserve data provided by Indonesia for 2005. **na** Not available.
Sources: King (2007); WBMS (2007); GFMS (2007); INSG (2007).

growth over the period 1997 to 2006, mainly a result of improved productivity at mine sites through plant optimisation and higher production at the Inco mine (PricewaterhouseCoopers 2005).

fig 39 **mine production**
Indonesia



exports

Most of Indonesia's mineral production is exported. In 2006, Indonesia accounted for around 34 per cent of global tin exports, and 2 per cent of global copper exports (table 25). Given the relative importance of Indonesia in the trade of these commodities, production disruptions in Indonesia can have a significant impact on world prices.

A large proportion of Indonesia's mineral exports are destined for other APEC economies. Japan is the main export market for Indonesian bauxite, copper and nickel ores and concentrates. The Republic of Korea and Singapore are the primary markets for Indonesian refined nickel and tin (Mélanie et al. 2005).

map 1 **major mines in Indonesia**

trends in exploration expenditure

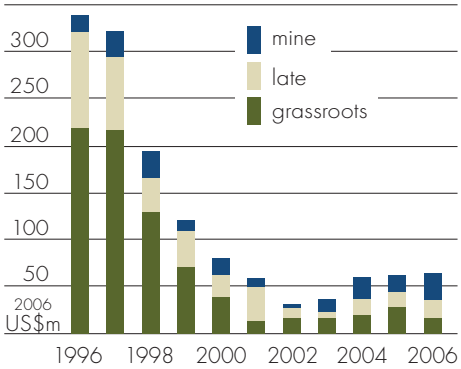
There has been a major reduction in mineral exploration expenditure in Indonesia since 1997. This was partly the result of the downturn in economic activity that occurred throughout Asia at that time and increased the risk of investment in Indonesia. As a consequence, many projects in Indonesia were delayed or suspended (Suryantoro and Manaf 2002).

Other factors that have driven the downward trend in mineral exploration expenditure in Indonesia include the decentralisation of mining approval processes following the autonomy laws in 1999 and 2004, and the restrictions placed on some mining activities following the implementation of the Forestry Law in 1999 (Suryantoro and Manaf 2002). The introduction of the Forestry Law halted around 150 projects, including several large scale projects (MEG 2006). Uncertainty associated with the passing of the new Mining Law, that has been in draft form for some time, has also been important.

There has been a slight recovery in exploration expenditure in recent years, though this remains at only 20 per cent of pre 1997 levels.

Traditionally, the majority of exploration activity in Indonesia has involved greenfield sites. However, recent exploration has been conducted at existing mine sites as part of short term production increases to take advantage of high commodity prices (figure 40; MEG 2006). The lack of greenfields exploration activity in Indonesia is a significant issue as the continued development of the mining sector depends on ongoing exploration, discovery and development of new deposits. Given the success rate of exploration to the discovery of economic deposits and the lengthy process from discovery to production, it is unlikely that there will be significant new mine development in Indonesia for some years.

fig 40 **exploration expenditure, by stage**
Indonesia

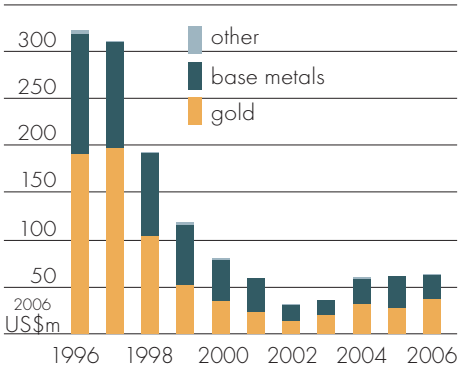


Investment in new mine development and fixed assets have also fallen significantly from their peak in 1998. In addition, most investment in these

categories has related to replacement of capital at existing large mines rather than to the development of new mines or expansions.

Over the past decade, the majority of exploration expenditure has been focused on the discovery of gold and base metal resources (figure 41; MEG 2006). This reflects increased exploration around large existing world class gold and copper deposits such as Grasberg and Batu Hijau.

fig 41 **exploration expenditure, by mineral** Indonesia



framework for mineral exploration

There are a number of issues that affect mineral exploration in Indonesia. These include the availability of geoscientific information, regulations affecting the minerals sector, as well as the provision of infrastructure and the prevalence of illegal mining.

geoscientific information

It is mandatory for companies to provide geoscientific information to the government after a prescribed period of time. The existing Geological Agency is under the Ministry of Energy and Mineral Resources. The agency has a mapping division, a mineral resource inventory division and an environmental geology division. A National Data Centre for Energy and Mineral Resources is being established to coordinate the data.

Indonesia, through the Directorate of Mineral Resources Inventory of the Ministry of Energy and Mineral Resources, has been a prime contributor to the development of a regional minerals database under the ASEAN minerals cooperation program. The structure of the Indonesian database has been accepted by the ASEAN project as the standard for all countries in the ASEAN region.

The mineral reserves of Indonesia are not well explored and significant further exploration is required to prove up additional reserves. Indonesia's major islands

and some smaller islands have been mapped at the 1:250 000 scale. The main island of Java has been mapped at the 1:100 000 scale. All geological maps are digitised and are available in electronic format upon payment of a fee. Geochemical data, which is important in the exploration of metallic metals, is only available for some of the major islands (Mélanie et al. 2005).

minerals legislation

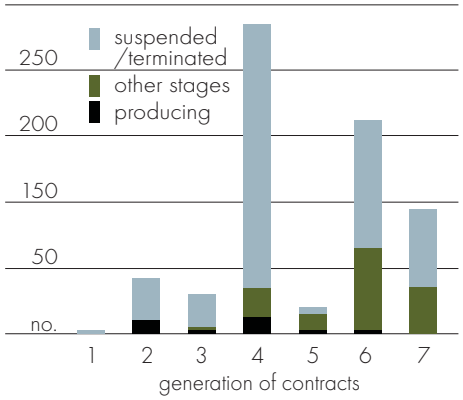
ownership and authority over mineral resources

Under the Indonesian Constitution, all natural resources are under the jurisdiction of the state and are to be used for the benefit and welfare of the people. Mining and exploration in Indonesia are governed by the Mining Law 1967.

current mining law

The Mining Law 1967 establishes the broad framework for the operation of the mining sector in Indonesia. The detailed operating environment is established by a mining right (Kuasa Pertambangan or KP) for domestic investors and a contract of work for foreign investors. The current Mining Law 1967 regulates the principles of mining operations in Indonesia. The law regulates minerals ownership, grouping of minerals according to their importance, the way mining will be conducted by different parties, the role of local governments and the way in which mineral development can be licensed or authorised.

fig 42 **contracts of work by generation and status**



Contracts of work are contracts between the Government or state owned enterprises and contractors to carry out specific tasks. The contract of work system is currently up to the eighth generation, with each generation incorporating changes to terms and conditions. To date, no eighth generation contract has been signed (figure 42; PricewaterhouseCoopers 2006c).

Total activity under any generation of contracts provides an indication of the attractiveness of the terms and conditions contained in the contract. For example, the third generation contract of work imposed new taxes and restricted foreign remittances which discouraged foreign investment and reduced total activity. Conversely, the removal of restrictive conditions resulted in much higher activity under the fourth generation of contracts.

There have been two conditions under the contract of work system that have been important in attracting foreign investment in the minerals sector. These are:

- the granting of conjunctive title to the contractor – this provides the right to perform consecutive activities from survey and exploration to mine development, production, processing and marketing of the final product.
- the granting of lex specialis status – this is intended to provide certainty to investors with more certainty by ensuring that the contract is not subject to changes in government laws or politics after signing for the period that the contract is in force (Mélanie et al. 2005).

Many investors consider that the Mining Law and contract of work system have had a positive impact on investment in Indonesia's minerals sector. However, changes to other Indonesian legislation and regulation, including those relating to regional autonomy and life protection of forests, have increased uncertainty in the minerals sector and have contributed to the decline in mining activity and investment.

draft mining law

The Indonesian Parliament is considering a draft revision of the mining law which is likely to result in significant changes in the operating environment for investors. A key issue is the allocation of responsibilities between central and regional governments. The new draft mining law concentrates power at the provincial 'district' level, rather than in the central government. There are 33 provinces and 440 districts or regencies in Indonesia. There is concern about how decentralisation will achieve consistency, transparency and certainty in the mining regulations and the implications of licence areas that cover multiple districts. A joint committee has been established at the central government level to consider inconsistencies with regional by laws.

Industry has also expressed concern about the removal of the contract of work system under the proposed system and its replacement with a new license system

that would abolish conjunctive title and does not provide an automatic right to convert licences from exploration to development (removing security of tenure).

Under the draft mining law, it is possible that companies will be required to do more value added processing domestically. As such, developers will be required to process mined ores into refined products in Indonesia. This could potentially increase the cost of operations, as companies are required to invest in high cost technologies and hire skilled labour, which could affect future investment in the industry.

The draft mining law would also end lex specialis status, meaning mineral exploration or extraction projects would be exposed to changes in government legislation during the period that the contract is in force.

exploration and mining licensing

Under the current Mining Law, Indonesian companies, cooperatives or private individuals can obtain a mining authorisation (Kuasa Pertambangan) from the Government. The authorisation can come in the form of a general survey permit, an exploration permit, an extraction permit, a processing permit, a transportation permit or a sales permit (table 26). One enterprise or individual can hold up to five mining authorisation permits. The holder of a mining authorisation has no ownership rights over the land. The land must be restored and returned to the Government on completion of mining (IMA 1988).

table 26 **permit conditions – Indonesia**

permit type	duration	extension duration	maximum area
general survey	1 year	1 year	50 km^2
exploration	3 years	3 years	20 km^2
extraction	30 years	10 years	10 km^2

A contract of work for foreign investors is negotiated with the Ministry of Energy and Mineral Resources, which makes a report to the Central Government Investment Coordinating Board, the Parliament and the President. The report makes a recommendation based on a technical and economic assessment of the mining proposal, including its potential contribution to economic growth. If approved, the contract of work is signed by the President. The rights and obligations of a contract of work cover the contractor for all stages of mining from initial survey through to extraction. Changes to legislation do not affect the terms and conditions of existing contracts.

In general, the contract stipulates five stages of work – general survey, exploration, evaluation, construction and operation (table 27). Contract areas vary in size, but should not exceed 250 square kilometres. To promote the national interest, the company must employ Indonesian personnel (and provide them with the required training) and utilise Indonesian services, raw materials and products manufactured in Indonesia where possible. Commonly, the contract of work requires the foreign company to transfer up to 51 per cent of company shares to Indonesian ownership after ten years.

table 27 **contract of work conditions – Indonesia**

stage	duration	extension duration
general survey	1 year	1 year
exploration	3 years	2 years
evaluation	1 year	1 year
construction	3 years	
operation	30 years	20 years

In the exploration stage, the company is obliged to spend an agreed amount annually on exploration activities. The company is required to submit an annual program and budget to the Department of Mines and Energy (IMA 1988).

fiscal regime

taxation

Under the current Mining Law, companies operating under a Kuasa Pertambangan are subject to the general Indonesian tax rules in force at any given time. This regime does not specify distinct tax rules. Conversely, the land rent, corporations tax, sales tax and a tax of general application on transfer of ownership of motor vehicles and ships that must be paid by foreign companies under the contract of work system are specified in the contract and generally reflect the overarching legislation at the time of signing. These rules are typically set out for the duration of the contract, regardless of changes to legislation (PricewaterhouseCoopers 1998). However, there is scope for companies with large strategic investments to negotiate special arrangements/rates with the government.

Generally, resident companies are taxed on their income from all sources, with tax credits for income that was taxed outside Indonesia (table 28). Nonresidents are only taxed on income from Indonesian

table 28 **company tax rates – Indonesia**

taxable income bracket	tax rate
≤ IDR 50 million	10%
IDR 50–100 million	15%
≥IDR 100 million	30% or prevailing rate

sources, which are also subject to relief under double taxation agreements. However, any nonresident company with a permanent establishment in Indonesia, such as a branch headquarter, is taxed on:

- the income from the business activities and assets
- income from the activities of the permanent establishment and sales of goods and services in Indonesia and
- all other income received by the permanent establishment such as dividends, interest, royalties, rent and other income associated with the use of property, fees, services etc (Anderson Consulting 2001).

table 29 **summary of main features of seventh generation contract of work – Indonesia**

	seventh generation	
dead rent on each stage of work	US$/ha/yr	
general survey	0.025–0.05	
exploration	0.10–0.35	
feasibility	0.50	
construction	0.50	
operation	1.5–3.00	
national tax	R	NR
	%	%
interest	15	20
dividends	15	20
dividend (founder shareholders)	7.5	7.5
royalties	15	20
rentals, technical, management fees	6	20
fees for other services		20
fees for other services performed outside Indonesia		20
value added tax rate (%)	10	

R = resident; NR = nonresident
Source: PricewaterhouseCoopers (1998).

Under the contract of work, companies are required to pay land and building taxes and dead rent – an annual amount based on the number of hectares in the contract of work area and stage of the contract of work. During the exploration stage, the dead rent is US$0.10 per hectare. Both these taxes are deductible against taxable income (table 29).

Value added tax (VAT) is imposed on most goods and services at a rate of 10 per cent. The rate can be adjusted by government regulations to as low as 5 per cent and as high as 15 per cent. Companies operating under a contract of work are designated as VAT collectors, and as such, must collect and pay all VAT from goods purchased or services received directly to the State Treasury rather than to suppliers.

A contract of work company is also required to withhold tax from most payments for services. The amount of withholding tax depends on the type of service and whether the service provider is a resident or nonresident (PricewaterhouseCoopers 1998).

deductible items

There are several items that a company operating under a contract of work can deduct from its taxable income. Companies are eligible to deduct all expenses relating to earning, securing and collecting taxable income. Items that are not deductible include those for the personal benefit of shareholders, benefits in kind to employees, gifts, donations and support (excessive) payments for goods and services. In addition, any expenditure incurred in research and development are tax deductible. Under the seventh generation contract of work, companies can carry financial losses forward for a period of eight years (Anderson Consulting 2001; PricewaterhouseCoopers 1998).

royalties

Royalties are payable quarterly to the government based on the volume of production as specified in the contract of work (table 30). Royalties are tax deductible. Indonesia's total company tax rate, including royalties, was 44.1 per cent in 2005 (PricewaterhouseCoopers 2006c).

export taxes

The Indonesian Government is of the view that mineral exports should be focused on value added products. While export quotas or bans on the export of mineral ores have been ruled out, taxes or licences for ore shipments of lead, iron, bauxite, copper and gold may be imposed.

In early 2007, the Indonesian Government limited shipments of tin. Only companies with an export licence and paying royalties are eligible to export refined tin.

table 30 **royalty rates – for seventh generation contract of work**

mineral	total calendar year production	royalty tariff
gold	<2 000 kg	US$225.00/kg
	≥2 000 kg	US$235.00/kg
silver	<25 000 kg	US$2.00/kg
	≥25 000 kg	US$1.90/kg
copper	<80 000 tonne	US$45.00/tonne
	≥80 000 tonne	US$55.00/tonne
nickel ore (garnierite)	<1250 tonne	US$70.00/tonne
	≥1250 tonne	US$78.00/tonne
nickel ore (limonite)	<750 tonne	US$62.00/tonne
	≥750 tonne	US$63.00/tonne
tin	<50 000 tonne	US$59.00/tonne
	≥50 000 tonne	US$64.00/tonne

Source: PricewaterhouseCoopers (1998).

other legislation affecting the minerals sector

Activity in the minerals sector in Indonesia is also governed by a range of additional laws and regulations, including the *Investment Law* (2007), the *Law on Regional Administration* (1999 and 2004) and the *Forestry Law* (1999). The laws have not necessarily been designed to accommodate mineral sector activity and, as a result, have different, sometimes conflicting, objectives.

investment law

The 2007 Investment Law supersedes Investment Law 1 of 1967 and Investment Law 6 of 1968, covering both foreign and domestic investment. The investment law identifies sectors of the economy that are open to foreign investment. The law has been passed, although implementing regulations are yet to be announced. The negative investment list – a list of industries where foreign investment is restricted or banned – has been issued and there is no change in ownership arrangements for mining interests.

The new law decentralises mineral investment decision making to the regional level, but it is likely that there will be provisions in the regulations for the central government to reserve decision making authority on investment above a defined value. The Investment Coordination Board (BKPM) is defined as the coordinator of investment policy implementation under the 2007 Investment Law. BKPM has established regional investment promotion/facilitation offices but it is up to local governments to decide how they wish to handle investment applications. It is anticipated that application processing time will be reduced to 30 days. Current applications usually take longer than 90 days and there is considerable variance around Indonesia.

the 1999 and 2004 laws on regional administration

Law number 22 of 1999 granted autonomy to regional governments in a range of economic areas from 1 January 2001. The law represents a significant shift in the Indonesian political framework and is part of the gradual process of democratisation.

Article 10 of Law 22 states that each regional government has the full authority to promote and develop the natural resources available in its region and is fully responsible for maintaining the environment. In addition, any new contract of work

under the current Mining Law of 1967 will be signed with the regional rather than the central government. However, no new contracts have been negotiated since the law came into force. Contracts of work signed prior to Law 22 coming into force remain under the administration of the central government.

Law 22 was amended by Law 32 of 2004 in which there is a move away from decentralisation to the district level to the provincial level.

Under the Laws on Regional Administration, the detailed management of mining activities is the responsibility of the regional or provincial government while the central government's role is limited to policy and management oversight. In order to facilitate the transition to regional government, the Department of Energy and Mineral Resources issued a standard operating procedure on the transfer of mining supervision to decentralised regions. In addition, the Minister of Energy and Mineral Resources established a task force to assist in transferring mineral title technology and mining administration expertise to the regions.

One outcome of the move to regional autonomy in Indonesia has been uncertainty regarding the roles of different levels of government involved in the management of the minerals sector and an increase in the overall regulation of the sector. In particular, regional governments have not necessarily clearly specified the requirements or preconditions for investment in the minerals sector. Further, negotiations with mining companies appear to be conducted on an ad hoc basis. This has led to differences in the attractiveness of regions for investors by increasing transaction costs and can increase the costs of undertaking exploration and development activity.

In addition, it is generally considered by industry participants that the capacity to administer the minerals sector is less well developed at this level of government. This refers to a lack of technical skills as well as to limited capacity in general administration.

There is anecdotal evidence that regional governments have placed increased demands on potential investors in relation to the provision of community services, environmental protection, the levying of taxes and the direct participation in mining activity without the establishment of equity. While this may be considered a means of ensuring that the benefits of mining accrue to local communities, it adds to the uncertainty of operating in the mining sector and increases the costs of investment.

forestry law

The *Forestry Law* of 1999 prohibits open cut mining in conservation forests (national parks). Mining in protected forests – forest areas whose chief function is to protect a life buffer system in order that the water system may be regulated, flooding prevented, erosion put under control, sea water intrusion prevented and soil fertility maintained – may be approved . The declaration of protected forests is based on an objective set of parameters related to the physical characteristics of the land, such as slope, rainfall and soil characteristics. Of the approximately 110 million hectares of forest area in Indonesia, 29 million hectares are declared protected (Melanie et al. 2005).

After the passing of this law, there were substantial areas of land where contracts of work had already been awarded that were affected by the declaration of protected forests. As a result, many highly minerals prospective areas have not been developed. In an attempt to clarify the provisions of the Forestry Law, the government promulgated Law 19 of 2004 and Presidential Decree 41 of 2004. The latter document listed thirteen companies with existing contracts of work that are permitted to conduct open cut mining in protected forests. In 2005, the Forestry Department issued a requirement for mining companies to replace two hectares or a new co located forest for every one hectare of forest disturbed by mining. Alternatively, if the company cannot provide the required land within two years, it must pay one per cent of the total production value annually to the Ministry of Forestry.

The Indonesian Parliament is considering a draft revision of the regulations covering underground mining in protected forests as well as compensation and rehabilitation arrangements. The compensation arrangements – the replacement of two hectares or a new co located forest for every one hectare of forest disturbed by mining or one per cent of the total production value annually – will be superseded by a fee to be paid into a forestry trust fund, which has a sliding scale of rates depending on mineral type, mine type and forest type (production or protected).

Forestry and environmental issues have been decentralised to the regional level, but not to the same extent as mining. However, coordination across government agencies at all levels remains an issue. The Forestry Law is governed at a central level but the allocation of land to protected forests is undertaken at the regional level with central government approval.

The conflict between provisions of the Forestry Law of 1999 and the mining industry has probably created more uncertainty for investors in Indonesia's mining

sector than any other legal or regulatory provision and is one of the key reasons for the decline in investment activity in recent years.

other factors affecting mineral exploration

access to infrastructure

The transport infrastructure in Indonesia is well developed around the population centres on the islands of Java and Sumatra where there is considerable road and rail connections for passenger and freight transport. Outside of these major centres, transport infrastructure is less developed. As Indonesia is an archipelago, sea transport of raw materials is well developed. Each of the major islands has at least one significant port city (Anderson Consulting 2001).

illegal mining

Illegal or informal mining is a considerable problem in the Indonesian mining sector. Illegal mining conducted by local people on a small scale is often tolerated by legal mining companies. However, in some areas, illegal mining is conducted on a large scale using heavy equipment, public roads and unlicensed port and shipping facilities.

Illegal mining can undermine the conditions set out under the contract of work or KP system by extracting minerals that are the property of legal miners. There is a view that illegal mines have been responsible for serious environmental damage in Indonesia, as they have no legal responsibility to restore damaged areas, and as a result, have undermined the reputation of large scale mining industry in relation to environmental impacts.

Illegal mining has caused land degradation in some regions of Indonesia. In addition, the creation of pits and tunnels in illegal operations has made the land subject to landslides and erosion. Waterways have also been adversely affected by illegal mining as oil from machinery and water pumps and mercury from gold processing flows into river systems.

Illegal miners tend to use inefficient practices and as such have low mineral recovery rates (around 60 per cent, which leaves 40 per cent of the mineral in the tailings). Inefficient practices, which only draw out the high value product, reduce the economic value of the mineral deposit (Aspinall 2001). It will be important and ensure that an appropriate framework is developed to discourage illegal mining and encourage responsible mining by small scale operations.

china

China's minerals sector is growing strongly and the rapid rise in its consumption of mineral commodities has been a major driver of growth for the minerals sectors of other APEC economies. Although it is the world's largest producer and consumer of a number of key mineral commodities, China is a net importer of many mineral commodities.

Mineral exploration in China has risen strongly since 2002, albeit from a low base. China now accounts for 5 per cent of mineral exploration expenditure in APEC. While exploration expenditure in China is largely undertaken by domestic companies or joint ventures, foreign investment in China's highly prospective western provinces is being promoted by the central government.

Reflecting its early stage of development, the functionality of China's regulatory framework lags behind that of APEC economies with more developed minerals sectors. Some factors to consider include:

- a lack of investor certainty and administrative transparency, particularly at the provincial level
- restrictive licensing conditions and
- a lack of consistency in the approvals process across different minerals and company structures.

overview of the minerals sector in China

contribution to the economy

The minerals sector is important to the Chinese economy, accounting for 5.6 per cent of gross domestic product in 2005 (NBS 2007). Government estimates of officially registered workers indicate that around 0.5 million were engaged in the mining of metallic ores, with 40 per cent of these employed by state owned enterprises (NBS 2007).

mineral resource base

China has significant mineral reserves, including the world's largest tin reserves and second largest reserves of lead and zinc (table 31). China also holds large reserves of relatively low grade iron ore. However, large areas of China remain underexplored, particularly in the western regions.

Metallic mineral resources are evenly distributed throughout China (China Geological Survey 2007; map 3). The north eastern and coastal regions of China contain abundant gold deposits, mainly located in Shandong, Fujian, Liaoning and Hebei provinces. Some of China's reserves of iron ore are found in the north eastern province of Liaoning. Mineral resources are more abundant in the central region, with around half of the economy's copper and bauxite reserves found there.

map 3 **geographic distribution of metallic mineral resources, China**

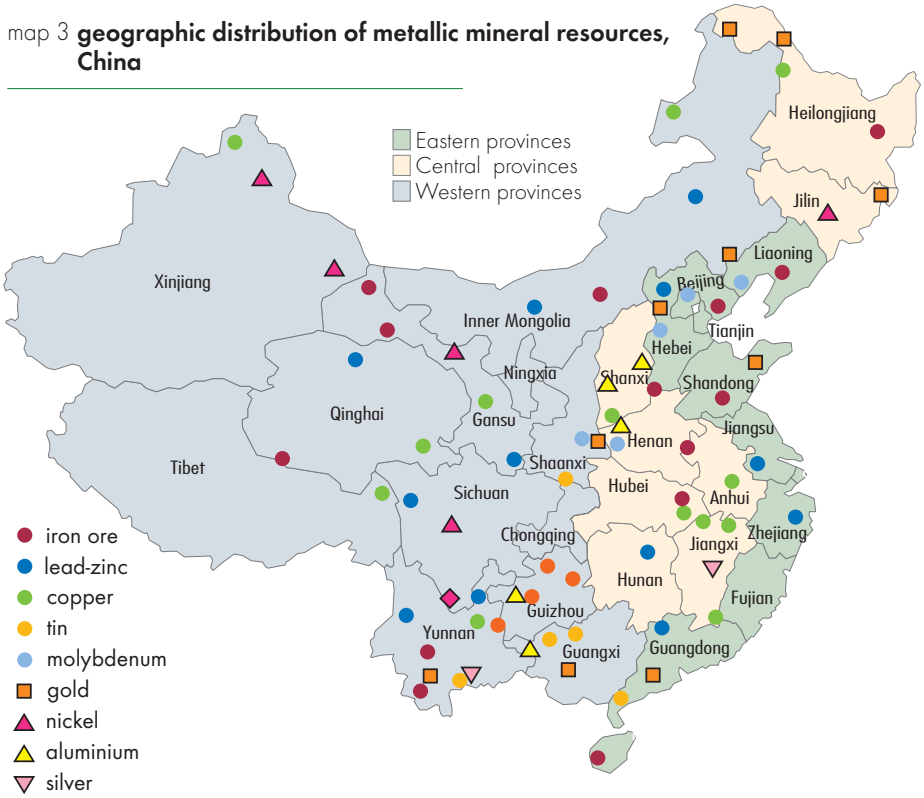


table 31 **mineral reserves, 2006 – China**

bauxite	copper	gold	iron ore	lead	nickel	silver	tin	zinc
Mt	Mt	t	Mt	Mt	Mt	kt	Mt	Mt
700	26	1 200	21 000	11	1.1	26	1.7	33

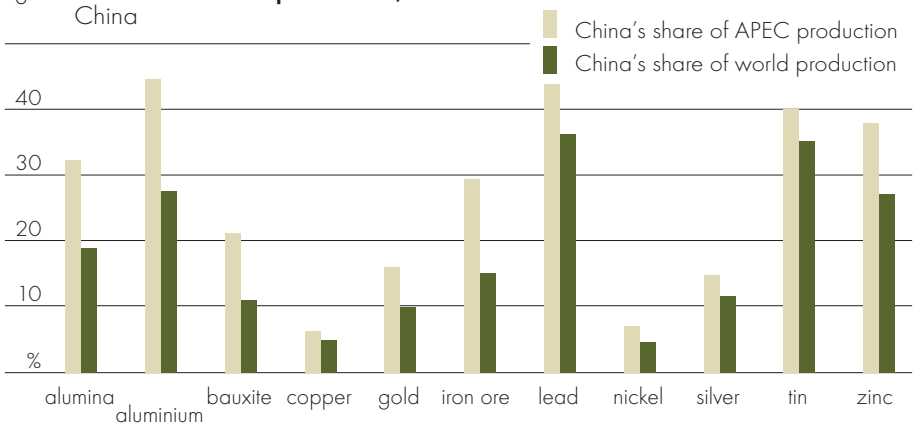
Source: USGS (2007a).

The western region of China is rich in a variety of metallic mineral reserves. Significant reserves of tin and copper are located there, as well as most of China's nickel deposits, predominantly in Gansu province. Reserves of lead and zinc in the western region comprise around three quarters of China's total reserves of these minerals and are found mainly in Yunnan province. The majority of China's bauxite reserves are also located in the western region, predominately in the provinces of Guangxi and Guizhou. In general, China's reserves of iron ore, copper and bauxite are of a low grade (CMA 2007a; NBS 2006; USGS 2007b).

production

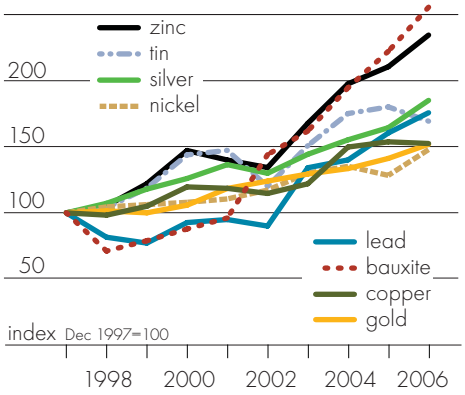
China is a large producer of mineral commodities in APEC and globally (figure 43). Within APEC, China was the largest producer of primary aluminium, gold, lead, and zinc in 2006. China, along with Indonesia, is also a significant producer of tin.

fig 43 **share of minerals production, 2006**
China



China's mine production has increased significantly over the past five years in response to rising demand (figure 44). Production of refined metals has grown at a more rapid pace than mine production, largely because of improved access to raw materials and more efficient technology. For example, over the past five years, China's aluminium production has more than doubled and has accounted for an estimated 64 per cent of the total growth in global aluminium production.

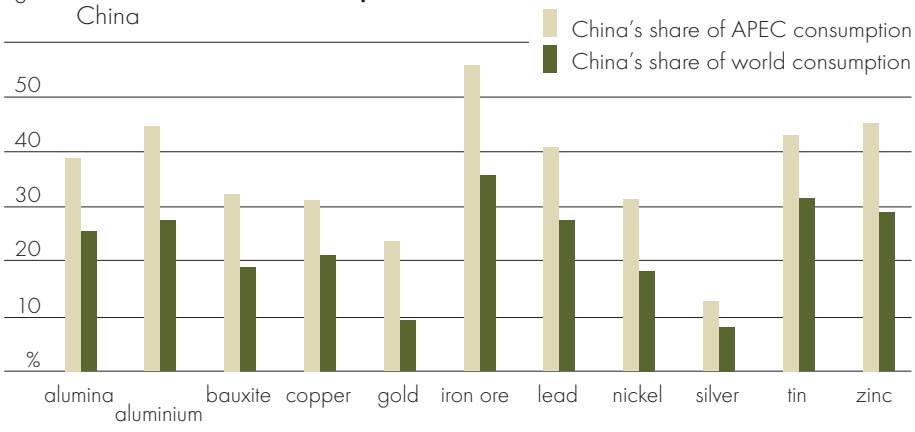
fig 44 **mineral (mine) production, China**



consumption

China's mineral consumption has increased significantly over the past decade, and is currently a significant driver of world mineral demand. Mineral commodities have been a key input into the rapid, sustained industrialisation and urbanisation that is taking place China. In 2006, China was one of the world's leading consumers of mineral resources, especially of metals, including aluminium, copper, lead and zinc (figure 45).

fig 45 **share of minerals consumption, 2006**
China



trade

While China's mineral base is substantial, demand for mineral products has far exceeded its domestic mineral production, resulting in China becoming a net importer of most mineral commodities. China is a major importer of mineral commodities, both within APEC and globally (figure 46). In 2006, China was APEC's largest importer of iron ore and lead ores and concentrates, and the second largest importer of refined copper, nickel and zinc.

fig 46 **share of mineral imports, 2006**
China

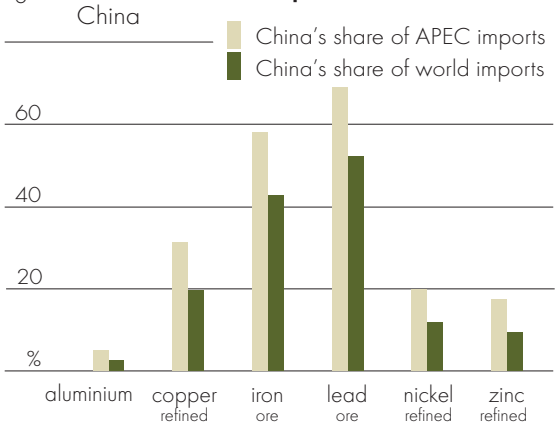
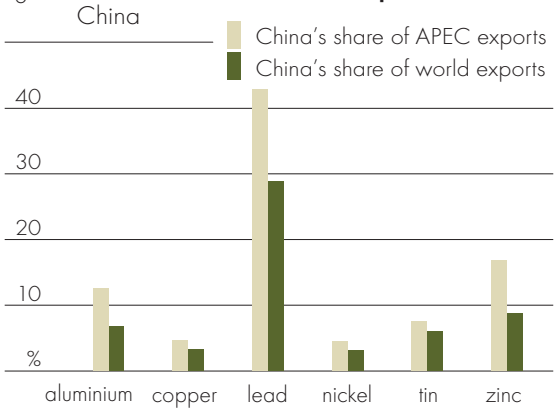


fig 47 **share of refined mineral exports, 2006**
China



With the exception of lead, China is not a major exporter of minerals, relative to its reserves and production (figure 47). Government restrictions and prohibitions on the trading of certain mineral commodities, including iron ore, gold and tin, and the imposition of other interventions, such as export quotas and taxes, also act as a disincentive to export.

trends in exploration expenditure

After reaching nearly US$24 million in the mid-1990s, China's mineral exploration expenditure declined steadily to US$8 million in 2002, in line with global trends (figure 48; MEG 2006). However, recent increases in commodity prices and China's rapidly growing demand have encouraged strong growth in exploration expenditure, which rose to US$213 million in 2006. The increase in exploration expenditure in recent years has been targeted mainly at gold exploration. Much of this increase in exploration expenditure has been by domestic companies and juniors.

fig 48 **trends in exploration expenditure, by mineral** China

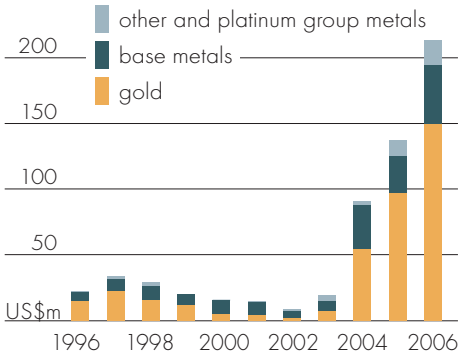
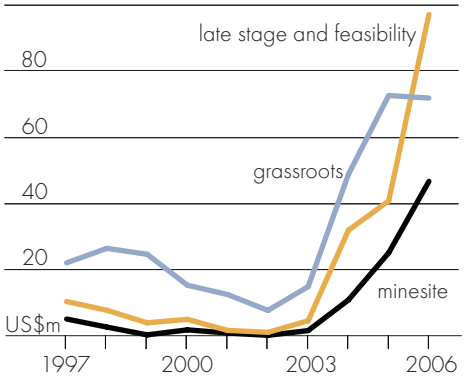


fig 49 **trends in exploration expenditure, by stage** China



Grassroots exploration expenditure in China stabilised in 2006 after rising rapidly in 2004 and 2005, while late stage and feasibility exploration expenditure more than doubled in 2006 (MEG 2006; figure 49).

framework for mineral exploration

Exploration expenditure in China is influenced by a number of factors. The regulatory and legislative framework for the minerals sector is complex in China. The framework manifests itself both in terms of a complex approvals process and inconsistent regulations and policy between central, provincial and local levels of government. Other factors, such as geoscientific information and access to infrastructure, are also important considerations.

geoscientific information

China's geological information is not of the same breadth or quality as that which exists in APEC economies with more developed minerals sectors. A lack of relevant legislation, an underdeveloped national database, and a reluctance to disclose geological information for national security reasons have all affected the provision of detailed geological information resources to the public (CIMG 2006).

A recent government decree that sets out the limitations on surveying and mapping by foreign entities is *Provisional Measures Governing the Surveying and Mapping*

in China by Foreign Organisations or Individuals (2007). This measure outlines the need for restrictions on obtaining geological data because of national security and military considerations, as well as emphasising the need for foreign investors to form joint ventures with domestic firms in order to undertake surveying and mapping operations.

There is a move in China to differentiate government survey funding between the provision of data for public and commercial purposes. It is intended that non profit basic and regional geological survey work for the evaluation of major mineral reserves deemed of relevance to the general public will be funded by the central government. Companies will be largely required to conduct their own exploration research and investment, with minimal national public funding assistance. The document, *Interim Measures on the Management of the Central Funds (Revolving Fund) for Geological Prospecting (2006)* discusses these funding arrangements in further detail. If enacted, such a move could reduce the likelihood of a unified national geological database being created unless stronger legislation requiring investors to submit geological data to state authorities is implemented.

Although attempts are being made to develop a national database, uncertainty surrounding the access and accuracy of available mineralisation data remains an impediment to investment. At this stage, provincial authorities remain reluctant to release local data, and the availability of maps is limited. Access to geological data is further impeded by indications that national legislation does not adequately compel companies or provincial land and resources departments to provide geological information. In addition, there are no strict guidelines for confidential information, and authorities may reject requests for information on the grounds that such information is confidential (CIMG 2006).

classification and reporting of resources

The mining sector uses the PRC National Standards – Classification of Solid Mineral Resources/Reserves, which became effective in 1999, for recording and reporting mineral resources and reserves. According to these standards, solid mineral resources and reserves are classified into three categories – extractable reserves, basic reserves, and resources, based on the geological assurance and the degree of economic viability of the resources and reserves (Ho et al. 2007).

minerals legislation

ownership and authority over mineral resources

In China, under the Property Law, the State owns the rights to all discovered and undiscovered minerals. Exploration and mining licences allow these rights to be granted to investors, subject to approval.

Since the late 1990s, the Ministry of Land and Resources (MOLAR) has been the principal centralised manager of China's mineral resources, both for exploration and mining. MOLAR's roles include formulating and reviewing laws, codes and standards, administering land issues, supervising and arranging arbitration relating to administrative law enforcement, and administering all issues relating to mining and exploration licences and rights transfers.

There are a number of other government agencies that regulate and influence the minerals sector in China, including:

- The National Development and Reform Commission (NDRC) – China's principal economic strategy body, oversees the minerals sector and its role in the economy, and is involved with project proposals and feasibility studies
- The Ministry of Commerce (MOFCOM) – the main body overseeing foreign investment in China
- The State Administration for Industry and Commerce (SAIC) – the administrative authority in charge of overseeing market regulation and supervision, including the issuing of business licences and registration
- The State Environmental Protection Agency (SEPA) – oversees the environmental impacts of mining
- Provincial authorities – oversee the development of mining within their province and have the ability to issue exploration rights. In many circumstances, the regulatory and administrative decision making is devolved to provincial level government departments.

The Mineral Resources Law

China's Mineral Resources Law underpins the legal framework for the minerals sector. The law was enacted in 1986, amended in 1996, and is expected to be

amended again as the Government strives to attract further foreign investment in mineral exploration and production in China (Hains and Leader 2006).

The current law establishes the basis for the ownership of mineral resources, sets out the framework for mineral exploration and mining rights acquisition and transfer, stipulates the need for assessing and subsequently reporting exploration results, and describes the obligations and potential administrative penalties for mineral rights holders.

Although the revised Mineral Resources Law of 1996 strengthened the legal framework surrounding the minerals sector, several issues remain outstanding. These include:

- the certainty, transferability, and security associated with mining and exploration rights
- the restrictions on the formation of certain business entities
- the complexity of the application and fees process and
- the restrictions on the mining of certain minerals in proven deposits.

It is expected that aspects of these issues may be addressed with future revisions to the Mineral Resources Law (CIMG 2006).

exploration and mining licensing

The Unified Block Registration System determines the size of the area allowed for mineral exploration. This system is described in the *Regulation for Registering to Explore for Mineral Resources Using the Block System*. The system is based on a grid pattern in which one basic unit block is equal to the area covered by one minute latitude by one minute longitude – approximately 848 acres or 343 hectares. For metallic, non metallic and radioactive minerals the maximum exploration area for each project is 40 basic unit blocks.

exploration

Obtaining an exploration licence requires dealing with a number of ministries and levels of government. A separate licence is usually required for different types of minerals. The process tends to be more complex for foreign investors as there are more stringent conditions on investment structures, foreign equipment and expertise,

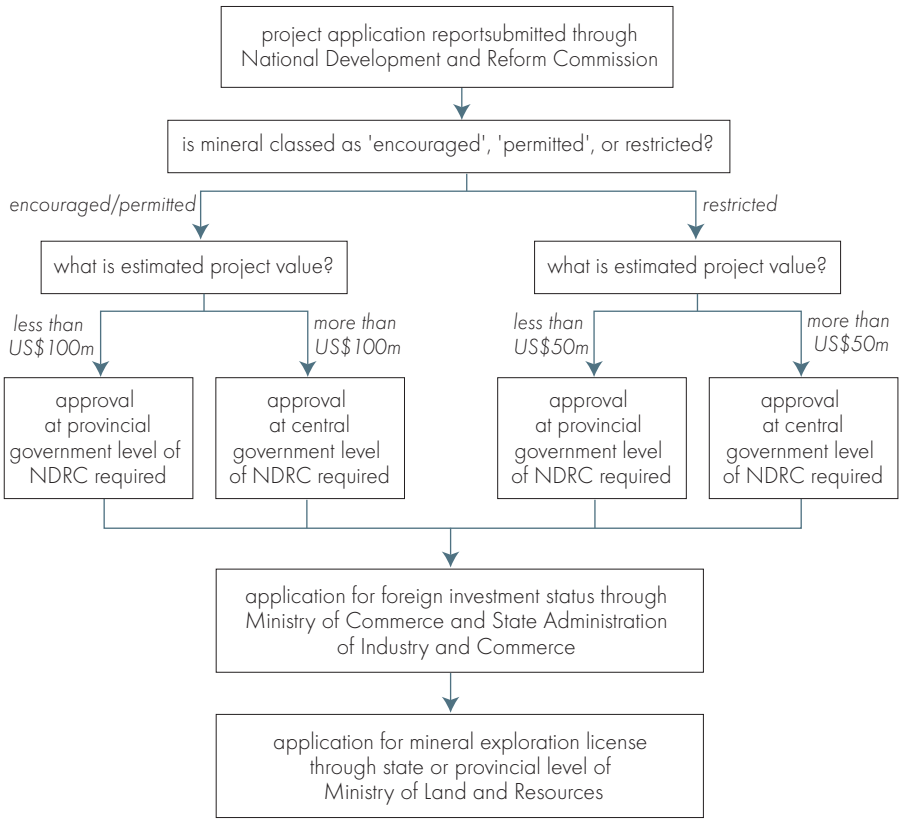
and the types of minerals that may be targeted. The process for foreign investors involves:

- submitting a project application report through the NDRC. The estimated value of the project and the class of mineral targeted determines whether approval is required through central government or provincial levels of the NDRC. This phase also requires an environmental impact report to be submitted to the central government or provincial level of the SEPA. This report includes an evaluation of the potential environmental impact of the project and the methods proposed to minimise any environmental damage caused by the project. Once the project has been approved, it will be listed in the State Annual Foreign Investment Plan.
- applying to MOFCOM for approval as a wholly foreign owned enterprise or joint venture. The approval of this status is required to be lodged with the SAIC.
- applying for a geological exploration qualification, unless the investor is a partner of a joint venture that already holds such a qualification. The qualification allows geological exploration work to be carried out throughout China. The application requires the applicant to be a legal person entity and requires details of assets, technical staff and equipment.
- applying to MOLAR, at either central government or provincial level, for the exploration licence. Subject to the investment limitations outlined in the *Foreign Investment Industrial Guidance Catalogue* (discussed later), a foreign investor registered as a joint venture or a wholly foreign owned enterprise can apply for an exploration licence. The licence application requires proof that the previous steps have been successfully approved, as well as details of the areas to be prospected and funding arrangements (CMA 2007b,c; AAR 2003a).

This process is depicted in figure 50. It should be taken as a guide only, as comprehensive information on the approvals process is difficult to obtain.

If the licence is approved, an annual exploration fee becomes payable to the government. The fee is calculated based on the number of years in which exploration has taken place, and is paid annually according to the size of the area explored. RMB 100 per square kilometre a year is charged for the first to third exploration year, while an extra RMB 100 per square kilometre a year is charged for the fourth exploration year. There is an upper limit of fees of RMB 500 per

fig 50 **mineral exploration rights approval process for foreign investors, China**



square kilometre per year (CMA 2007d). The duration of exploration rights for minerals is three years, with extensions of up to two years possible on each application for extension.

mineral extraction

For foreign investors, the approval process to obtain mineral extraction rights involves:

- applying to MOLAR to reserve, if necessary, exploration rights for up to two years
- applying to MOLAR for approval of the desired mining area boundaries
- providing a report to MOLAR of the mineral deposit, using a qualified appraisal organisation
- submitting a mining project application report to the NDRC at either the central government or provincial level, depending on the estimated value of the project and the type of mineral targeted – this phase also requires an environmental impact report to be submitted to the central government or provincial level of the SEPA
- potentially converting the corporate structure of the mineral exploration entity into a mining entity
- commissioning a company holding a mining design certificate to carry out a mining resource development and utilisation plan
- applying to MOLAR for the right to mine, with approval contingent on aspects such as proof of access to funds, technology and equipment, proof of the successful completion of all the above steps, and provision of an environmental impact assessment – in general, all foreign mining licences must be approved at the central government level, however provincial departments of land resources are provided with the authority to grant mining rights and
- payment of a mining fee (CMA 2007e; AAR 2003b).

Licences may also be granted through tender, auctions or bid in certain circumstances, such as when central government funding has been used for exploration and a viable deposit has been uncovered.

transfer of rights

The transfer of exploration and mining rights between entities can occur one year after of the issuing of the original rights or once mineral resources are discovered. Additionally, a minimum amount of investment must have been completed by the holder of the exploration rights. This amount is determined by the number of exploration years that have elapsed up to the time of the transfer application. For example, to enable transfer to occur, RMB 2000 per square kilometre must have been invested within the first exploration year, RMB 5000 per square kilometre within the second year, and RMB 10 000 per square kilometre within the third year.

For transfers to be allowed, mineral extraction rights must not be subject to dispute, and fees and resource taxes must have been fully paid. Any other conditions imposed by relevant government agencies must also have been satisfied (CMA 2007f).

In all cases, application for exploration or mining rights transfer must occur with the relevant examination and approval of authorities. The transfer contract between the two parties may be for transfer by sale, equity joint venture or transfer by cooperation. The process also requires a valuation of the mining or exploration right, the undertaking of which has raised concerns with foreign investors because of a perceived lack of accuracy, reliability and objectivity within the valuation process (CIMG 2006).

security of tenure

Once the mineral reserves have been verified, the potential miner must apply for the actual mining licence. The length of time for holding a valid mining licence depends on the size of the mining project. If the scope of project is regarded as large the mining licence is valid for up to 30 years, for a medium sized project the licence may be valid for up to 20 years, and for a small sized project, the licence may be valid for up to 10 years. The regulation that governs mining licences is the Regulations for Registering to Mine Mineral Resources.

The Mineral Resources Law 1996 states that a 'privileged priority' to mine is granted to investors who have explored a particular area and subsequent notices issued from MOLAR have reinforced this stance. However, there are indications that the acquisition of such a right is neither automatic nor transparent. In many cases, the authority to grant exploration and mining rights is transferred to provincial and other local levels of governments, depending on the estimated value of the project. These government agencies, at times, present a different regulatory and policy focus from that at central government level. Consequently, as the value of a project changes as the project moves through the phases of exploration, feasibility, construction, devel-

opment and operation, investors are often required to comply with standards that overlap, are unclear, and may be subject to a degree of administrative discretion at the provincial level. The lack of an effective administrative review mechanism and the need for investors to comply with both provincial and central levels of government undermines confidence in the approvals process, and adds to uncertainty in investment in exploration.

foreign investment regulations

Overall, foreign direct investment (FDI) in China's mining sector remains a small proportion (1 per cent) of total FDI across all sectors (table 32). Through the Mineral Resources Law and associated regulations, MOLAR and MOFCOM regulate the level of foreign ownership in the mining sector, including exploration.

Reforms to foreign investment regulations in recent years have enhanced China's reputation for encouraging overseas investment. From 2004, foreign investors have

box 13 China's 'Go-West' strategy

China is actively encouraging the development of the western and middle regions of China through the 'Go-West' Strategy. A number of incentives are provided for mineral exploration and extraction in these regions, including:

- exemptions or deductions for investors from mineral exploration or extraction rights licence fees
- a five year exemption of the mineral resource indemnification fee and
- the deliberate reclassification of the investment in a range of specified minerals and minerals sector processes as 'encouraged' within China's western provinces.

table 32 foreign direct investment status, 2006 – China

	number of projects	contracted value	actually utilised value	number of foreign funded enterprises
	no.	US$b	US$b	no.
mining	208	1.94	0.46	970
scientific research, technical service and geologic prospecting	1 035	2.60	0.50	6 954
total FDI (all sectors)	41 473	193.73	60.02	274 863

Source: NBS (2006).

been able to make capital injections into investment companies using domestic funds earned in China. Previously, foreign investors were allowed only to use foreign currency as a source of investment funds. Additional reforms include a loosening of capital reserve requirements for loan applications and a simplification of administrative project approval procedures. China has also targeted the western regions as a destination for foreign investment activity (box 13).

categories of minerals

The *Foreign Investment Industrial Guidance Catalogue* categorises various minerals as 'encouraged', 'permitted', 'restricted' or 'prohibited' and determines the type of investment structure permitted for exploration and extraction. A brief outline of these categories is provided in box 14.

The most recent revision to the catalogue came into force on 1 December 2007 and reduced the number of minerals classified as 'encouraged'. A mineral's categorisation and the proposed size of the investment determine the authority through which applications must be lodged. For example, for restricted minerals such as gold, the law requires that investment projects over US$50 million be approved by central government level ministries. However, if the project is below US$50 million, it may be approved by the provincial government and registered with the central government.

The catalogue lists the extraction of iron ore as encouraged (table 33). Restricted minerals include precious metals such as silver and gold. While silver and gold

table 33 **foreign investment restrictions for minerals sector, selected minerals – China**

	mineral	corporate structure allowed
encouraged	iron ore	unspecified
permitted	all other unspecified minerals	unspecified
	copper, lead, zinc	unspecified
	bauxite	unspecified
restricted	gold, silver	unspecified
	platinum group metals	unspecified
prohibited	tin	none
	radioactive minerals	none
	rare earth metals	none

EJV = Equity Joint Venture. CJV = Contractual Joint Venture.

box 14 foreign investment framework for corporate structures and mineral categories, China

mineral categories

The *Foreign Investment Industrial Guidance Catalogue* classifies certain minerals into the following categories:

encouraged – investment approval is least stringent for encouraged items. Unless specified, minerals categorised as encouraged allow investment by all foreign investors and preferential taxation treatment may be available.

permitted – all minerals and activities not specified by the *Foreign Investment Industrial Guidance Catalogue*, with approval granted subject to compliance with other Chinese laws, policies and regulations.

restricted – approval for foreign investment in restricted items is more stringent than for encouraged or permitted items. Majority Chinese ownership is required in some restricted industry sectors, but wholly foreign owned enterprises are permitted in others.

prohibited – foreign investment in prohibited items is disallowed.

This classification affects both the investment approval process and the permissible level of foreign ownership. However, there are no clear standards for each category.

corporate structures

In order to operate within China, foreign investors must be approved as one of the following corporate entities. Each entity is subject to different conditions pertaining to foreign ownership, profit distribution, and liability.

representative office – activities are limited to representing the foreign investor in China and acting as a liaison for marketing and other indirect business activities. A representative office is prohibited from engaging in direct business activities in China.

joint ventures – joint ventures (JVs) involve partnerships between foreign and Chinese parties. There are two types of joint ventures, each with a similar structure, but containing different rules on profit distribution:

» *equity joint ventures (EJV)* – an EJV takes the form of a limited liability company, with investors' liability limited to the amount of their total capital contribution. While

continued...

box 14 foreign investment framework for corporate structures and mineral categories, China *continued*

profits are distributed according to each partner's contribution, these entities are required to allocate post tax profits to a reserve fund, an enterprise expansion fund and an employee incentive and welfare fund. The board of directors decides on the total amount of profits to be allocated and the division of these profits across the three different funds. Profits must be distributed in the form of cash only.

» *contractual joint venture* – an unincorporated contractual (or cooperative) joint venture (CJV). This takes the form of a partnership, rather than a company. The partners are not considered to be independent of the CJV and are considered jointly liable for the CJV's debts and obligations. The CJV is required to establish a board of directors or similar joint managerial institution. The assets accumulated by the CJV during its operation are jointly owned by the parties, but disposal or extraction of a CJV's assets requires the permission of the other party. Unlike an EJV, a CJV does not require allocation of any part of its profits to various funds and can distribute its profits in products and other assets, rather than just in the form of cash. In addition, a CJV can distribute profits based on the agreement reached by the parties rather than having to distribute profits on the basis of relative capital contributions.

  - A legal person CJV is a hybrid combining the characteristics of both an unincorporated CJV and an EJV. It has a similar corporate structure to that of an EJV, but has some additional flexibility, including profit distribution.

foreign invested joint stock company with limited liability – an entity that must have at least two investors and is subject to minimum capital requirements. The capital is divided into equal shares with at least half of the promoters of the company required to live in China, and one required to be a foreign investor.

wholly foreign owned enterprise – A Chinese legal entity established by a foreign company or companies. This allows more complete control by the foreign investor over the business and the direction of the operation. A WFOE takes the form of a Chinese limited liability company and is therefore distinct from its controlling parties. Through a WFOE, profits earned in Chinese currency may be converted to US dollars (Yu and Zhou 2006).

projects are not noted as being limited to joint ventures, wholly foreign owned enterprises targeting these minerals remain rare. The exploring for, and mining of, radioactive minerals and rare earth metals and tin is prohibited.

This form of classification of minerals can pose challenges for investors as the exploration right will usually only be granted for particular minerals in particular areas. Since different minerals are often found at the same site and could be profitably mined, the return on miners' exploration and extraction efforts are sometimes not fully realised (CIMG 2006).

foreign ownership conditions

Foreign investment in China is largely undertaken through joint ventures between foreign juniors and domestic mining companies. For foreign companies, joint ventures are, in many cases, the primary pathway for overseas companies to enter the Chinese minerals sector. Government regulation prevents the outright acquisition of Chinese mining companies.

As discussed in the previous section, the level of foreign investment allowed in China depends, in part, on the nature of the mineral in question as classified by the *Foreign Investment Industrial Guidance Catalogue*.

While encouraged under legislation, in practice WFOEs are less likely to be approved than JVs. Consequently, there are very few WFOEs operating in China within the minerals sector, a situation that limits the level of interest from foreign companies in establishing operations in China (Yu and Zhou 2006). However, JVs have the benefit of the experience of the domestic partner in dealing with the Chinese regulatory framework.

However, major multinational mining companies are positioning themselves to play an increasing role in exploration in China, through smaller investments in monitoring and generative exploration programs. For example, Anglo American plc has committed to invest US$20 million over the next three to five years to explore for platinum in Sichuan province in the south west of China (KPMG 2006).

Obtaining explorer status can also be problematic for foreign entities. Legal entities must be formed and project proposals must be lodged to enable exploration applications to be successful, posing challenges for independent investors who have not had adequate access to geological surveys to enable them to formulate an appropriate project proposal.

The freedom to repatriate profits and capital to the parent economy located overseas depends largely on the investment structure utilised by the foreign investor in China. For example, wholly foreign owned enterprises allow profits earned in Chinese currency to be converted to US dollars, therefore enabling funds to be remitted abroad, to the parent company.

fiscal regime

royalties

China levies a number of fees and taxes on investors that may be classed as royalties. The mineral resource indemnification fee and the resource tax are levied on the value and quantity of the mineral extracted respectively, while mineral prospecting and extraction royalties are levied on the activity of exploring or extracting.

The mineral resource indemnification fee is a form of property tax paid by the mineral extraction rights holder and is aimed to capture the economic benefits of state owned mineral resources. The fee is shared between central government and provincial governments and is based on the sales revenue earned by the products derived from the mineral resources, a factor related to the extraction recovery rate, and an indemnification fee rate. The value of the sales revenue for the purposes of determining this fee is based on prices specified according to state regulation, average prices payable on the local mineral market of the time, or, for the case of exporters, international market prices of the time (CMA 2007d).

Resource taxes are also applicable to the mining sector. Resource taxes are levied on those enterprises, companies and individuals extracting taxable mineral products within China. They are unit based taxes determined by the resource status of the mineral and the weight of the mineral mined.

corporate tax

There are two main categories of taxpayers for the payment of company income tax. These relate to foreign invested enterprises and domestic enterprises.

The foreign invested enterprise category includes equity joint ventures (EJVs), contractual joint ventures (CJVs) and wholly foreign owned enterprises (WFOEs). If a foreign invested enterprises have headquarters in China, then all income originating from its business in China is taxed. The income tax amount that an enterprise has paid for income derived overseas is deducted from its taxable income when

paying on a consolidated basis. However, this deduction is not allowed to exceed the taxable income of overseas income.

A proportional tax rate of 33 per cent is adopted for income tax for foreign and domestic enterprises. For foreign invested enterprises, this rate comprises foreign enterprise income tax of 30 per cent, while local income tax makes up the remaining 3 per cent (CMA 2007g). In most cases, however, tax exemptions and reductions reduce the effective rate for foreign invested enterprises to between 15 and 24 per cent.

This dual tax regime for foreign and domestic companies is in the process of being simplified (table 34). In March 2007, a proposal unifying China's corporate tax rate at 25 per cent for both domestic and foreign companies was approved. This proposal will become effective from the beginning of 2008 (People's Daily Online 2007).

table 34 **corporate tax rates, China**

company	type	current rate %	new rate as of 1 January 2008 %
domestic	all	33	25
foreign	base rate for foreign enterprises	33	25
	foreign enterprises granted tax exemptions/reductions	15–24	25

Sources: CMA (2007b); People's Daily Online (2007).

deductible items

There are a number of deductions and reductions in corporate tax available in various circumstances. For example, the corporate tax rate is reduced to between 15 and 24 per cent for:

- foreign invested enterprises set up in special economic zones, such as the Pudong economic and technological development zone
- high technology enterprises set up in high technology industrial development zones
- specified western regions of China and
- specified coastal or riparian Chinese cities.

There are also a number of other situations where deductions or exemptions are available, including:

- where investors deal with certain mineral grades and types
- where the extraction of minerals may be problematic
- where high technology usage occurs and
- when mining occurs in China's western regions.

In addition, nonspecified discounts or exemptions are often available to foreign invested enterprises (CMA 2007b).

taxes on international trade

Taxes on exports and imports are applied in China. However, rates change regularly and vary depending on the commodity. The export tax rate for aluminium, copper and nickel is currently 15 per cent, while gold exports are prohibited. Export taxes are often offset by export tax rebates, which also fluctuate depending on factors such as mineral scarcity and trade and macroeconomic considerations. The export tax rebate system comprises five levels – 17 per cent, 13 per cent, 11 per cent, 9 per cent and 5 per cent. The export tax rebate for most base metals was lowered to 5 per cent from 1 July 2007 (Embassy of the People's Republic of China in Australia 2007).

As well as imports tariffs, imports are subject to a value added tax (VAT). The VAT is an ad valorem tax, with a rate of between 13 and 17 percent, payable by companies and individuals engaged in the sale of goods and services, including imports. Import tariffs and VAT may be reduced or exempted for cases where investment occurs for items listed as 'encouraged' in the *Foreign Investment Industrial Guidance Catalogue*.

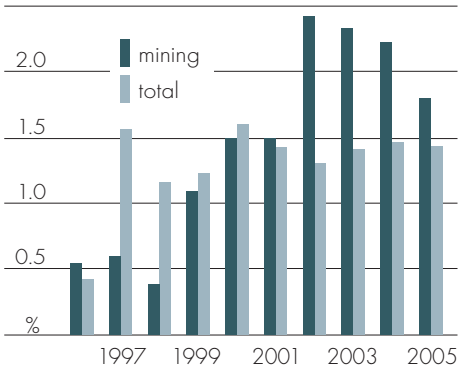
other factors affecting mineral exploration

access to skilled labour, health and safety

Skilled labour shortages have emerged in China in recent years, resulting in substantial increases in labour costs. The modernisation of the mining sector is expected to accentuate skilled labour shortages in the sector and to raise labour

costs accordingly. The growth in wages in the mining sector in recent years has outstripped that in the rest of the economy (ILO 2007; figure 51). However, despite their recent growth, wage levels in China remain very competitive globally.

fig 51 **annual growth in wages**
China



The Ministry of Labour and Social Security and the State Administration of Production Safety are the principal regulatory bodies that administer health and safety laws and regulations. The principal health and safety laws and regulations applicable to the mining sector in China include:

- the *Labour Law*, promulgated by the Standing Committee of the National People's Congress on 5 July 1994 and effective from 1 January 1995
- the *Law on Mine Safety*, promulgated by the Standing Committee of the National People's Congress on 7 November 1992 and effective from 1 May 1993, and its Implementing Regulations issued by the Ministry of Labour and Social Security on and effective from 30 October 1996
- the *Law on Production Safety*, promulgated by the Standing Committee of the National People's Congress on 29 June 2002 and effective from 1 November 2002
- the *Regulations on Production Safety Permits*, issued by the state council on and effective from 13 January 2004 (Ho et al. 2007).

Despite the presence of these laws, high numbers of accidents that occur at coal mines in China have contributed to the perception of unsafe labour conditions in the mining sector more generally.

access to mining equipment and new technologies

For exploration and mining projects that are classified as 'encouraged' under the *Foreign Investment Industrial Guidance Catalogue*, the importation of equipment for mining projects may be reduced or exempt from import duties and value

added tax (VAT). All imported machinery equipment, vehicles, raw materials, fuels, remnants, parts and components and other accessories necessary for carrying out contracted export deals by foreign enterprises do not require import licences.

The global perspective of foreign mining and exploration companies, and their associated endowment of modern equipment, techniques and methods, has introduced new technology into the Chinese minerals sector. The Chinese Government has also encouraged new technology and mining practices from abroad. Despite this, there remain deficiencies in the technology level associated with the domestic mining sector, such as in high resolution exploration, deep mining technology, remote controlled mining, tailings and waste mineral rock processing, cold weather mining and management expertise, and mine waste and disposal technology (Jen 2006). The ongoing large share of state owned and other domestic companies within the sector, and the relatively slow entry of foreign companies into China, may have contributed to the limited pace of this technological progression.

access to water and infrastructure

Infrastructure such as ports, airports, power stations and water supply are considered to be less developed than in many other APEC economies. However, significant spending is being undertaken by the government to improve the quality of infrastructure.

Official water supply networks are generally limited to urban areas, and tend to be lacking in rural areas, especially in the western provinces and in areas with difficult terrain. However, the government has indicated the need to address these issues through the eleventh five year plan. The plan outlines intends to increase the coverage of water infrastructure to rural areas to give inhabitants greater access to safe water supply, and also identifies sanitation, education, infrastructure development, road construction and poverty alleviation as areas of priority for the development of rural areas. The improvement of municipal services to outlying areas should act to improve the feasibility of mining projects and help to create a competitive investment environment.

peru

Peru is currently among the world's leading producers of silver, copper, tin, zinc, gold and lead, and mineral exports account for around 60 per cent of Peru's export revenues. It is the fifth largest destination for exploration expenditure in APEC economies, and exploration expenditure increased by 182 per cent between 2002 and 2006 (MEG 2006).

Recent reforms of the mining law, as well as high prices and a stable investment environment have contributed to recent growth in Peru's mineral exploration expenditure. Positive factors include:

- good geological information
- clear processes and information for investors and
- a liberal foreign investment regime.

The main potential barriers to investment in exploration and the mining sector are social and community relations, with many projects subject to disputes with local communities.

overview of the minerals sector in Peru

contribution to the economy

Mining accounted for 6.1 per cent of Peru's gross domestic product in 2006. Mineral exports are Peru's largest export earner, accounting for around 60 per cent of Peru's export revenue in 2006. Direct and indirect employment from mining accounted for around 3.5 per cent of total employment.

Mining also has large indirect effects on Peru's economy. Of the US$1.5 billion of inputs delivered to the sector, an estimated two-thirds are supplied from within Peru. In 2003, the mining sector paid for about 4 per cent of the government's actual spending, and contributed slightly more than 5 per cent of the total tax intake, making the sector one of the largest overall tax payers in Peru (ICMM 2006).

However, there is still significant social inequality and disparities in income and regional development in Peru. Unlike in many other economies, poverty levels in Peru have not fallen as mining investment has increased (ICMM 2006).

mineral resource base

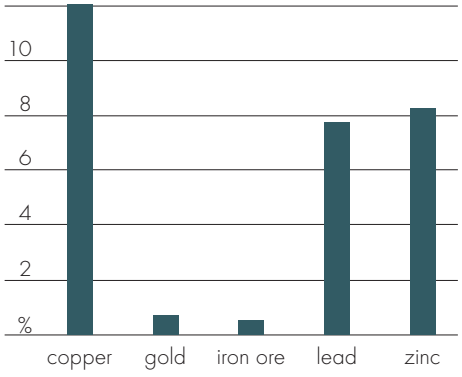
Peru has significant deposits of a number of mineral resources (table 35). Its resources of copper are the fourth largest in the world, while its gold resources are equal third, lead seventh, silver equal fifth, tin fourth and zinc seventh (USGS 2007a; figure 52). Many of these resources are co located within polymetallic ore bodies from which more than one metal can be recovered.

table 35 **reserves of major minerals, 2006 – Peru**

	kt
copper	57 132
gold	2.0 **a**
iron ore	1 141 203 **b**
lead	6 295
silver	54.3
tin	474
zinc	17 106

a Excludes metal in placer deposits. **b** Long tonnes
Source: MEM (2007).

fig 52 **share of world mineral reserves**
Peru



Over the past decade significant investment in exploration, new technology and infrastructure has helped to expand Peru's mineral resource base. These resources are found predominantly in the Andes district of central Peru (map 4; MEM 2007).

production

Reflecting its large resource base, Peru is a significant producer of a number of mineral commodities. In 2006, Peru was the world's largest producer of silver, the world's third largest producer of copper, tin and zinc, and the world's fourth largest producer of lead (table 36).

In the past ten years, production of metallic minerals has increased substantially, with gold and copper production more than doubling (figure 53; MEM 2007). Gold

map 4 **major minerals projects**
Peru

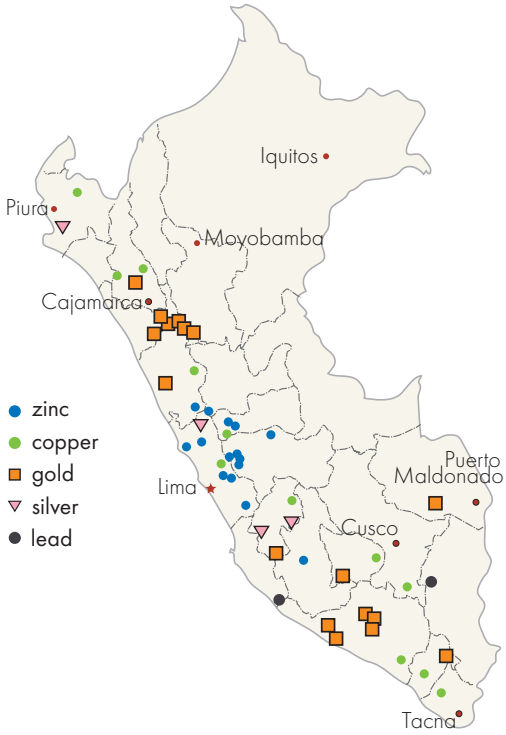
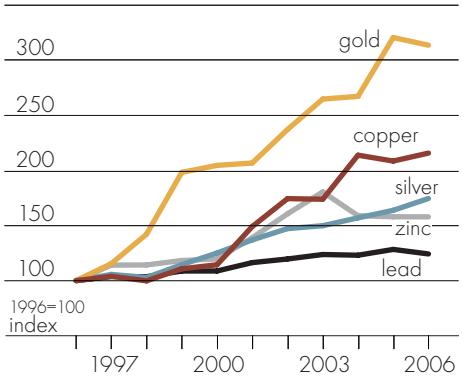


table 36 **ranking in mineral production volumes, 2006 – Peru**

	Latin America	World
copper	2	3
gold	1	5
zinc	1	3
silver	1	1
lead	1	4
tin	1	3

Source: MEM (2007).

fig 53 **minerals production**
Peru



production in Peru grew at an annual average rate of 12 per cent between 1996 and 2006, while copper production increased by 8 per cent a year over the same period.

exports

In 2006, Peru's major mineral exports were – in order of value – copper, gold, zinc, lead, silver, tin and iron ore. Copper accounted for 41 per cent of total export value for minerals in 2006, while gold accounted for 27 per cent. In real terms, the total value of Peru's mineral exports grew by 16 per cent a year between 1996 and 2006, with strong growth in gold, copper, zinc and silver (figure 54; MEM 2007).

In volume terms, copper, tin, iron ore, gold, silver, lead and zinc all grew by more than 5 per cent a year on average between 1996 and 2006 (figure 55). The strongest performer over this period was gold where export volume grew at an average rate of 16 per cent a year, followed by growth in copper exports (8 per cent a year) and tin exports (7 per cent a year).

fig 54 **minerals exports, by value**
Peru

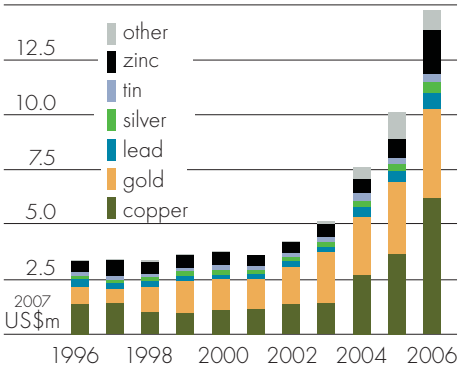
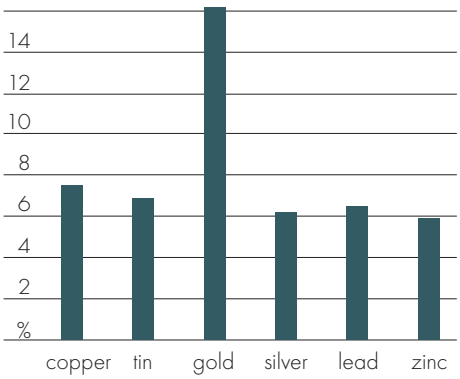


fig 55 **mineral exports, by volume**
annual average growth 1996-2006 Peru



trends in exploration expenditure

In real terms and reflecting the global situation, there was a downward trend in mineral exploration expenditure in Peru from 1996 to 2003. This was reversed in 2004 and in 2005 reached a level similar to that in 1996 (figure 56; MEG 2006). While gold and base metals exploration expenditure have generally followed a similar trajectory, gold exploration expenditure (in real terms) has averaged marginally higher than that for base metals in Peru between 1996 and 2006.

There was a decline in overall grassroots exploration expenditure between 1996 and 2002 but this picked up from 2003 to exceed 1996 levels in 2006. The average expenditure for grassroots exploration remained above all other levels of expenditure between 1996 and 2006. However, late stage expenditure exceeded grassroots in recent years. Late and mine stage exploration expenditure trended slowly down until 2003 after which there was a considerable rise in expenditure for both stages of exploration. In 2006 late stage exploration expenditure was the highest of the three categories (figure 57; MEG 2006).

framework for mineral exploration

In addition to the outlook for global prices, some of the issues that may affect mineral exploration in Peru include the introduction of more stringent environmental and social regulations in recent years, industrial action by workers at certain mining

fig 56 **mineral exploration expenditure, by mineral** Peru

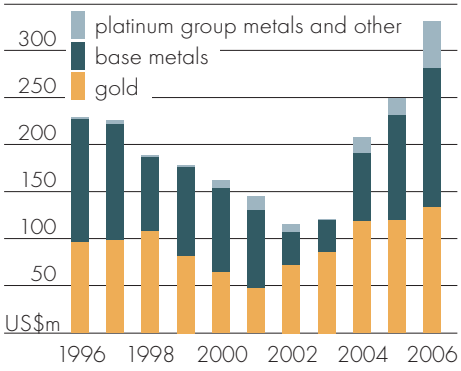
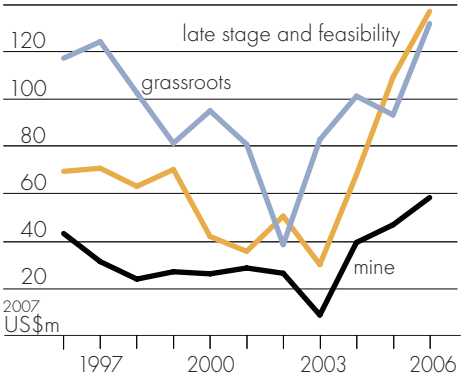


fig 57 **mineral exploration expenditure, by stage** Peru



operations, and opposition by local residents at some of Peru's mineral projects. These issues, as well as the general regulatory and investment environment in Peru, are discussed in more detail in the following sections.

geoscientific information

The Geological, Mining and Metallurgical Institute (INGEMMET) is the public entity that holds the exploration data gathered or obtained by the state. This information is available online to interested private parties for a nominal fee. Geological maps are available at a scale of 1:100 000 for all areas of Peru, with maps of 1:50 000 gradually becoming available for some areas in recent years.

classification and reporting of resources

There is no official classification system for companies to comply with. Reports issued by qualified professionals are used to support the statements on reserves and resources issued by companies. While not compulsory, it is common for companies to follow the JORC code for these reports.

In order for a company to list its shares on the Lima Stock Exchange, it is required to file a geological report prepared in accordance with the 'Code for Reporting on Mineral Resources and Ore Reserves', approved by the Lima Stock Exchange. This is also based on JORC code (Rodrigo 2007).

minerals legislation

ownership and authority over mineral resources

The Peruvian state is the owner of all mineral resources in the ground. The state grants the right to explore and extract minerals by awarding mining concessions to private parties. The concession holder is the owner of all extracted minerals.

A mining concession is independent from the ownership of the surface land under which it is located. Title over a mining concession does not entail any ownership or possession rights over the surface land. In order to undertake exploration or mining activities, the holder of the mining concession can either:

- purchase the surface land for the project. This reduces the exposure of its holder to potential conflicts with the owners or
- negotiate agreements to obtain the temporary use of the surface.

The mining sector is mainly regulated through laws and regulations issues by the national congress and its executive branch. The general legal framework applicable to mining activities is the General Mining Act (Supreme Decree No. 014-92-EM). The Ministry of Energy and Mines is the government office in charge of the mining sector (Rodrigo 2007).

exploration and mining licensing

Any private party may obtain the right to explore and extract any mineral resource, as long as the respective mining concession is granted by the National Institute of Concessions and Mining Cadastre (Instituto Nacional de Concesiones y Catastro Minero or INACC). INACC has recently merged with INGEMMET.

A mining concession title allows its holders to carry out exploration and extraction activities within the granted area once the required administrative permits are obtained. The granting of mining concessions is on a first come, first served basis. The state has no discretionary powers on granting concessions, and is obliged to grant them if the requirements are met and no restrictions apply on the area. Mining concessions are irrevocable and cannot be cancelled as long as its holder complies with the required conditions, including annual payments.

The annual payment for mining concession titles is US$3 per hectare. There are penalties for not achieving a minimum level of production (US$100 per hectare a year in gross sales) within six years after the year that the concession title is granted. If minimum production is not reached by the first half of the seventh year, the holder of the concession must pay a US$6 penalty per hectare a year until such production is reached. The penalty increases to US$20 per hectare a year from the twelfth year. It is possible to avoid payment of the penalty if evidence is presented to the mining authorities that an amount ten times the applicable penalty or more has been invested. Non compliance with any of these payments for two consecutive years will result in the cancellation of the concession (Rodrigo 2007).

There are no restrictions or special requirements for foreign companies to hold mining concessions in Peru, although they are required to incorporate a local company to be the formal title holder of the concession. The only exception is if the

mining concessions are located within 50 kilometres of Peruvian borders, which requires an additional – although normally straightforward – approval by the Ministry of Defence.

Mining concessions are granted in areas ranging from 100 to 1000 hectares in grids or groups of adjacent grids. Concessions in coastal areas may be granted for areas between 100 to 1000 hectares (MEM 2006). No exploration activities may be undertaken in the capital, Lima.

Any interested party may find information regarding a concession by reviewing its administrative file at the INGEMMET. The files and cadastral maps include information on the location of a concession, and information on the existence of surrounding or adjacent mining rights. This information is available online and is a useful tool for prospective explorers in Peru.

There are no restrictions in transferring or selling of mineral concessions between parties.

approvals process

exploration

For approvals, exploration projects fall into three categories, depending on their impact on the environment (MEM 2006, Rodrigo 2007):

category A – an exploration project that may make a very slight or no alteration to the surface. These projects require no authorisation or permits. Activities might include geological and geophysical surveys, topographic surveys, and the collection of small amounts of surface rock and ore samplings using instruments/tools that are transported by hand, or over the surface without doing any more damage to the surface than non exploration activities.

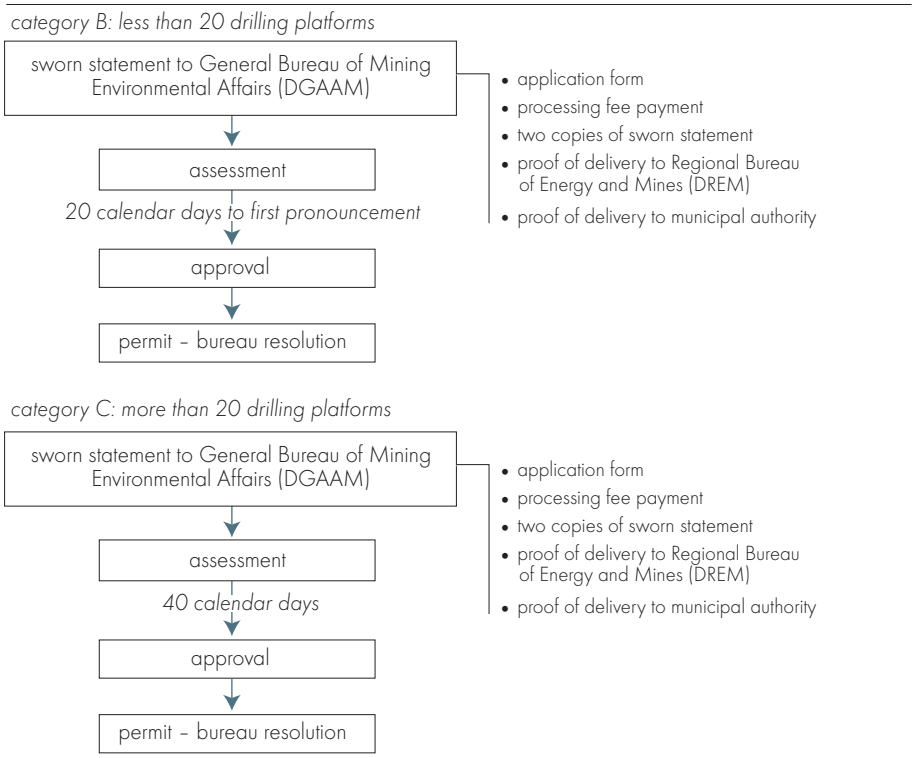
category B – mining exploration activities that generate effluents or wastes capable of degrading the environment and that involve the disturbance of an area required to build 20 drilling platforms or less, up to a maximum disturbed area of 10 hectares, or the construction of tunnels with a maximum length of 50 metres. These projects must file an affidavit and certain documents to the mining authorities communicating their intention to start the exploration project. The authorisation will be issued automatically as long as all the required information is presented.

category C – mining exploration activities that generate effluents or wastes capable of degrading the environment and that involve the disturbance of an area required to build more than 20 drilling platforms, and more than 10 hectares to be disturbed, or the construction of tunnels exceeding 50 metres in length. These projects require an authorisation that is granted once the environmental assessment is approved by the Ministry of Energy and Mines. Usually this process takes between two and four months (figure 58; MEM 2006).

extraction

Before initiating construction or mining activities, and/or expanding existing operations, an environmental impact study must be approved. This process of authorisa-

fig 58 **approvals process for mineral exploration projects**
Peru



tion involves public hearings at the site where the project is located and concludes within a term of 120 calendar days, although in practice it might take between six and eight months (MEM 2006).

fiscal regime

taxation

Peruvian nationals and foreigners residing in the economy, legal entities incorporated in Peru and local permanent establishments of foreign entities, are considered as domiciled tax payers. Companies incorporated in Peru are generally subject to corporate tax rates of 30 per cent. Companies that make dividend distributions to individuals or legal entities that are not domiciled in Peru are further subject to a supplementary tax of 4.1 per cent on the value of the distributions (Rodrigo 2007).

royalties

In 2004, the Peruvian Government imposed an ad valorem royalty based on the value of the mineral concentrate. Mineral concession holders must pay a mineral royalty on the extraction of mineral resources, payable monthly between 1 per cent and 3 per cent of the value of the ore concentrate or equivalent. The mining royalty is calculated by applying a 1 per cent rate to the annual sales of concentrates under US$60 million, 2 per cent to the excess over US$60 million up to US$120 million, and 3 per cent to the excess over US$120 million (Polo y La Borda 2006).

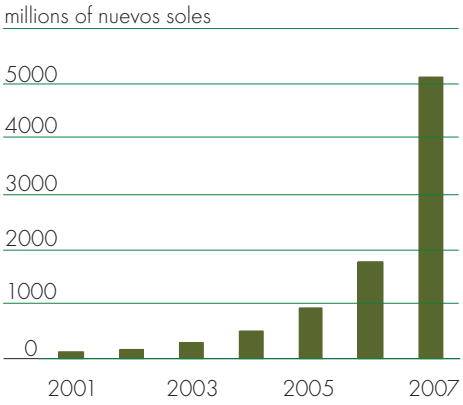
tax incentives

During the exploration phase, mining concession holders may apply for the full recovery of valued added tax (19 per cent) in relation to goods, services and construction contracts directly used in respect of exploration activities. To apply, the concession holder must enter into an exploration investment agreement with the Peruvian Government (a minimum of US$500 000 investment commitment is required) (Rodrigo 2007).

Canon Minero

In Peru there is a mechanism – the Canon Minero – which directly redistributes mining revenue collected by the central government to regional authorities. Since 2002, 50 per cent of corporate income tax collected from mining companies has been redistributed to regions, municipalities and districts where mines are located.

fig 59 **Canon Minero transfers**



Although the Canon Minero transfers amount to only a small proportion of total national government spending, these can be highly significant at the local and regional level, and have been increasing strongly in recent years (figure 59; MEF 2007). However, the increase in funding has not necessarily been matched by equal improvements in institutional and administrative capacity at the regional and local level, which has limited the flow of funds into projects. This will need to be improved for the Canon Minero to effectively achieve the intended results. Another restriction in the ability of the Canon Minero to deliver results is that it must be spent on capital projects, as opposed to capacity building projects. To date there has been no visible reduction in local poverty; however, it may be too early for any benefits from the increased transfers to show up in available data (ICMM 2006).

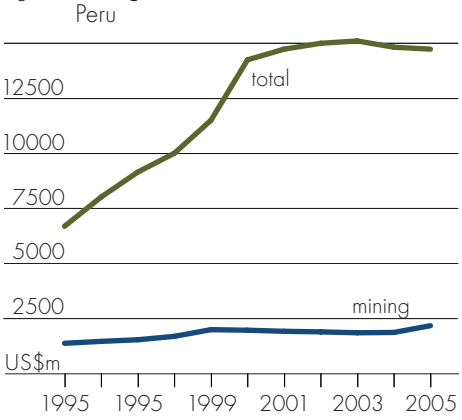
other legislation affecting the minerals sector

foreign investment

The mining laws and regulations that were enacted during the 1990s were aimed at encouraging and promoting private foreign investment in the sector (box 15). Proinversion is the Peruvian Investment Promotion Agency, which has been set up to promote the economy as providing a favourable environment for national and foreign investment. The Foreign Investment Promotion Law 1991 establishes the rules for the development of foreign investments in Peru.

Foreign investments are allowed, without restrictions, in most economic activities.

fig 60 **foreign direct investment**



No prior authorisation is required for foreign investments; acquisition of national investors shares is fully allowed through the stock exchange or other mechanism. Companies are free to remit profits and dividends abroad. Companies may also enter in stabilisation contracts with the government that guarantee aspects of the investment environment.

Foreign direct investment in mining accounted for 15 per cent of total foreign investment in Peru in 2005, and has increased by more than 7

box 15 **economic and mining sector reform in Peru**

At the end of the 1980s, the Peruvian mining sector was performing poorly. State owned mining operations were reporting annual losses of around US$100 million, and new investment was not forthcoming.

The Peruvian Government that took office in 1990 initiated a series of structural reforms in 1991. The mining sector was targeted directly by the reforms.

Following a period of state dominance of the mining sector, private sector involvement was actively encouraged and state owned mining assets were privatised. A new mining law was enacted in 1992 – the General Mining Law – which coincided with the start of a mineral exploration and production boom in the early 1990s.

These changes included a definition of the status of mineral rights, and the functions and management of a modern cadastre. They also simplified the tax regime, eliminating any discrimination between national and foreign capital, introduced stability contracts, and removed restrictive foreign exchange rate policies.

Further reforms were undertaken early this decade, including a decentralisation process that devolved significant responsibility and resources to regions, and a number of laws related to sustainable development (Bastida et al. 2005).

per cent a year on average over the past decade (Proinversion 2007a; figure 60). The share of the mining sector fallen in recent years, from 21 per cent a decade ago.

stabilisation contracts

One of the measures the Peruvian Government has put in place to attract foreign investment includes the possibility for foreign investors, including in the minerals sector, to enter into stability agreements for ten year terms with the government (the general stability regime) that guarantee stability with respect to income tax, currency exchange, and non discrimination against investors. Locally based companies conducting mining activities can execute stability agreements for ten or fifteen year terms (the special mining stability regime) which, in addition to the above features, permit free trade of mineral production and administrative stability for validity fees, penalties and other mining related fees.

- General stability regime – foreign investors or the local enterprises receiving investment may execute juridical stability agreements with the state for a ten year term, provided that certain requirements are met and minimum investment levels are assumed (US$10 million in the case of mining activities). The agreement guarantees stability concerning the income tax regime; the currency exchange regime, including free availability of foreign currency and free remittance of capital and profits; nondiscrimination; and the labour contracting regime.
- Special mining stability regime – the holders of mining activity concessions make executive mining stability contracts with the state for 10–15 year terms provided that certain minimum production or investment commitment is assumed. These agreements guarantee: tax stability; nondiscriminatory treatment; free trade of mineral production; free remittance of profits and availability of foreign currency; and administrative stability (Rodrigo 2007).

environmental regulations

Some of the most important laws that regulate environmental issues in Peru are the General Environment Act, the Mining Closure Act and its recently approved regulations, the Environmental Protection Regulations for Mining Activities, Environmental Regulations for Mining Exploration Activities, Environmental Impact Law and regulations, and the Regulations on Maximum Permissible Limits for Emissions and Effluents.

mine closure law

The mine closure law sets out the obligations and procedures that title holders must follow to design their mine closure plan, as well as requirements to establish financial guarantees to ensure the fulfilment of the obligations. The mine closure plan has to be implemented progressively from the beginning of the operation to the final and post closure stages of a mine. The financial guarantee required by the mine closure plan must be constituted within twelve months after the mine closure plan has been approved, and yearly financial contributions must be made by companies, based on costs (Polo y La Borda 2006).

other factors affecting mineral exploration

access to capital

The main source of financing in Peru is the banking system (foreign and local), mainly through project finance, and the securities market, that is, the issuance of bonds and shares through public offerings. In the past, only major mining companies had the possibility of accessing the securities market due to its high transactional costs and strict requirements. However, the 'risk capital segment' of the Lima Stock Exchange was created to allow junior companies to list their shares and raise funds for exploring and developing new projects, provided that certain requirements and technical standards are met. There is an increasing interest from both junior companies and individual investors in this financing mechanism (Rodrigo 2007).

labour restrictions

Companies operating in Peru are allowed to hire foreign employees for up to 20 per cent of their total number of employees. The remuneration paid to foreign employees must not exceed 30 per cent of the total company payroll. The employer may request exoneration from these limitations for specialised professionals, technicians, and management staff. Foreign employees are required to have written labour contracts for a maximum period of three years, although these are renewable (Proinversion 2007b).

social issues

In recent years the number of protests and associated conflicts by affected communities against minerals projects in Peru has increased (box 16). With local and

box 16 social issues and mineral exploration in Peru: the case of Rio Blanco

The Rio Blanco copper/molybdenum deposit in northern Peru is one of the largest undeveloped copper resources in the world, and if developed as planned, will be the second largest copper mine in Peru. The target date for mine start up is 2011.

There have been a series of problems since exploration rights were obtained by the project developer earlier this decade. It is a prime example of an exploration project that does not appear to have a clear 'social licence' from the community.

While the project has the support of the national government, local mayors have campaigned against the project, supported by environmental groups and other NGOs. Marches and violent clashes between the police and local peasants protesting against the project have occurred in 2004, 2005 and 2006.

In September 2007, there was an unofficial referendum in the three affected districts. Of the 17 971 votes cast (a turn out of almost 60 per cent), all but 984 voted against the mine. While the state is not forced to accept the results of the referendum, it highlights the significant opposition that exploration and mining projects can face in Peru.

Concerns raised about the Rio Blanco project include a threat to endangered species, such as the Andean tapir, as well as water quality. The environment impact study for the project has not yet been released. It is also understood from the Peruvian Ombudsman that the company has not obtained the authorisation of two-thirds of the members of the communities in the mining concession area, as required under current law, to commence exploration on the land.

The company has employed a number of strategies to engage with the local community. It employs a social team of thirty professionals who live and work in the Rio Blanco Area. A Rio Blanco Steering Committee has been formed, which is a forum where supporters and opponents of the project can express their opinion and discuss the impacts and benefits of the project.

More recently, the project developer has proposed to each of the two principal local communities in the area of influence of Rio Blanco (Yanta and Secunda y Cajas) their participation in two US$40 million private funds to be established for the benefit of each of these communities, to be used for community projects of their choice. This US$80 million contribution will be in addition to the share of revenues that these communities will receive from taxes and royalties paid by the company and remitted to them by the national and provincial governments once the mine comes into production.

Sources: Monterrico Metals (2005, 2007); The Economist (2007); The Economist Intelligence Unit (2007); Oxfam America (2007); Bebbington et al. (2007).

regional government bodies struggling to provide basic public services in the often remote areas that mineral projects are located in, such as healthcare, water and electricity, communities often turn instead to companies for such services.

While most companies have introduced initiatives that benefit surrounding populations in order to achieve good relationships, this is often perceived to be insufficient (Polo y La Borda 2006, ICMM 2006). Local communities often own the superficial lands required to explore and eventually extract a particular resource, and good relationships are essential. Public participation has been fostered though public hearings and comments, involving more stakeholders. While this is an important aspect of project development, it has the potential to delay solutions to disputes and development of projects (Polo y La Borda 2006).

The influence of nongovernment organisations (NGOs) has also increased in recent years in Peru. This has been supported by improved communications facilities, the greater involvement of surrounding populations, and the increasing incorporation of public participation in the development of government policies. At the beginning of 2006 there were more than 1000 registered NGOs in Peru (Polo y La Borda 2006).

In response to these emerging issues, several mining companies agreed to execute agreements with the government to make voluntary contributions direct to local communities of 3 per cent of the sector's after tax profits (The Economist 2007). This is in addition to the Canon Minero funds flowing to the communities. Annual contributions are expected to amount to approximately 500 million nuevo soles (US$159 million), which would result in a total contribution of 2.5 billion nuevo soles during a five year term. These funds will be managed and invested by special associations controlled by the companies, but with participation from the regional communities and authorities (Rodrigo 2007).

6

sustainable development and the minerals sector

Increasingly, environmental and social considerations are influencing investment decisions in the minerals sector. Unregulated mining activities during the early development of the minerals sector in a number of APEC economies have left a legacy of unrehabilitated mine sites, polluted rivers and degraded land. Minerals projects are also often cited as key factors stimulating other environmental and social concerns, including the release of ozone depleting substances; the threatening of endangered species; illegal logging; transborder movements of hazardous wastes; and breaches of human rights. The potential adverse environmental and social consequences of mining can linger long after mines are closed.

These issues are particularly important in the exploration stage of minerals projects as this is the first opportunity for companies to build relationships with local communities and to begin to plan how environmental and social issues can be addressed throughout a project's life cycle.

Much of the environmental damage caused by mining activities has a direct impact on local communities in terms of their livelihoods and health. For example, mining operations can affect land used by indigenous people for hunting and gathering, shift cultivation, or adversely affect forests that yield timber and non timber products. Further, indigenous cultures are often closely linked to natural resources that have a high social and spiritual significance.

The environmental, social and economic effects of mining on local communities have attracted wide public attention and political controversy in recent decades. Mining operations, particularly of a large scale, have become the targets of increasingly pro environment politicians, nongovernment organisations (NGOs), and the public at large. This increased interest has also led to a significant rise in the expectations of local communities and national and local governments about the effectiveness of the sector in addressing environmental and social concerns.

Against this background, it is becoming increasingly clear that the institutions and systems that economies establish to regulate, manage and monitor the economic, environmental and social impacts of exploration and mining operations directly influence the extent of investors' interest in starting up a particular mining operation. It is important that principles developed to contribute to sustainable development in

the minerals sector are flexible and recognise the constraints facing the sector from an economic, environmental and social perspective and that these differ across regions (Lambert 2001; MMSD 2002).

business case for sustainable development

From an investor's perspective, it is now widely recognised that the financial success of mining firms is increasingly tied to environmental competence (Bond and Weber-Fahr 2002). As such, these firms are placing more emphasis on competent regulators and efficient institutions that reinforce the importance of reliable and widely accepted environmental and social frameworks. Firms involved in the minerals sector can benefit from addressing sustainable development concerns, including:

- Lower labour costs – a commitment to social and environmental responsibility can translate into employees that are more motivated, satisfied, innovative and productive. As a result there are likely to be fewer disruptions from labour disputes, employee absenteeism and lower labour turnover.
- Lower health costs – employees' health and well being is supported by a healthy environment. This can result in higher productivity, lower employee compensation and reduced costs to social services and medication. For example, in Papua New Guinea, the tropical disease of lymphatic filariasis at Placer Dome's Misima mine was eradicated through a joint initiative between the company, the World Health Organisation and James Cook University. This resulted in reduced absenteeism by employees at the mine.
- Lower costs as a result of cleaner production methods – reduced use of raw materials and increased recycling in the production process can lower production costs. Technological change and innovation can improve production processes, for example, the ability to process lower grades of ore that would have otherwise been classed as waste. This improves recoveries and reduces the environmental issues of metal content in waste.
- Social licence to operate and lower transaction costs – companies require access to resources to sustain the business. To do this, companies must be able to address high expectations of governments and communities in their social and environmental performance (MMSD 2002). Increased transparency regarding a project can assist in building stronger relationships with stakeholders, thereby reducing transaction costs in terms of managing stakeholders and approvals processes.

Companies and governments have acknowledged the minerals sector can play a role in sustainable development and have introduced a number of initiatives to assist in the better management of environmental and social issues arising from mining operations, and of stakeholders potentially affected by these issues. These include the Extractive Industries Transparency Initiative and the Kimberley Diamond Certification Scheme. The minerals sector has been an active supporter of, and participant in, this work.

economic contribution of the minerals sector

Mining can create substantial direct and indirect economic benefits such as royalty payments, infrastructure development, employment and skills development. World Bank studies indicate that every dollar a company spends on a mine generates around US$2.80 elsewhere in the economy (MMSD 2002). Mineral production in developing economies can stimulate socioeconomic development by converting mineral wealth into human, social and physical capital. This is important for many developing APEC economies that are resource rich, particularly in south east Asia and Latin America.

A number of APEC economies, including Canada, Australia, and the United States, advanced in part through the development of their minerals sectors. In Australia, mineral extraction contributed to the growth of cities and regional centres, and the development of infrastructure such as railways and ports. These factors facilitated the expansion of other industries, including agriculture and manufacturing.

The International Council on Mining and Metals (ICMM), World Bank and UNCTAD Resource Endowment Initiative analysed the socioeconomic performance of 33 resource rich economies to better understand how large scale mining activity in low and middle income economies can enhance the socioeconomic development of host economies (ICMM, WB and UNCTAD 2006). The initiative analysed economic growth over a 20 year period and compared the performance with previous decades using data over a 50 year period. The performance of the 33 economies was also analysed in terms of the contribution of the minerals sector to reducing poverty, as measured by the UN Human Development Index, infant mortality, and two Millennium Development Goals: the number of people below a minimum level of dietary consumption and the number of rural households with access to improved drinking water. It concluded that the performance of the 33 economies was highly variable, and that resource wealth does not automatically translate into economic improvements. Within APEC, the performance varied

from very good (Chile, Malaysia and Mexico), to poor (Peru), to very poor (PNG and the Philippines) (table 37).

A number of APEC economies have developed supporting policies and regulation of the minerals sector to ensure that economic benefits are captured and create long lasting benefits for the community. In most instances this has been developed with participation from all stakeholders.

One of the ten mining policy principles agreed to at the APEC Minister's Responsible for Mining Meeting (MRM3) was to support capacity building activities for sustainable development so that all APEC economies are able to maximise the benefits and minimise the impacts from minerals resource development (box 17).

table 37 **socioeconomic performance of resource rich, low to middle income economies**

better performers		worse performers	
better performers	**generally better performers**	**weaker performers with relatively better performance in a few economic (E) and social indicators (S)**	**clearly poor performers**
Chile	Colombia	South Africa (E)	Bolivia
Botswana	Guinea	Tanzania (E)	Central African Republic
Malaysia	Jamaica	Guyana (E)	Congo
Tunisia	Mali	Mauritania (E)	Liberia
Ghana	Morocco	Gabon (E + S)	Niger
Mexico	Mozambique	Peru (S)	PNG
	Namibia	Suriname (S)	Philippines
	Senegal	Togo (S)	Sierra Leone
		Jordan (S)	Zambia
		Zimbabwe	

Note: With the exception of Mozambique, these groups remain unchanged irrespective of whether twelve equal weights are given to all twelve economic (growth) and social (poverty) indicators (that is eight economic indicators = 66% and four social indicators = 33%) or whether one uplifts the four social indicators by giving both groups of indicators an equal share of 50%. In the first instance, Mozambique would be included in the top group. However, it was included with the second group because the data for Mozambique cover only a few years.
Source: ICMM, WB and UNCTAD (2006).

box 17 **capacity building in APEC – MRM3 workshops**

Building on the success of the sustainable development capacity building workshops held during the APEC Ministers Responsible for Mining meeting (MRM3) in Perth in February 2007, the Australian Government initiated two further workshops to be held in Jakarta (Life of Mine Planning) and Beijing (Stewardship) in November 2007. These workshops aim to contribute to the implementation of the policy principles agreed at the MRM3 meeting and contribute to the objectives of the newly agreed APEC Mining Task Force.

Broadly speaking, the workshops aim to:

- foster sustainable mining practices through the provision of technical and capacity-building support to APEC economies for the mining and processing of minerals, including small-scale mining, and where possible and appropriate, improve value-added processing, upgrade scientific and technological information, for example, to reclaim and rehabilitate degraded sites.
- support efforts to address environmental, economic, health and social impacts and benefits of mining throughout its life cycle, including workers' health and safety, and promote transparency and accountability for sustainable mining and minerals development.
- enhance the participation of stakeholders, including local and indigenous communities and women, to play an active role in minerals development throughout the life cycles of mining operations, including after closure for rehabilitation purposes, in accordance with national regulations and taking into account significant transboundary impacts.

social issues

Social issues are progressively forming an integral part of the sustainable development agenda in the minerals sector. The social dimensions of mining vary significantly across APEC economies, reflecting different socioeconomic and political conditions. While there has been a trend toward more socially responsible performance by companies over the past decade, the priority accorded to these issues varies across APEC economies. Important social considerations for mining companies include community engagement, land use and human rights.

community engagement

Strong, enduring relationships with the local community are essential for mining companies. This is particularly important in the exploration stage as the relationship between the community and mining company is first established and sets a precedent for future activities and other companies that wish to engage with the community. Community perceptions will be influenced by the process of community engagement. It is important that companies are fully informed about and understand the community's priorities and use this information in business planning. For example, Newmont Mining Corporation used community consultation effectively to ensure the local community's commitment to the closure and rehabilitation of the Martha Mine in New Zealand (box 18).

box 18 **community engagement at the Martha Mine - New Zealand**

The Martha Mine is located at the centre of the Waihi township in New Zealand and has been operated by the Newmont Mining Corporation since 2000. In 2003, Newmont established a forum to facilitate community participation in planning for closure and rehabilitation of the Martha Mine through a community consultation process with the local council. Newmont agreed to fund the costs of an independent facilitator, venue hire and running costs.

The establishment of the Waihi consultative committee provided a broad opportunity for the community to be proactive in working toward the long term social, environmental, cultural and economic sustainability of the town. The success of this initiative is attributable to:

- the use of an independent facilitator who had the confidence of all parties involved
- active long term senior level participation of key stakeholders
- an inclusive process that took all views into consideration
- a commitment to meeting community based goals
- a commitment to the development of relationships with the community
- a commitment to transparency and
- consensus decision making.

Source: ITR (2006a).

Government policy and approval systems in a number of APEC economies encourage consultation with key stakeholders to assess and minimise the social impact of mining activities on a community. For example, in Australia, Primary Industries and Resources South Australia (PIRSA) encourages project proponents to engage in consultations with communities and other departments by requiring a community consultation committee to be established.

land use

In many APEC economies there is a conflict between ownership of land and ownership of mineral resources. Typically, surface land rights are either publicly or privately owned while mineral ownership generally resides with the government. As a result, some companies face challenges in the use of the land despite holding concessions to explore for, or extract, mineral resources.

Uncertainty about land access for mineral exploration can impose considerable constraints on the minerals sector. However, the development of mineral resources has significant implications for competing land uses such as agriculture and urban development. As such, other parties – typically local communities and indigenous landowners – have a stake in land use decisions. There are a number of ways in which affected parties can be involved in the decision making process (MMSD 2002). These include providing information to communities of planned activities that will alter the way land is used and consulting with all affected parties, including those who have a vested interest in the land and any sites of natural, cultural or spiritual significance.

Decisions regarding land use may require the company to compensate parties that must surrender their rights for the common good. In some instances individuals or groups have the right to refuse some land use decisions

human rights

Typically, mining companies must operate in regions where there is high mineral prospectivity. In some instances, mineral resources are located in economies where governments have abused the human rights of their citizens. As a result, companies are often accused of complicity, or at times direct or indirect responsibility, since they have been willing to work with repressive regimes or in economies with weak governance and rule of law.

Allegations of human rights abuses have also occurred when companies have relied on national security forces to gain control over land or to defend established premises. Mineral deposits are often found in remote areas where companies and security forces have little understanding of local traditions and processes.

Mining companies can also affect human rights through labour conditions, including poor pay and unsafe working conditions. These conditions are generally maintained under the International Labour Organisation standards (MMSD 2002).

Most mining companies have good human rights records owing to a number of declarations and initiatives for human rights that are supported by mining companies, such as, the United Nations' Global Compact and universal declaration of human rights, and the World Bank's operational directive on involuntary resettlement. The minerals industry also supports initiatives aimed at reducing the illegal trade of commodities that are used to finance wars. For example the diamond industry helped establish the Kimberley Process Certification Scheme (box 19) that aims to stem the flow of rough diamonds that are used by rebel movements to finance wars against legitimate governments.

box 19 Kimberley Process Certification Scheme

The Kimberley Process Certification Scheme is a joint government, international diamond industry and civil society initiative to stem the flow of conflict diamonds - rough diamonds that are used by rebel movements to finance wars against legitimate governments. The trade in these illicit stones has contributed to conflicts in economies such as Angola, Cote d'Ivoire, the Democratic Republic of Congo and Sierra Leone.

The Kimberley Process Certification Scheme has 47 participants, including the European Community. These participants account for more than 99.8 per cent of global production of rough diamonds. Under the Kimberley Process Certification Scheme, participants must certify that shipments of rough diamonds are free from conflict diamonds and participants can only trade with other participants who have met the minimum requirements of the Scheme.

The KPCS was developed in 2002 after the United Nations General Assembly adopted a resolution supporting the creation of an international certification scheme for rough diamonds in December 2000.

Source: Kimberley Process (2007).

environmental considerations

Typically, exploration has a limited impact on the environment – depending on the stage of exploration. However, the development of a mineral deposit can have considerable environmental implications. Unregulated mining activities during the early development of the minerals sector in a number of APEC economies have left a legacy of unrehabilitated mine sites, polluted rivers and degraded land. In some APEC economies, environmental regulation is well established and effective voluntary regulatory frameworks, such as impact assessments, have been developed to encourage corporate social responsibility.

Each stage of minerals projects from exploration to production can potentially create adverse air quality impacts through the emission of particulates, including dust, diesel and silica. Dust is an inevitable part of mining resulting from blasting, handling, processing or transporting ore. It is one of the most visible and invasive forms of particulate emissions and can have significant impacts on the health of employees and surrounding communities.

Mining and mineral processing require a considerable amount of energy. As such, controlling the level of greenhouse gas emissions is becoming increasingly important. The emissions efficiency of a project can be influenced by changes to the emissions intensity of purchased energy.

At most mines sites, ore extraction and processing, workforce health and safety, and rehabilitation require water. In addition, mining operations have the potential to affect the local water quality through the release of chemicals and waste from processing. Mining companies must compete with other users for water resources, particularly in arid areas. Since water is a shared resource, it is important to develop water management systems. These systems account for site specific physical, chemical and climatic differences. Periodic reviews can help ensure the effectiveness of the system.

The Environmental Impact Assessment (EIA) assesses the potential impact of a project on the environment and is the most widely used environmental management tool in the minerals sector. The EIA is increasingly being expanded to include social concerns, integrating social impact assessment into the process.

The full benefits of an EIA are gained when incorporated into an environmental management system (EMS) that incorporates environmental responsibilities into a company's management practices. The EMS is structured so that the company

and regulatory authorities are aware of, and can control, a project's performance throughout its life cycle. The stages of an EMS cycle include: organisational commitment; environmental policy; socioeconomic impact assessment; environmental impact assessment; community consultation; objectives and targets; environmental management plan; documentation and environmental manual; operational control and emergency procedures; training; emissions and performance monitoring; environmental and compliance audits; and reviews (MMSD 2002).

International Organisation for Standardisation (ISO) is an international body of technical standards for various industries. Obtaining ISO certification can result in business efficiency through better process control (ISO 2007). The 14 000 series provides for the development of an environmental management system and a supporting audit program.

byproducts of mining

Large scale mining can generate a considerable amount of waste – including mined rock, tailings and slag – that can reduce the productive capacity of the land if it is not rehabilitated adequately and release pollutants into nearby water systems.

Tailings are commonly stored in surface facilities, which can represent as much as half of the area of disturbance of mining operations. It is important for companies to manage this waste so as to minimise its impact on the environment during operation and after closure. Tailings storage facilities, at a minimum, provide safe, stable and economic storage of tailings that present negligible public health and safety risks and low social and environmental impacts.

Mining activities can also create non mineral waste, such as, oils, tyres, refractory linings and other domestic rubbish. It is important that this waste is recycled where possible or disposed in an environmentally sound manner. A number of international conventions have been developed to prevent the transborder movement of hazardous waste and promote better management of hazardous materials. These include the Basel Convention (box 20) and the International Cyanide Management Code (box 21).

closure/rehabilitation

Inevitably every mining operation will be required to close either through economic resource exhaustion or changes to project viability. In some instances, mining will

only be suspended and the project placed on care and maintenance. The completion of mining and the mine closure strategy determines what legacy is left for future generations. If an effective mine closure strategy is not in place, a site can remain hazardous and a source of pollution for many years. As such, for a mine to contribute to sustainable development, closure strategies should be considered at the beginning of the project.

A mine closure plan defines the end result and methods to achieve that result. A good mine plan incorporates a rehabilitation plan that ensures that the post mine landscape is safe and stable against the erosive forces of wind and water; surrounding water quality is maintained; and the agreed post-mining land use is acceptable to local authorities and communities. Mine closure plans are more effective when developed well in advance of closure. For example, the closure of the Misima mine in Papua New Guinea was well managed by the company and community (box 22).

box 20 **Basel Convention**

There are a number of multilateral environmental agreements that are administered by the United Nations Environment Programme (UNEP) to minimise the effect of hazardous waste on humans and the environment. The Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal was implemented in 1992. The convention has 170 parties and aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes.

Under the convention, all exports and imports of covered materials must be consented to by the countries of import and export. Shipments are considered illegal if prior consent is not obtained. In addition, all parties to the convention must enact domestic legislation to prevent and punish the illegal movement of hazardous waste and ensure that all wastes are disposed of in an environmentally sound manner.

Reflecting this, all parties should ensure that the transfer of transborder waste is minimised; waste is disposed of a close as possible to where it is generated and to minimise the amount of waste generated at the source.

Source: UNEP (2007).

box 21 International Cyanide Management Code

There is currently no economically viable, environmentally sound alternative to using cyanide as the reagent in gold production. Cyanide requires careful management. The International Cyanide Management Code For the Manufacture, Transport, and Use of Cyanide In the Production of Gold is a voluntary initiative for the gold industry to promote the responsible management of cyanide used in gold mining while reducing the impacts on human and environmental health.

The code establishes nine principles, each with a specific standard of practice, to protect employees, the environment and the community. The principles address:

- responsible production
- safe transport
- proper handling and storage
- operations
- decommissioning plans
- employee safety
- emergency response strategies and capabilities
- training
- public dialogue.

Companies must have their operations audited by a third party to ensure that their operations and management of cyanide meet the requirements of the code in order to gain certification. Results of the third party audits and certification are available on the ICMI website www.cyanidecode.org.

Source: ICMI (2006).

Closure planning has increasingly expanded to include socioeconomic issues so that regions are developed in a way that will remain sustainable after the closure of the mine. After the closure of a mine, local governments are likely to receive less revenue; individuals may be unemployed; and some institutions lose funding. As such, financial planning is essential in ensuring that benefits of the mine development will not be lost (MMSD 2002).

box 22 **closure of the Misima Mine, Papua New Guinea**

The Misima Gold Mine commenced production in 1987 and operated until 2004. In April 2005, final deconstruction and rehabilitation was completed. Detailed planning of the mine closure commenced five years prior to final production. A risk assessment was used in three facilitated workshops to gather views of all stakeholders in the rehabilitation planning. The first workshop, held in 2001, identified safety and sustainability issues and hazards, and ranked suitable control measures. The second workshop, held in 2003, reviewed the detailed closure plans and the issues identified in the first workshop. The final workshop was held in 2004 prior to demolition and conducted a final risk assessment focusing on key safety aspects.

From these workshops an action plan was developed that resulted in the successful deconstruction completed as planned; no lost time accidents or injuries; landform use suitable for agricultural purposes; opportunities for local landholders and government to manage the hydroelectric power and water system; and local governments responsible for medical centres and other infrastructure installed during development. Strong community support ensured the success of this plan.

Source: ITR (2006b).

governance

Governments play a central role in improving governance for sustainable development through passing legislation, regulation and the provision of incentives. Good governance is vital for converting revenues from mineral extraction into economic growth and poverty reduction. When transparency and accountability are weak, extractive industries may contribute to corruption, conflict and poverty. The Extractive Industries Transparency Initiative was developed to ensure greater transparency of governance in developing economies (box 23).

A number of international conventions have been developed to contribute to sustainable development in the sector (table 38). These conventions are intended to compel governments to enact legislation to implement their commitment. However, in some instances this does not occur due to a lack of resources, political will or power of enforcement.

box 23 Extractive Industries Transparency Initiative

A number of APEC economies are involved in the implementation of the Extractive Industries Transparency Initiative (EITI). Australia, Canada, the United States, Japan and the Russian Federation (through G8) have announced their support of the initiative. Peru is the only APEC economy that has committed to implementing the EITI principles (EITI 2007).

In 2001, the World Bank conducted the Extractive Industries Review (EIR). The review engaged numerous stakeholders to discuss whether extractive industries projects were compatible with the World Bank's goals of sustainable development and poverty reduction. After two years of consultations it was determined that extractive industries can contribute to sustainable development and poverty reduction provided the following enabling conditions were in place:

- public and corporate governance aimed at assisting the poor, including proactive planning and management to maximise poverty alleviation through sustainable development
- more effective social and environmental policies and
- respect for human rights (World Bank 2004).

Reflecting the findings of the EIR, the EITI was developed to ensure that revenues from extractive industries contribute to sustainable development and poverty reduction. EITI encourages governments, publicly traded, private and state owned extractive companies, international organisations, non government organisations and others with an interest in the sector to voluntarily work together to promote transparency of payments and revenues through the publication and verification (reconciliation) of company payments and government revenues.

table 38 key international conventions

convention	relevance to the sector	ratification status of APEC economies
Conventions on Combating Bribery of Foreign Public Officials in International Business Transactions, OECD, 1997	Requires international cooperation to combat corruption	All OECD APEC economies have ratified the Conventions (Australia, Canada, Chile, Japan, Republic of Korea, United States, Mexico, New Zealand)
ILO Safety and Health in Mines Convention, 1995	Contributes to the improvement of working conditions in the minerals sector	Philippines, United States have ratified the Convention
Biological Diversity Convention, 1992	Aims to conserve biodiversity and ensure the equitable dispersion of benefits from its use	All APEC economies except Brunei Darussalam and the United States have ratified the Convention
Framework Convention on Climate Change, 1992	Controls emissions of greenhouse gases, namely though the Kyoto Protocol 1997, and is encouraging the implementation of a range of measures	All APEC economies have ratified the Convention. All APEC economies except the United States and Brunei Darussalam have ratified the Kyoto Protocol
Basel Convention on the Trade in Hazardous Wastes, 1989	Prohibits transboundary movements of hazardous waste for recycling and recovery which affects metals trade	All APEC economies except the United States have ratified the Convention
Indigenous and Tribal Peoples Convention, 1989	Provides basic rights for indigenous and tribal people including traditions and property	Mexico and Peru have ratified the Convention
Montreal Protocol on Ozone Depleting Substances, 1987	Forces changes to fire protection and refrigeration policies	All APEC economies have ratified the Protocol
World Heritage Convention, 1972	Protects natural or cultural values	All APEC economies except Brunei Darussalam and Singapore have ratified the Convention

7

best practice principles

This study has addressed a number of factors that influence mineral exploration investment in the APEC region. From this analysis, and drawing on extensive consultation within government and industry in APEC economies, a set of 'best practice principles' at the economywide and minerals sector levels is proposed. These principles identify ways to invest and, consequently, ways in which investment in mineral exploration in APEC economies could be increased and the value of an economy's mineral wealth maximised (box 24).

The principles are founded on the view that governments are ultimately responsible for setting the rules by which mining takes place in a given jurisdiction and their actions are critical to achieving sustainable benefits from the minerals sector for the national economy. They must provide strategic direction and the requisite legal, regulatory and institutional frameworks to pursue economic, social and environmental objectives; they must ensure accountability, transparency, and stakeholder consultation; and they must implement systems that deliver tangible benefits to the economy's citizens.

The principles also highlight the role of the private sector in supporting the sustainable development of the minerals sector. In particular, mining companies are responsible for engaging in cooperative efforts with governments, local communities and other stakeholders to address the minerals sector's negative environmental image and resolve the concerns associated with the social impacts of mining (Melanie et al. 2005).

Broadly, the best practice principles aim to address the need for:

- economic efficiency
- a nondiscriminatory economic environment that facilitates foreign direct investment and trade
- the promotion of a regulatory and legislative framework that encourages:
    - an efficient and simple approval process
    - transparency within legislative and regulatory bodies
    - predictability and certainty for investors over the life of a mining project

box 24 **best practice principles for the APEC minerals sector**

The concept of best practice is the most efficient and effective way of ensuring that the minerals sector operates within a framework that is economically, environmentally, and socially sustainable. The implementation of best practice principles provides the foundation for improving the incentives to invest in mineral exploration in an economically, environmentally and socially sustainable manner. These principles are:

economywide

1 good governance that incorporates consistency, accountability and administrative capacity at all levels of government
2 competitive neutrality across all sectors of the economy
3 the facilitation of flexible business structures
4 a non restrictive foreign investment environment
5 a market free from barriers to trade
6 unrestricted access to domestic and global capital markets
7 adequate investment in infrastructure

minerals sector specific

8 the provision of basic up to date geoscientific information
9 optimal allocation of land, taking into account economic, environmental and social issues
10 clear, efficient and transparent licensing and approvals processes
11 security of tenure
12 internationally competitive taxation regimes
13 adequate supply of qualified professionals
14 appropriate and consistent environmental rules
15 effective stakeholder engagement and
16 optimal distribution of the benefits of resource development.

- the promotion of environmentally and socially sustainable mineral development
- a strengthening of institutional and human capacities in the minerals sector within the APEC region.

These principles should only be taken as a guide to achieve best practice as it is up to each economy to determine the importance it places on minerals investment and the optimal policies to adopt, taking into account its stages of development and individual circumstances.

economywide recommendations

governance

While not confined to the minerals sector, there is a pressing need for improved governance in some APEC member economies. While the importance of good governance in the public and private sectors, and civil society generally, to strengthen and sustain capacities to deliver programs, projects and basic services is well recognised, there remain several areas of concern. These negatively affect the general economic performance and equally the performance of individual sectors, such as mining.

To achieve further progress in improving governance, it is recommended that governments in APEC:

- continue to invest in capacity building programs to strengthen the technical, regulatory, legal, commercial and administrative skills of public sector agencies involved in regulation of the minerals and other sectors
- pay particular attention to capacity building at the local government level in terms of personnel, financial resource management, and intra and intergovernmental relationships
- ensure enforcement and consistent application of regulations
- focus on delivering accountable, participative and results oriented governance outcomes in economies where significant policy reform initiatives are already in place
- encourage the development of property rights that are clearly defined, actively enforced, and applied consistently throughout the economy.

competitive neutrality

In order to provide an economic environment that does not discriminate against the minerals sector, it is recommended that APEC economies:

- have a clear sense of direction, vision and purposeful commitment to ensure that there is a level playing field across competing sectors in terms of fiscal and other economic condition, taking into account the role of government in specific aspects of the minerals sector, for example royalties
- convey and demonstrate their commitment to the community through targeted and sustained education programs designed to enhance the profile of the sector in terms of its potential economic benefits and environmental performance
- minimise the involvement of state owned enterprises in the exploration, extraction and processing of minerals and remove any conflict of interest between the government as a regulator and developer of mineral resources, taking into account that there is a role for government in the provision of basic geoscientific information.

business formation

The range of corporate structures available to investors (such as foreign ownership, partnership, and joint venture arrangements) should be appropriate for the mining sector and should enable investors to readily respond to changes in the commercial market environment. It is therefore recommended that APEC economies:

- permit investors to form flexible corporate structures that enhance exploration and mining activities and do not inhibit investors from operating in a competitive market environment.

foreign direct investment

Despite APEC's determination to encourage FDI inflows generally, specific restrictions continue to exist on these inflows. The technological and skills transfer and diffusion associated with FDI improves the quality and scale of the mineral exploration sector in the host economy. Capital inflows, especially in developing APEC economies are likely to lead to increases in productivity and income. It is therefore recommended that APEC economies:

- remove restrictions on and actively promote FDI in international forums to facilitate further development of the region's minerals sector. In some economies,

this would involve the relaxation of minimum capital requirements and joint venture requirements, to assist in stimulating foreign investors' participation in the development of extractive industries.

trading rights

An important issue in a number of APEC member economies relates to government regulations such as mandatory domestic processing requirements and limitations on the importation of foreign capital and labour. While it is understandable that governments may wish to support value adding activities within their own jurisdictions, this is unlikely to be in the best national interest if it is not based on an economy's comparative advantage. In this context, it is recommended that APEC economies:

» remove all barriers to trade affecting the minerals sector both directly and indirectly.

access to finance

Given the limited availability of domestic capital in some APEC economies, access to finance is an important issue facing prospective investors in the region. In some cases, domestic capital markets are weak, and access to foreign capital markets is limited. To mobilise adequate investment funds to support economic development, it is recommended that governments in APEC economies:

» strengthen domestic capital markets through the provision of stable and unambiguous regulatory environments

» remove any policies that may restrict access to global financial markets.

quality of infrastructure

A prerequisite for the development of the minerals sector is the availability of essential infrastructure such as roads, ports, energy and communications. Infrastructure needs are particularly acute in less developed APEC economies where the options for financing investment are most limited. While governments have a role in the provision of infrastructure, financial constraints in some APEC member economies mean that there is reliance on the private sector for the provision of infrastructure services. To ensure that APEC governments attract private provision of infrastructure services, it is recommended that they:

- create and maintain an environment characterised by a liberal trade and investment regime and stable macroeconomic conditions
- reduce the commercial and political risks faced by potential investors.

For APEC economies where infrastructure capacity constraints are particularly acute, both in terms of a lack of physical infrastructure and coordination along the supply chain (such as rail, ports and shipping), it is recommended that APEC economies:

- identify and/or address the infrastructure needs of the industry and improve coordination along the supply chain
- consider the role of government provision of infrastructure, particularly where market failure is impeding the development of the minerals sector, and take into account the net economic benefits of different policy options.

minerals sector recommendations

reliability and availability of basic geological information

The availability of reliable and accessible basic geological data in APEC varies significantly and can act as a disincentive to private exploration expenditure. To secure the long term viability of the minerals sector in APEC economies, it is recommended that governments:

- provide basic, up to date geological information, geophysical data (such as aeromagnetic data) and topographical maps at a level of detail that enables potential investors to make informed assessments of the country's mineral prospectivity
- seek to develop, establish and maintain national databases that catalogue all existing and historical exploration and mining activity as well as mineralisation and reserves/resources
- in the presence of limited government resources, explore the opportunities for partnerships with industry, academia and community organisations to provide that information
- generate support for collaborative research programs designed to add to the region's mineral reserves by developing ways of finding new ores and extracting currently uneconomic resources in a sustainable manner.

- investigate the potential for donor funding to improve the capacity of some APEC member economies to collect, compile and disseminate geological information
- encourage the accurate reporting of reserves against national or international reporting standards.

land access

In parallel with economic growth, land access issues are becoming more controversial in APEC economies. In some economies, the tradeoffs across competing land uses such as housing, tourism, infrastructure development and mining are often being resolved in favour of non mining sectors, where the payoffs are more immediate, the benefits more tangible, and the environmental issues less evident. In addressing these issues, it is recommended that APEC governments:

- adopt a market based system for determining the optimal allocation of land resources in cases where property rights can be assigned to particular land uses
- devote additional resources to the development of regulatory frameworks for allocating and securing property rights over land resources where property rights are not clearly defined
- where property rights cannot be defined, adopt transparent and consistent administrative processes and procedures to remove the uncertainty surrounding access to land resources
- ensure that these processes and procedures are flexible enough to allow new information related to mining technologies, as well as changes in economic factors such as minerals prices, to be taken into account.

regulatory certainty

In several APEC member economies, uncertainty about the licensing process is the single largest impediment to minerals sector investment. Further, in some economies, approval processes are open ended with different levels of government issuing exploration and mining licences without coordination. These factors add substantial uncertainty and cost to potential mining projects. To minimise the uncertainty attached to mineral licensing processes, it is recommended that APEC economies:

- ensure that the licensing process is clear, efficient and transparent, while acknowledging that improving regulatory certainty in the minerals sector requires an enhancement of both regulations themselves and institutions that carry out their implementation
- where laws are vague or incomplete, pay attention to improving their clarity and broadening their scope
- strengthen institutions to ensure that government agencies are consistent in their application of regulations, acknowledging that improving regulatory certainty in the minerals sector is closely linked to the broader issues of improving governance generally and reducing sovereign risk
- provide clear information about existing regulations and procedures, including licensing processes, to potential investors in a readily accessible form
- consider the establishment of a 'one stop shop' for minerals sector investment
- consider the potential contribution of the private sector in identifying the weaknesses in existing regulations and procedures and in designing and delivering appropriate capacity building programs.

security of tenure

There are major issues associated with security of tenure in a number of APEC economies. Typically, in these economies, the laws covering mineral exploration and extraction provide no guarantees that a company securing exploration rights will be given the first right of refusal to mine any economic deposits found. In addition, the lease period for mineral development is often short relative to the economic life of the reserve of mineral deposits, with possible renewal not always a feature of these licences. Where renewal is allowed, the process is often ad hoc, piecemeal and lengthy. These issues have a negative impact on investment in the mining sector, given the high capital intensity, long lead time and high risks involved. To enhance investor confidence in the security of mining tenements, it is important to:

- ensure that the period of the licence is long enough to enable meaningful and constructive exploration activity to occur
- ensure that holders of exploration rights are given first right of refusal to mine any economic deposits found
- ensure that licence conditions permit exploration activity that enables the

mineral potential of the tenement to be adequately investigated, possibly through a variety of modern exploration techniques such as exploratory drilling, trial mining, bulk sampling and aerial surveying

- ensure that the requirements for investors to proceed from an exploration licence to a mining licence are clear and transparent so as to reduce the actual and perceived risks involved in allocating substantial capital resources at the high risk exploration stage
- ensure that the existence of overlapping tenements is minimised or, if present, is able to be dealt with systematically and fairly
- specify the conditions under which a title can be revoked
- allow exploration and mining rights to cover multiple minerals, even if these minerals were not specifically factored into the initial project planning phase
- ensure that minerals rights are exclusive, and transferable to other enterprises, provided that all technical, financial, environmental and other requirements are met.

competitive taxation regime

Within the context of increasing competition for global capital resources, the establishment of internationally competitive taxation regimes is crucial for encouraging minerals sector investment in APEC. Importantly, the design of tax policy instruments has implications for the optimal allocation of mineral reserves, maximisation of mineral rents, maintenance of environmental standards and reinvestment of mineral rents (Sarma and Naresh 2001). Ideally, mining taxation regimes should be:

- internationally competitive and allow a fair share of benefits between governments and investors
- easy to understand
- easy to administer
- stable and predictable over time
- non discriminatory
- transparent
- provide a level playing field for all participants (Parsons 2001, World Bank 2003).

In this context, it is recommended that APEC member economies:

- consider their minerals sector taxation regimes in comparison with those of economies with more established minerals sectors and economies that have had recent success in attracting substantial capital inflows to their minerals sector, taking into consideration that the mix of minerals produced, the degree of decentralisation and the level of economic development will affect the composition of minerals taxation regimes across economies
- develop taxation regimes for the minerals sector with a full understanding of the international context in which mining companies operate
- given the cyclical nature of minerals markets, move toward the adoption of royalty arrangements that are linked to profitability (the efficiency implications of alternative mineral royalty arrangements are examined in Hogan 2007).

technical skills

Improving technical skills in geology, mine engineering, environmental sciences and other disciplines related to the mining sector in certain APEC economies is an area where regional cooperation in APEC may be particularly valuable. Limited access to technology in some economies could be overcome by improving public private sector partnerships in geological exploration, and by facilitating FDI. As such, it is recommended that APEC economies:

- seek to improve technical skills in geology, mine engineering, environmental sciences and other disciplines related to the mining sector through regional cooperation initiatives and public private sector partnerships.

promoting environmentally and socially sustainable mineral development

In addition to economic issues, it is becoming increasingly evident that addressing the environmental and social dimensions of mining will be paramount in allowing the sustainable development of mineral resources in both advanced and developing economies over the medium to long term. In this context, it is recommended that APEC member economies:

- demonstrate their commitment and ability to set appropriate and reliable environmental rules, at acceptable international standards, and to monitor these standards in a credible manner

» where the legal and institutional settings are not in place, initiate a process of gradually establishing:
    - a legal basis for environmental regulation
    - basic institutional responsibilities
    - essential regulatory frameworks
    - monitoring and enforcement procedures, including public disclosure
    - human and financial resources to address priority issues (Bond and Weber-Fahr 2002), taking into account that the methods employed for achieving environmental objectives will vary considerably on the basis of different local, natural, economic, social and cultural conditions.
» where the legal and related institutional mechanisms are already in place, focus on the implementation of these frameworks and on finding pragmatic solutions that take into account resource and capacity constraints
» work with the private sector to address the environmental liabilities that the mining sector has inherited from past operations.

Reducing the minerals sector's negative environmental image is, to a large extent, the responsibility of the private sector. Mining companies, by maintaining 'clean' track records, could contribute significantly to improving the profile of the minerals sector – an issue that international mining firms are fully aware of, and fully committed to.

In this context, the development and adoption of an industry code of conduct would be beneficial. There are numerous examples of voluntary national initiatives already underway or proposed for the mining sector across a range of economies (Greene 2002). These initiatives have a role in supplementing existing legal regimes, and can also be used to address unregulated areas and encourage 'beyond compliance' performance in regulated areas. Typically though, voluntary initiatives are often adopted in the first instance by larger companies, who are already advanced in environmental management. It is therefore recognised that there is a need to:

» provide strong underlying regulatory regimes to encourage the development of, participation in, and continued evolution of effective voluntary initiatives.

There is also scope for community information campaigns to raise awareness about modern sustainable minerals sector practices. Community distrust of the mining sector will only dissipate through the implementation of responsible and

environmentally sound minerals sector practices (from exploration to mine site rehabilitation) by mining companies over a sustained period of time.

Associated with the antimining sentiment that is apparent in some APEC economies is the need to:

» consider more explicitly the social impact of mining, particularly on local communities that rely on the natural environment for their livelihoods.

Again, it is important for mining companies to address the legitimate concerns raised by communities, with a focus on stakeholder engagement. Mining projects should be linked to development initiatives that are implemented and pursued in partnership with local government agencies and communities. These development initiatives should incorporate capacity building aimed at empowering local communities and, importantly, transparent and continuous consultation with the direct beneficiaries of mining projects to ensure that the actual distribution of earnings is as intended. It is essential for mining companies to build an atmosphere of trust and a reputation for responsible mining, and to work in cooperation with local communities to find ways of sharing the benefits from resource development.

Both developed and developing APEC economies have regulatory regimes that display, to different extents, characteristics of these best practice principles. Developed economies have, in general, more mature minerals sectors and, consequently, developing APEC economies may be able to adopt proven aspects of their regulatory frameworks. Nonetheless, the minerals sectors of developed APEC economies contain elements that do not attain best practice and, as such, further minerals sector reform in line with these principles should be encouraged. Additionally, the long term policy objectives of developing economies should aim to incorporate best practice principles in a way that ensures compatibility with the individual circumstances of each APEC member economy.

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