



sustainable development of the  
**minerals sector in the APEC region**

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# foreword

The sustainable development of mineral resources is a fundamental platform for continued economic growth in APEC. With access to vast mineral reserves, highly skilled human resources and world class technologies, the APEC region is a world leader in minerals production, processing and trade. The region also encompasses some of the most dynamic economies that have underpinned the substantial increase in global minerals consumption in recent years.

Despite APEC's strong position in global minerals markets and its critical role in an industrialised world, it is recognised that the past performance of the minerals industry is no guarantee for its future. Operating in an increasingly globalised environment, it is clear to the industry that its future is inextricably linked to the pursuit of sustainable development through the integration of economic progress, responsible social development and effective environmental management.

APEC economies and companies are at varying levels of capacity and at different stages of development in sustainable mining, and therefore can benefit from information, knowledge and experience exchange on key sustainable mining issues.

The objectives in this report are to analyse the global market outlook for minerals over the medium term, identify key issues affecting the sustainability of the minerals sector in the APEC region and recommend possible actions to respond to these issues. These issues are structured around the APEC pillars of trade and investment liberalisation; business facilitation; and economic and technical cooperation. The report highlights the need for a strong and effective policy framework to allow APEC economies to capitalise on growth opportunities in global minerals markets.

Australia is hosting the APEC Ministers Responsible for Mining meeting in Australia in February 2007 and this amended and updated report is intended to assist the development of a comprehensive work program for consideration by APEC ministers.



Phil Glyde  
*Executive Director*

January 2007

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# summary

The development of mineral resources has contributed to economic growth in many of the world's economies. The minerals sector can boost economic growth and raise living standards by providing employment, both directly and indirectly, government and export revenues, and investment in infrastructure and human capital. The sustainable development of mineral resources is recognised as a fundamental platform for continued economic growth in the APEC region (APEC 2004, 2005).

From a regional perspective, APEC has vast mineral resources and is a world leader in minerals production and processing. Rich endowments of natural resources, combined with human and intellectual capital and economic strength, have placed the region in a strong global market position that has proven highly attractive to international resource investment. In particular, the region accounts for a large share of global minerals exploration budgets, with seven APEC economies (Australia, Canada, Chile, Mexico, Peru, the Russian Federation and the United States) in the top ten destinations for exploration expenditure in 2005. Minerals industries in the APEC region also have access to world class technology in exploration, development, production, processing and environmental management. In addition to being a major source of minerals and metals, the region encompasses some of the most dynamic economies that have underpinned the substantial increase in global consumption of minerals in recent years.

Within the broad APEC spectrum, individual member economies have diverse mixes of mineral endowments as well as different economic, institutional and political structures. Notwithstanding the diversity across APEC economies, it is clear that the sustainable development of mineral resources in the region hinges on the intersection of economically efficient, environmentally sound and socially acceptable approaches to minerals exploration and development. Further, it is also clear that the minerals industry operates in an increasingly globalised and competitive environment, making the provision of an enabling investment climate and the pursuit of a leading edge in human and technological capacity critical.

Key issues affecting the sustainable development of the minerals sector in the APEC region are the focus in this report. It is intended to provide input into the development of a comprehensive work program for consideration by APEC ministers responsible for mining in the context of the APEC Ministers Responsible for Mining Meeting to be held in Australia in February 2007.

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Specific objectives for this report are:

- ❖ to provide an overview of the minerals sector in APEC economies, subject to data being provided by APEC economies, through the Expert Group on Minerals and Energy Exploration and Development (GEMEED)
- ❖ to analyse the global market outlook for minerals over the medium term
- ❖ to identify key issues affecting the sustainability of the minerals sector in the APEC region and
- ❖ to recommend possible actions to respond to these issues.

The focus is on high value globally traded mineral commodities relevant to the APEC region. These are bauxite, alumina, aluminium, coal, copper, gold, iron ore, lead, nickel, tin, uranium and zinc.

## overview

APEC member economies include the world's largest producers and consumers of minerals. Minerals trade also plays a vital role in the region. Differences in resource endowments, economic development, population growth and government policies have resulted in considerable diversity in minerals production, consumption and trade patterns across the region. The region accounts for major shares of world production of the minerals covered in this report, with regional production of coal, copper, lead, tin and zinc greater than 70 per cent of the world total in volume terms in 2005 (figure 1).

## APEC region

Over the past decade, strong economic growth in APEC economies has had a significant impact on regional and global consumption of mineral commodities. This impact is characterised by a significant increase in minerals consumption in the less developed economies, such as China, where per person consumption of minerals is relatively low. In 2005, APEC accounted for more than 60 per cent of global consumption of copper, coal, lead, zinc, aluminium, alumina, iron ore and tin (figure 1).

The diverse mix of minerals production and consumption patterns in the APEC region is underpinned by significant minerals trade relationships within APEC and between APEC member and nonmember economies. APEC as a region is the

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fig 1 **APEC share of world minerals production (mine) and consumption, 2005**

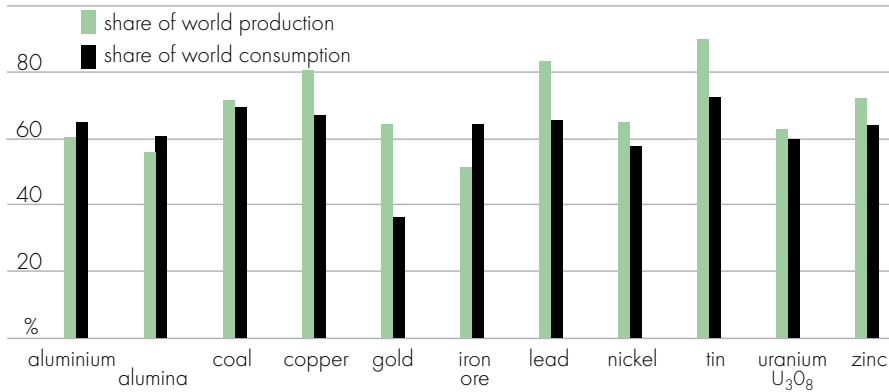
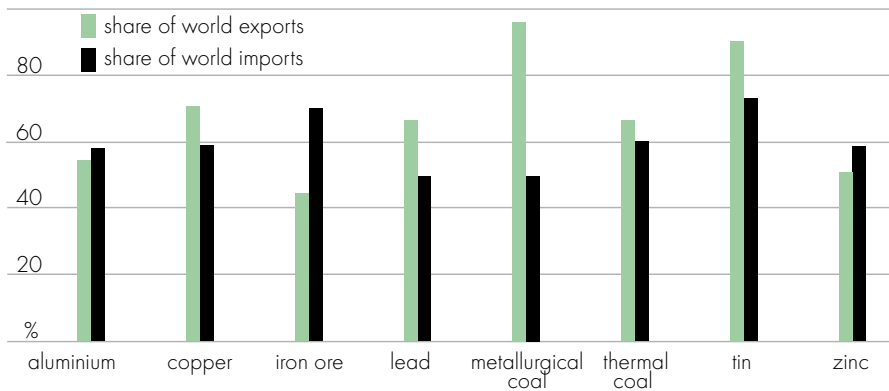


fig 2 **APEC share of world minerals exports and imports, 2005**



largest exporter of a wide range of mineral commodities, accounting for more than 70 per cent of global exports of metallurgical coal, copper and tin (figure 2).

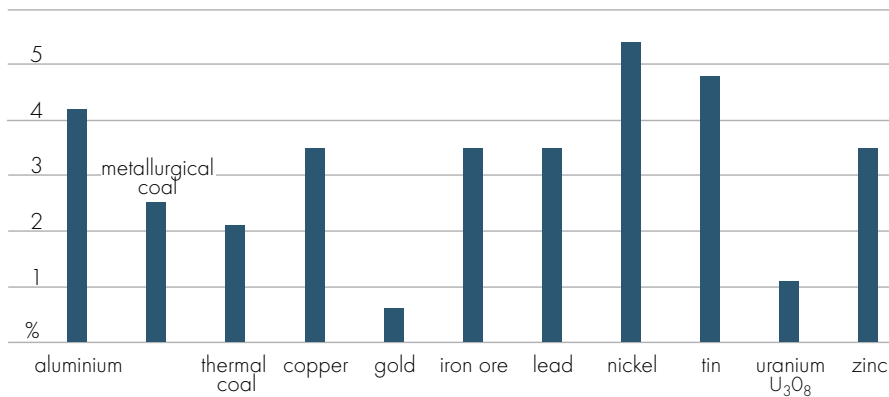
A significant proportion of minerals exports from APEC economies is destined for markets within the APEC region. Leading importers of minerals based products in the region include the advanced economies of Japan, the Republic of Korea and the United States. Over the past decade, China has also emerged as a key market for global exports of minerals.

## global medium term outlook

Global economic growth – supported by growth in the manufacturing, construction and infrastructure services sectors – will continue to be the main driver of demand for minerals over the medium term. As incomes rise in developing economies generally, the composition of household expenditure will increasingly shift away from primary products toward minerals intensive manufactured products and services.

Over the past decade, China has emerged as one of the key global economies that are expected to provide an impetus to world economic growth. China's metals consumption per person, while increasing, is still low in comparison with that in developed Asian economies, implying that there is considerable potential for further increases in minerals consumption over the medium term.

fig 3 average annual growth in minerals consumption, 2005–11



Against this background of strong demand arising from continuing robust world economic growth and China's increasing requirements for raw materials (figure 3), the price outlook for specific commodities is being driven by a range of supply side factors. For many commodities, exploration expenditure in the sector has risen in recent years, generating a number of prospective projects. However, emerging constraints on skilled labour have the potential to affect the cost and timing of project development.

## *sustainable development of the minerals sector - key issues*

The capacity of APEC economies to capitalise on future growth opportunities in global minerals markets is inextricably linked to their capacity to develop their mineral resources within an economically, environmentally and socially sustainable framework.

The key issues for the APEC minerals sector were broadly addressed at the first meeting of APEC ministers responsible for mining, held in Antofagasta, Chile, in June 2004 (APEC MRM1 2004) and the second meeting of APEC ministers responsible for mining, held in Gyeongju, Republic of Korea, in October 2005 (APEC MRM2 2005).

These key issues are structured under the APEC pillars and include:

- ✘ trade and investment liberalisation
- ✘ business facilitation
- ✘ economic and technical cooperation.

### **trade and investment liberalisation**

Traditional barriers to trade, such as tariffs, have declined substantially over the past fifty years as a result of multilateral, regional and bilateral trade liberalisation initiatives. In APEC economies, a range of nontariff barriers, including quotas, import and export levies and licensing, and export subsidies, have also been removed or converted into tariffs since APEC's inception. However, nontariff barriers to trade in the form of institutional, regulatory and legal impediments continue to restrict access to some markets. Emerging nontariff trade related measures aimed at environmental, labour or other nontrade objectives also have the potential to inhibit access to key markets.

Further, while the APEC region has become more open to foreign direct investment (FDI), progress in achieving the Bogor investment liberalisation objectives has been uneven. In the declaration made by APEC leaders in Bogor, Indonesia, in 1994, APEC aims to achieve free and open trade and investment in the region by no later than 2020. Caps on foreign ownership are still applied to foreign investment in the minerals sector in some APEC economies.

**key recommended actions in support of trade and investment liberalisation**

- ❧ Continue the process of trade liberalisation and facilitation.
- ❧ Remove all nontariff barriers to trade affecting the minerals sector both directly and indirectly.
- ❧ Develop an integrated approach to respond to, and avoid, trade restrictive measures based on environmental, social and other nontrade objectives.
- ❧ Renew the ongoing commitment to liberalise investment regimes, particularly by removing restrictions on foreign ownership.

**business facilitation**

The long term viability of the minerals sector in APEC is contingent on sustained investment in mineral exploration and development and on the provision of an enabling environment that also seeks to minimise business transaction costs. Spurred by strong commodity prices, there has been a substantial increase in global exploration expenditure in recent years, with 2005 exploration budgets for nonferrous metals approaching levels close to the 1997 peak of US\$5.2 billion (Metals Economics Group 2006). While seven APEC economies (Australia, Canada, Chile, Mexico, Peru, the Russian Federation and the United States) were in the top ten destinations for minerals exploration expenditure in 2005, the allocation of global exploration budgets was not evenly distributed across the APEC region.

To a large extent, the relative ability of APEC economies to attract investment in minerals exploration reflects the diverse mix of policy and institutional settings. In addition to geological potential and global market dynamics, there is a wide range of policy driven factors that impinge on the relative attractiveness of minerals projects worldwide. These include factors that affect the general performance of an economy, such as macroeconomic stability, nondiscriminatory regulatory environments, access to relevant infrastructure and human capital, and a strong governance framework. Equally important are sector specific factors that affect principally the performance of the minerals sector. These include access to land, security of tenure of mining tenements, the competitiveness of taxation and royalty regimes, and access to skilled labour.

Market transparency is also an important part of APEC's business facilitation agenda. Transparent markets have the potential to reduce transaction costs, enhance risk management and deliver more efficient investment and market outcomes. The concept relates both to transparency of minerals related informa-

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tion, such as geological information and statistical data; and transparency of regulations in terms of scope, application and enforcement.

The quality and accessibility of high level geoscientific data and market data in APEC is mixed. Similarly, the degree of sovereign risk or regulatory uncertainty varies considerably across APEC economies.

While there are many examples of best practices in relation to these factors in the APEC region, it must also be acknowledged that there is significant scope for improvement in some member economies.

### ***key recommended actions in support of business facilitation***

- Have a clear sense of direction, vision and commitment to ensure that there is a level playing field across all economic sectors and within the minerals sector in terms of fiscal and other economic conditions.
  - Minimise the involvement of state owned enterprises in the operation of resources sectors and remove any conflict of interest between the government as a regulator and developer of natural resources.
  - Aim to achieve and maintain long term macroeconomic stability to minimise large fluctuations in output, employment and inflation that can add to uncertainty for investors.
  - 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 related sectors.
  - Strengthen institutions to ensure that all levels of governments 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.
  - Strive to provide high level geoscientific information through public geological surveys.
  - In the presence of limited government resources, explore opportunities for partnerships with industry, academia and community organisations to provide that information.
  - Establish an APEC minerals database to cover high level geological information; and key market data such as production, consumption and trade on an agreed consistent and comparable basis. This should be complemented by capacity building in data collection and analysis in developing APEC economies.
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- ❖ Ensure that the licensing process and other regulations and procedures are 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. In this context, consider the establishment of a 'one stop shop' for minerals sector investment.
- ❖ Consider the potential contribution of private sector firms in identifying the weaknesses in existing regulations and engage them in designing and delivering appropriate capacity building programs where appropriate.
- ❖ Ensure that the requirements for investors to proceed from an exploration licence to a mining licence are clear and transparent.
- ❖ Ensure that mining rights are exclusive, and transferable to other enterprises, provided that all technical, financial, environmental and other requirements are met.
- ❖ Ensure that the processes and procedures related to the issuance of exploration and mining licences are responsive enough to allow new information related to mining technologies, for example, as well as changes in economic factors such as minerals prices to be taken into account.
- ❖ 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.
- ❖ Where property rights cannot be defined, adopt transparent and consistent administrative processes and procedures to remove the uncertainty surrounding access to land resources.
- ❖ Move toward minerals taxation regimes that are simple, transparent, equitable and efficient.
- ❖ Where applicable, consider minerals sector taxation regimes in comparison with economies that have 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.
- ❖ Respond to the current and emerging skills shortages through education initiatives that improve the quality of, and access to, physical, environmental and social science programs relevant to the minerals sector.

## **economic and technical cooperation**

Economic and technical cooperation is closely linked to trade and investment liberalisation, and business facilitation. Essentially, economic and technical cooperation involves the fostering of human resources and improvements in systems supporting trade and investment flows.

It is widely recognised that the minerals sector faces growing environmental and social challenges. In this context, economic and technical cooperation can play a significant role in reducing the technological gaps and building capacity across APEC members in order to foster sustainable development.

From the minerals industry's perspective, it is becoming increasingly clear that the institutions and systems that economies establish to regulate, manage and monitor the social and environmental impact of mining operations directly influence the extent of investors' interest in starting up a particular mining operation. In the face of strong social and environmental awareness by local communities and the broader community, mining firms, particularly multinational firms investing in developing economies, have become increasingly concerned about the reputational and financial risks from causing, advertently or inadvertently, social and environmental damage. Consequently, these firms are placing more emphasis not only on clear social and environmental frameworks, but also on competent government institutions that can effectively monitor and enforce compliance with these frameworks.

In some APEC economies, environmental regulation is well established and effective, and voluntary codes of conduct have been developed to encourage high standards in corporate social responsibility. In others, environmental regulations, and the enforcement of these regulations, act as a deterrent to investment.

Social issues are progressively forming an integral part of the sustainable development agenda in the minerals sector. In essence, social issues are about the impacts of companies' decisions on stakeholders other than shareholders.

The social dimensions of mining vary significantly across APEC economies as a reflection of different socioeconomic and political conditions. While there has been a realignment of corporate cultures toward more socially responsible performance over the past decade, the priority accorded to these issues varies across APEC economies. Minerals projects are not always pursued in partnership with local government agencies and communities. The lack of stakeholder

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engagement in some economies continues to undermine community support for mine development. Further, in some APEC economies, mine health and safety is a particularly pressing issue.

***key recommended actions in support of economic and technical cooperation***

- ❖ Demonstrate government commitment and ability to set appropriate and reliable environmental rules, consistent with international standards, and to monitor and ensure compliance with these rules in a credible and transparent manner, drawing on the experience of leading economies.
- ❖ Devote human and financial resources to address priority issues, taking into account that the methods employed for achieving environmental and social objectives will vary considerably on the basis of different local, natural, socio-economic and cultural conditions.
- ❖ Seek to improve technical skills in geology, mine engineering, environmental sciences and other disciplines related to the minerals sector through regional cooperation initiatives and public/private sector partnerships.
- ❖ Consider leading practices in the region in developing strong underlying regulatory regimes to encourage the development of, participation in and continued evolution of effective voluntary initiatives.
- ❖ Consider and address more explicitly the social impact of mining, particularly on local communities, while striving to form mutually beneficial partnerships with indigenous people.
- ❖ Promote long term investment in the development of more efficient technologies through collaborative research efforts.
- ❖ Remove barriers to technology transfer and diffusion.

# introduction

The Asia Pacific Economic Cooperation (APEC) region has abundant mineral resources and is a world leader in minerals production and processing. Seven APEC economies – Australia, Canada, Chile, Mexico, Peru, the Russian Federation and the United States – were in the top ten destinations for exploration expenditure in 2005. The region also has some of the world's most dynamic economies that have experienced substantial increases in minerals consump-

## key economic indicators, 2006 – APEC economies

	area '000 sq km	population <sup>a</sup> million	GDP US\$b	minerals sector	
				GDP per person US\$	contribution to GDP <sup>b</sup> %
Australia	7 692	20.5	743.7	36 016	5.0
Brunei Darussalam	6	0.4	11.5	30 415	na
Canada	9 971	32.2	1 273.1	39 135	4.0
Chile	757	16.2	140.4	8 570	18.9
China, People's Rep. of	9 561	1 307.6	2 554.2	1 944	10.8
Hong Kong	1	7.0	188.7	26 824	na
Indonesia	1 905	219.2	351.0	1 581	3.3
Japan	378	127.7	4 463.6	34 955	0.1
Korea, Rep. of	99	48.3	877.2	18 015	0.3
Malaysia	330	26.0	147.0	5 570	0.8
Mexico	1 958	105.3	811.3	7 594	1.6
New Zealand	271	4.1	101.8	24 566	na
Papua New Guinea	463	5.9	4.1	662	na
Peru	1 285	27.9	89.3	3 151	6.7
Philippines	300	84.2	116.9	1 361	1.6
Russian Federation	17 075	142.7	975.3	6 861	na
Singapore	1	4.4	133.5	30 161	na
Chinese Taipei	36	22.8	355.5	15 472	na
Thailand	513	65.1	194.6	2 959	0.3
United States	9 364	296.6	13 262.1	44 315	na
Viet Nam	332	83.2	55.3	655	1.1

<sup>a</sup> figures are for 2005. <sup>b</sup> Figures are for 2004, except for Mexico, Peru and the Philippines for which figures are for 2003.

na Not available.

Sources: APEC (2006) and data provided by individual APEC economies

tion in recent years (table 1). Most notably, sustained rapid growth in China's economy has had a significant impact on global consumption of and trade in mineral commodities generally.

APEC member economies have diverse mixes of mineral endowments as well as wide ranging economic, institutional and political structures. APEC economies can be classified as:

- ❖ resource rich economies with mature minerals sectors
- ❖ resource rich economies with underdeveloped minerals sectors and
- ❖ resource poor economies with limited minerals production or not involved in minerals production.

Notwithstanding the diversity across APEC economies, it is clear that the sustainable development of mineral resources in the region hinges on the intersection of economically efficient, environmentally sound and socially acceptable approaches to mineral exploration and development. It is also clear that the minerals industry operates in an increasingly globalised environment. This creates opportunities and challenges. Intense regional and sectoral competition for global capital resources implies that it is critical for APEC economies to provide a stable and constructive investment climate, and maintain a leading edge in human and technological capacity.

Achieving sustainable development of mineral resources, including attracting investment to the sector, is recognised as a fundamental platform for continued economic growth in the APEC region (APEC 2004, 2005).

The specific objectives in this report are to:

- ❖ provide an overview of the minerals sector in APEC economies
- ❖ analyse the global market outlook for minerals over the medium term
- ❖ identify key issues affecting the sustainability of the minerals sector in the APEC region and
- ❖ recommend possible actions to respond to these issues.

The focus in the report is on high value globally traded mineral commodities relevant to the APEC region. These are bauxite, alumina, aluminium, coal, copper, gold, iron ore, lead, nickel, tin, uranium and zinc.

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Data for this report were to be provided by APEC economies, through the Expert Group on Minerals and Energy Exploration and Development (GEMEED). However, it was not possible for ABARE to obtain a complete data set for all APEC economies. Some data were unavailable and of the data that were available, much of it was not in a format that allowed comparisons to be made. Therefore, this report has not included a time series analysis of mineral production, consumption, investment and trade across APEC, even though this type of analysis would have been useful in understanding long term trends and identifying particular patterns within APEC. In the absence of a complete set of data across APEC economies, ABARE has relied primarily on its own data sources in writing this report.

The experience in attempting to obtain data from APEC economies and the resultant lack of available comparable data across APEC economies form the basis for a recommendation that an APEC minerals database be developed to provide high level geological data and key commodity statistics. Data from such a database could be useful in understanding long term trends in the region.

# 2

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## overview of the APEC minerals sector

APEC member economies include the world's largest producers and consumers of minerals. Minerals trade also plays a vital role in the region. Differences in resource endowments, economic development, population growth and government policies have resulted in considerable diversity in minerals production, consumption and trade patterns across the region.

The original intention of this report was to analyse data provided by APEC economies, through the Expert Group on Minerals and Energy Exploration and Development (GEMEED). Given difficulties with data collection it was not possible for ABARE to obtain a complete data set for all APEC economies and, as a result, this report has not included a time series analysis of minerals production, consumption, investment and trade across APEC. This type of analysis would have been useful in understanding long term trends and identifying particular patterns within APEC and may be completed in reports in the future. In the absence of a complete set of data across APEC economies, ABARE has relied primarily on its own data sources in writing this report.

**recommendation 1** - *Establish an APEC minerals database to cover high level geological information and key market data such as production, consumption and trade on an agreed, consistent and comparable basis. This should be complemented by capacity building in data collection and analysis in developing APEC economies.*

Reflecting the large variations in the maturity and intensity of development within the minerals sector, the contribution of the sector to overall economic development also varies significantly across the region. In a number of the smaller APEC economies, the minerals sector makes a particularly significant contribution to the economy. For example, the minerals sector contributed around 19 per cent of Chile's gross domestic product (GDP) in 2004 (table 1), while the sector has consistently been Peru's major foreign exchange generator, accounting for more than 50 per cent of total export revenues in 2003.

In line with the evolution of economic structures toward the services sector as economies develop, the contribution of the minerals sector to GDP is not as large in the

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developed APEC economies. Nonetheless, the minerals sector makes a significant contribution to GDP in a number of larger and more advanced APEC economies, such as Australia and Canada (5 per cent and 4 per cent respectively, table 1). Similarly, the minerals sector is well established in Indonesia where it contributes to more than 3 per cent of GDP. Notably, the contribution of the minerals sector to economic activity varies significantly on a provincial basis within economies such as Indonesia.

Other APEC economies with considerable mineral resources but with significant unrealised development potential include several of the south east Asian economies, such as the Philippines and Viet Nam, where the minerals sector contributes only 1.6 per cent and 1.1 per cent of GDP respectively.

At the other end of the spectrum are the economies with limited mineral resources and in which the contribution of the minerals sector to the economy is relatively small. Brunei Darussalam, Hong Kong China, Singapore and Chinese Taipei do not have significant domestic mining sectors and rely heavily on imports of mineral commodities.

### *mineral reserves*

The APEC region accounts for an extensive share of world mineral reserves, covering a wide mix of metallic minerals, nonmetallic minerals and energy minerals. Mineral resources are concentrated in a number of APEC member economies, notably Australia, Canada, Chile, China, Indonesia, Peru, the Philippines, the Russian Federation and the United States (table 2).

The lack of consistent and credible reserves data across all APEC economies makes it challenging to provide definitive estimates for the region as a whole. From individual economies' perspectives, available data point to significant reserves in several APEC member economies. In particular, Australia has the world's largest economic demonstrated resources (EDR – mineral resources from which profitable extraction or production is possible) of nickel, lead, uranium and zinc, and the second largest EDR of copper behind Chile.

China also has significant mineral reserves, including the world's largest tin reserves and second largest reserves of lead and zinc. The United States and the Russian Federation have the world's first and second largest endowments of recoverable coal reserves respectively. Indonesia also has significant mineral reserves, including copper, tin, nickel and gold. Papua New Guinea has large resources of copper and gold, while the Philippines has significant deposits of gold and nickel.

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**2 mineral reserves <sup>a</sup> – APEC economies**

	bauxite	coal	copper	gold	iron ore	lead	nickel	tin	uranium	zinc
	Mt	Mt	Mt	t	Mt	Mt	Mt	Mt	Mt	Mt
Australia	5 300	70 300	42.1	5 570	14 600	22.9	22.6	0.16	0.63	41
Canada		6 578	6.7	1 023	x	0.872	4.9	x	x	6.9
Chile	x	x	140	x	x	x	x	x	x	x
China, People's Rep. of	700	114 500	26	1 200	21 000	11	1.1	1.7	x	33
Indonesia	5.7	4 968	30.3	2 570	x	x	x	0.4	x	x
Japan		359	x	x		x				x
Korea, Rep. of		80			x					
Malaysia	18	1 700	0.825	106	50			0.92		
Mexico		1 211	27	x	x	1.5				8
New Zealand		571		x	x					
Papua New Guinea			x	x						
Peru		x	30	3 500	x	3.5		0.71		16
Philippines	x	x	9.35	1 564	4.5	x	3.6			0.3
Russian Federation	200	157 010	20	3 000	25 000	x	6.6	0.3	x	x
Chinese Taipei		x								
Thailand		1 354			x	x		0.17	x	x
United States	20	246 643	35	2 700	6 900	8.1		0.02	x	30
Viet Nam	4.0	3 521	6.8	x	1 200	x	0.09	0.104	x	x

<sup>a</sup> That part of the reserve base that can be economically extracted or produced at the time of determination. x Occurrence of resource, but no data available. Sources: US Geological Survey (2006); BP (2006); and data provided by individual APEC economies.

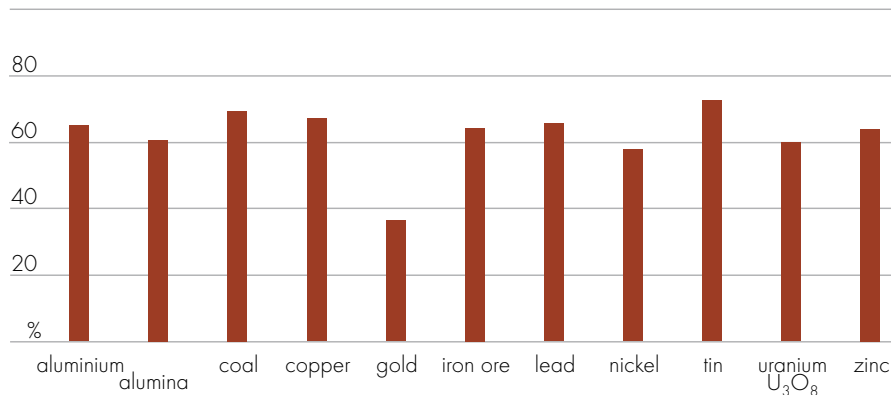
## minerals consumption

Over the past decade, strong economic growth in APEC economies has had a significant impact on regional and global consumption of mineral commodities. This impact is characterised primarily by a significant increase in minerals consumption in the less developed economies that have typically had a relatively low minerals and metals consumption per person. Key drivers of this growth have been the expansion of metals intensive manufacturing and construction sectors, substantial energy and transport infrastructure developments, rising incomes and the associated increase in demand for consumer durables.

As a region, APEC accounts for substantial shares of world consumption of a range of minerals (figure A). In 2005, the region accounted for more than 60 per cent of global consumption of coal, copper, lead, zinc, aluminium, alumina, iron ore and tin.

The distribution of minerals consumption within APEC is quite independent of the pattern of minerals production and is, instead, related to the structure of economic activity, and particularly the significance of minerals processing, manufacturing and construction sectors. Several APEC economies, while minor producers of minerals, are major consumers – Japan, Korea and Chinese Taipei. On the other hand, the bulk of the minerals produced in APEC economies such as Australia, Peru, Chile, Papua New Guinea and Indonesia is exported for processing and consumption in other markets, both within the APEC region and beyond.

figA **APEC share of world minerals consumption, 2005**



### 3 minerals consumption, 2005 – APEC economies

	aluminium kt	alumina kt	coal <sup>a</sup> Mt	copper kt	gold <sup>b</sup> t	iron ore <sup>b</sup> Mt	lead kt	nickel kt	tin kt	uranium (U <sub>3</sub> O <sub>8</sub> ) t	zinc kt
Australia	380	3 711	139	158	10	11	28	2	1	0	239
Canada	803	5 644	58	290	27	10	42	7	3	2 118	175
China, People's Rep. of	7 119	15 222	2 179	3 639	257	473	1 916	189	116	1 594	3 037
Japan	2 276	12	178	1 229	167	132	291	173	33	9 651	602
Korea, Rep. of	1 201	20	84	853	80	44	383	100	18	3 551	503
Russian Federation	1 020	7 112	238	792	67	87	80	26	7	4 020	171
United States	6 114	4 837	1 019	2 270	220	56	1 552	135	42	24 765	1 077
Other APEC	1 655	1 172	192	1 981	365	35	768	85	34	1 406	985
APEC total	20 568	37 730	4 088	11 210	1 192	849	5 060	717	253	47 106	6 789
- share of world (%)	64.9	60.6	69.3	67.1	36.3	64.1	65.5	57.7	72.4	59.8	63.9

<sup>a</sup> Includes brown and black coal. <sup>b</sup> China, People's Rep. of iron ore composition adjusted to world average.

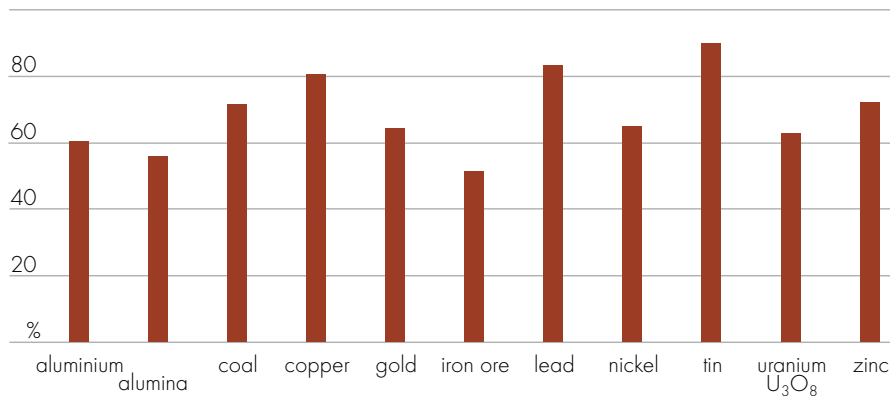
Sources: coal – IEA estimate; gold – GFMS Gold Survey 2006; iron ore – ILSI and ABARE; lead and zinc – International Lead and Zinc Study Group; nickel – International Nickel Study Group world nickel statistics; copper, aluminium, bauxite, alumina and tin – World Metal Statistics.

In 2005, the United States, China and Japan were the leading consumers of mineral resources within APEC (table 3). As a result of rapid and sustained economic growth, China has become one of world's major consumers of minerals and metals such as aluminium, copper, lead and zinc. These developments have resulted in China's emergence as an important participant in world markets for mineral resources.

### *minerals production*

APEC economies are among the leading producers of mineral commodities. The region accounts for major shares of world production of the minerals covered in this report. In 2005, APEC accounted for more than 70 per cent of global production of coal, copper, lead, tin, and zinc (figure B).

figB **APEC share of world minerals production (mine), 2005**



Major producers in APEC include Australia, Canada, Chile, China, Indonesia, the Russian Federation and the United States. China was the single largest producer of primary aluminium, coal, lead and zinc in 2005, while the production of copper was dominated by Chile (table 4). Australia and the United States shared first position in the production of gold, together accounting for 32 per cent of total APEC production. Indonesia and China led tin production, each contributing 36 per cent of global tin production. With a share of 20 per cent of world production, the Russian Federation ranked first in nickel production, followed by Canada and

## 4 minerals (mine) production, 2005 – APEC economies

	alumina		aluminium <sup>a</sup>		bauxite	coal <sup>b</sup>	copper	gold	iron ore <sup>c</sup>	lead	nickel	uranium		zinc
	kt	kt	kt	kt								kt	kt	
Australia	17 684	1 903	65 416	371	930	263	262	715	187	3	11 222	1 329		
Canada	998	2 894	0	65	595	119	28	79	198	0	13 713	667		
Chile	0	0	0	0	5 321	40	8	1	0	0	0	29		
China, Peoples Rep. of	7 519	7 806	20 000	2 226	651	224	198	1 023	60	120	826	2 525		
Indonesia	0	252	2 342	140	1 064	167	0	0	150	120	0	0		
Mexico	0	0	0	10	429	31	12	134	0	0	0	476		
Peru	0	0	0	0	1 010	208	8	319	0	42	0	1 202		
Philippines	0	0	0	3	16	32	0	0	22	0	0	2		
Russian Federation	2 795	3 647	6 409	297	805	176	97	36	280	5	3 921	186		
United States	4 947	2 480	221	1 027	1 140	262	55	434	0	0	1 218	747		
Other APEC	14	355	2	58	196	100	5	3	0	8	0	132		
APEC total	33 957	19 338	94 390	4 197	12 157	1 619	672	2 744	898	298	30 900	7 295		
- share of world, %	55.9	60.4	50.0	71.4	80.6	64.3	51.2	83.2	64.9	89.9	62.7	72.1		

<sup>a</sup> Aluminium production is refined production. <sup>b</sup> Includes brown and black coal. <sup>c</sup> China's iron ore composition adjusted to world average.  
Sources: coal – IEA estimate; gold – GFMS Gold Survey 2006; iron ore – IISI and ABARE; lead and zinc – International Lead and Zinc Study Group; nickel – International Nickel Study Group world nickel statistics

Australia. These two economies were also the top two suppliers of uranium to the world, accounting for 28 per cent and 23 per cent of global uranium production respectively in 2005.

## minerals trade

The diverse mix of minerals production and consumption patterns in the APEC region is underpinned by significant trade relationships within APEC and between APEC member and nonmember economies. APEC as a region is the largest exporter of a wide range of mineral commodities, accounting for more than 70 per cent of global exports of metallurgical coal, copper and tin (table 5).

A number of APEC economies export the vast majority of their minerals production. Indonesia, for example, has consistently exported a large share of its minerals production, with 87 per cent of copper, 84 per cent of gold, 98 per cent of nickel and 97 per cent of bauxite production exported over the ten years to 2004. Similarly, the structure of the minerals sector in Australia is highly export oriented.

## 5 exports of minerals, 2005 – APEC economies

	aluminum	copper <sup>a</sup>	iron ore	lead <sup>a</sup>	metal- lurgical coal <sup>b</sup>	thermal coal <sup>b</sup>	tin <sup>a</sup>	zinc <sup>a</sup>
	kt	kt	Mt	kt	Mt	Mt	kt	kt
Australia	1 588	315	239	245	125	106	1	463
Canada	2 262	297	28	161	26	1	0	527
Chile	0	2 799	6	0	0	0	0	0
China, People's Rep. of	1 324	140	0	455	6	66	23	123
Indonesia	166	280	1	0	0	108	132	0
Japan	34	248	0	4	0	0	0	54
Korea, Rep. of	49	87	0	37	0	0	1	261
Peru	0	514	8	115	0	0	33	101
Russian Federation	2 740	301	19	0	12	63	0	49
United States	379	51	12	46	26	19	4	0
Other APEC	681	221	7	111	2	13	131	194
APEC total	9 224	5 253	320	1 174	198	377	324	1 772
- share of world (%)	54.3	70.5	44.5	66.3	96.0	66.4	90.3	50.7

<sup>a</sup> Figures refer to imports of refined copper, lead, tin and zinc. <sup>b</sup> IEA estimates.  
Sources: WMS and ILZSG.

In particular, Australia exports approximately 75 per cent of its annual black coal production.

A significant proportion of minerals exports from APEC economies is destined for markets within APEC. Leading importers of mineral based products in the region include the advanced economies of Japan, Korea and the United States. Around 56 per cent and 84 per cent of total APEC thermal coal and metallurgical coal imports respectively are attributable to these three economies (table 6). These economies also account for a substantial share of nonferrous metals imports in the region.

Over the past decade, China has emerged as an important market for global exports of minerals. In particular, it has become the world's single largest importer of iron ore. While China is a significant producer of iron ore, its reserves and mine output are insufficient to meet the growing demand from steel producers. China's imports of iron ore have grown significantly – rising from 14 million tonnes in 1990 to 275 million tonnes in 2005. China also imports significant volumes of refined copper and nickel.

## 6 imports of minerals, 2005 – APEC economies

	aluminum	copper <sup>a</sup>	iron ore	lead <sup>a</sup>	metal- lurgical coal <sup>b</sup>	thermal coal <sup>b</sup>	tin <sup>a</sup>	zinc <sup>a</sup>
	kt	kt	Mt	kt	Mt	Mt	kt	kt
China,								
People's Rep. of	637	1 222	275	37	7	18	0	388
Chinese Taipei	524	640	15	98	5	57	14	309
Indonesia	182	21	2	54	0	2	0	84
Japan	2 977	74	132	18	63	114	34	46
Korea, Rep. of	1 231	428	44	159	21	56	19	59
Malaysia	0	246	2	32	0	9	0	472
Mexico	407	52	3	35	0	4	3	0
Singapore	234	41	0	50	0	0	69	12
Thailand	387	235	0	68	0	8	0	23
United States	3 691	977	13	298	1	26	38	700
Other APEC	353	123	26	48	5	57	13	49
APEC total	10 622	4 059	512	897	102	353	188	2 142
- share of world (%)	58.0	58.8	70.0	51.7	49.7	60.1	73.0	58.6

<sup>a</sup> Figures refer to imports of refined copper, lead, tin and zinc. <sup>b</sup> IEA estimates.  
Sources: WMS and ILZSG.

## *minerals sector investment*

Attracting investment is an integral component of the minerals sector's sustainability in the longer term. The lack of data on minerals sector investment across APEC economies makes it difficult to provide a regional picture of where APEC stands relative to the rest of the world. Where data are available, different concepts, coverage and methodologies for measuring investment flows add to the difficulties of providing a consistent dataset. Despite limited data, the following key general observations can be made:

- ❖ Investment in the minerals sector tends to show significant cyclical patterns. Key economic drivers of mineral exploration are the discovery of newly prospective jurisdictions, actual and expected world commodity prices, and the adoption of new technologies.
- ❖ Minerals sector investment in APEC is funded from both domestic and foreign sources, with foreign direct investment (FDI) remaining a more significant driver of minerals sector development in developing APEC economies.
  - Importantly, a significant share of foreign investment in the minerals sector by high income APEC economies, such as Australia, Canada, Japan and the United States, continues to be allocated to other economies within the APEC region. These injections of foreign capital not only provide the necessary project finance but also contribute to more employment opportunities and the transfer of advanced technologies, skilled labour and leading management practices.
- ❖ There is a significant disparity in the relative ability of APEC economies to attract domestic and global capital to their minerals sector. This reflects a wide array of factors that essentially affect the risk adjusted profitability of competing minerals projects. These factors are discussed in chapter 4.
- ❖ The process of globalisation has intensified competition for global investment funds over the past decade. The expansion of the global economy through trade and investment linkages has significantly increased investment options available to prospective investors, both from a geographical and sectoral viewpoint.

# 3

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## global outlook for minerals

Global economic growth, supported by growth in the manufacturing, construction and infrastructure services sectors, will be the main drivers of minerals demand over the medium term. As incomes rise in developing economies generally, the composition of household expenditure will increasingly shift away from primary products toward manufactured products (such as electrical goods and machinery) and services (such as transport, electricity and housing), hence increasing minerals consumption.

Over the past decade, China, in particular, has emerged as one of the key global economies expected to provide continuing impetus to world economic growth in the short term, and over the medium to longer term. The pace of China's development has highlighted a range of issues surrounding the increasing resource intensity of developing economies. Nowhere has China's growing economic influence been felt more significantly than in world commodity markets. In 2005, China accounted for around 40 per cent of world consumption of metallurgical coal, 37 per cent of world thermal coal consumption, 36 per cent of world iron ore consumption and well over 20 per cent of world consumption of crude steel, alumina, aluminium, copper, lead, tin and zinc. China's metal consumption per person, while increasing, is still low in comparison with that in developed Asian economies, implying that there is considerable potential for further increases in China's minerals consumption over the medium term.

Against this background of strong demand arising from continuing robust world economic growth and China's appetite for raw materials, the immediate price outlook for specific commodities is being driven by a range of supply side factors. For many commodities, exploration expenditure in the sector has risen in recent years and generated a number of prospective projects, but emerging constraints on skilled labour and material inputs have the potential to affect the cost and timing of project development.

The global outlook to 2011 for the mineral commodities covered in this study are outlined in this chapter. The analysis draws on ABARE's short and medium term commodity analyses published in ABARE's quarterly journal, *Australian Commodities*, in December and March 2006 respectively.

## aluminium

### production

World aluminium production grew by 7 per cent to 32 million tonnes in 2005 (table 7). APEC economies accounted for over 60 per cent of this amount, with most of the growth in production coming from China.

Over the medium term, expansions in capacity will be determined by the ability of new and existing smelters to secure competitive power contracts. In developed economies, where aluminium smelters compete with industrial and residential users for power, it will become increasingly difficult to replace or renew contracts at similar prices. Rises in electricity prices, in addition to increasing costs associated with aging technology and low economies of scale, have combined to significantly reduce the profitability of aluminium production, particularly in Europe.

A significant proportion of planned new capacity over the medium term is expected to be located in the Middle East (colocated with abundant low cost natural gas supplies) and in Iceland, which has abundant resources of hydroelectric and geothermal power. World aluminium production growth is expected to ease over the medium term, averaging 4.3 per cent a year between 2005 and 2011 (table 7).

### 7 aluminium outlook – world

		2005	2006	2011	average annual growth 2005–11
					%
<b>Production</b>					
Primary aluminium	kt	32 021	33 818	41 252	4.3
<b>Consumption</b>					
Primary aluminium	kt	31 703	33 895	40 661	4.2
Bauxite	Mt	176	196	219	3.7
<b>Prices</b> (London Metal Exchange)					
World aluminium					
- nominal	US\$/t	1 898	2 538	1 630	-2.5
- real <sup>a</sup>	US\$/t	1 955	2 538	1 469	-4.7
<b>Alumina</b>					
- nominal spot	US\$/t	443	433	193	-12.9
- real spot <sup>a</sup>	US\$/t	456	433	174	-14.8

<sup>a</sup> In 2006 US dollars.

## consumption

World consumption of aluminium increased by around 6 per cent to 31.7 million tonnes in 2005, with 65 per cent of this total attributable to APEC economies.

Over the medium term, world aluminium consumption is projected to rise by around 28 per cent to an estimated 40.7 million tonnes in 2011. China is expected to account for the majority of the growth in aluminium consumption, reflecting its level of economic development and size. It is anticipated that by 2011, aluminium use in the transport sector will account for around a quarter of China's aluminium consumption.

In the United States, assumed lower growth in economic activity and industrial production are expected to curb growth in the construction and motor vehicle industries. As a result, aluminium consumption in the United States is forecast to ease over the medium term.

## prices

In 2005, world aluminium prices increased strongly, driven largely by strong growth in consumption and increased concerns over the future supply of aluminium. Prices are forecast to increase further in 2006 as world consumption exceeds production, leading to a decline in stocks. Prices are projected to ease over the remainder period to 2011, as world production is expected to outpace consumption after 2007. In 2011, real aluminium prices (in 2006 dollars) are projected to be around 25 per cent lower than in 2005.

## *alumina*

### production

APEC economies accounted for around 56 per cent of global alumina production in 2005. In 2006, alumina production is expected to increase by 12 per cent, reflecting committed expansions in alumina capacity in China, Brazil and Australia. Over the medium term, further capacity expansions are expected in China, Brazil, India and Australia.

## consumption

Alumina is primarily used in the production of aluminium, with an average of 2 tonnes of alumina required to produce 1 tonne of aluminium. As such, world consumption of alumina is derived from aluminium production. In 2005, APEC economies accounted for 61 per cent of total global alumina consumption. China, alone, accounted for 24 per cent.

Over the medium term, world alumina consumption is forecast to increase in line with aluminium production.

## *bauxite*

### production

In 2005, APEC economies produced around 49 per cent of world bauxite output. The world's major deposits of bauxite are found in Guinea (32 per cent of world reserves), Australia (19 per cent) and Jamaica (9 per cent). Given the relatively low value of bauxite, it is generally not economic to transport bauxite over long distances. As a result, bauxite mines are usually developed in conjunction with, and in close proximity to alumina refineries.

Over the medium term, world bauxite production is forecast to increase to 213 million tonnes by 2011, with Australia, Guinea and China expected to account for the majority of this increase.

### consumption

Bauxite is used predominantly in the production of alumina. On average over 2 tonnes of bauxite are required to produce 1 tonne of alumina. Reflecting this, world consumption of bauxite is derived from the production of alumina. In 2005, APEC economies accounted for just under 56 per cent of world bauxite consumption.

Over the medium term, world bauxite consumption is forecast to increase at an average rate of 3.7 per cent, in line with growth in alumina production. World bauxite consumption is projected to reach 219 million tonnes in 2011. The majority of this growth is expected to occur in Brazil, China, India and Australia.

## coal – metallurgical

### production

APEC accounts for around 80 per cent of world metallurgical production. Recent strong prices have led to the expansion of metallurgical coal mines in key producing economies such as Australia and Canada. Over the medium term, Australian metallurgical coal production is projected to reach 164 million tonnes in 2010-11. New mine developments in response to robust demand and high prices are also expected in Canada. However, development of these projects is conditional on continued strong prices, as Canadian coal producers are less price competitive than Australian producers.

### consumption

The APEC region contributes around 66 per cent of global metallurgical coal consumption and 50 per cent of imports respectively. In 2005, world metallurgical coal trade was 204 million tonnes. Demand for metallurgical coal over the medium term will depend largely on steel making technologies. Blast furnace steel producers are making an effort to increase productivity and use inputs more efficiently to compete against alternative steel making technologies.

An important recent development in blast furnace technologies is the use of pulverised coal injection (PCI), where the coal is pulverised and directly injected into the furnace. This can reduce the use of high cost coking coals – it is estimated that

## 8 metallurgical coal outlook – world

		2005	2006	2011	average annual growth 2005-11 %
Exports	Mt	204.0	221.6	248.0	3.3
Hard coking coal price					
- nominal	US\$/t	125	115	75	-8.2
- real <sup>a</sup>	US\$/t	128	115	69	-9.8
Semisoft coking coal price					
- nominal	US\$/t	80	56	43	-9.8
- real <sup>a</sup>	US\$/t	82	56	40	-11.3

<sup>a</sup> In 2006 US dollars.

1 tonne of PCI typically replaces 1.4 tonnes of coking coal. However, use of PCI coal is limited to 150–200 kilograms per tonne of hot metal produced, thus limiting the scope for long term efficiency gains.

Increased use of electric arc furnaces (EAF) for steel production has supported the development of hot briquetted iron (HBI) plants where iron briquettes are mixed with scrap in an EAF to yield high quality steel. HBIs can be used in blast furnaces to improve iron input quality, reducing the reliance on coke in the production of molten iron. On balance, strong growth in world steel production over the outlook period is expected to underpin a significant rise in demand for metallurgical coal, particularly in China, India and Brazil.

### **prices**

Prices received for hard coking coals in Japan typically provide reference prices for coal traded in other Asian markets. Contract prices for hard coking coal are expected to fall by 8 per cent in the Japanese financial year 2006-07 (JFY, April–March) to US\$115 a tonne. In JFY 2005-06 many producers packaged sales of semisoft and hard coking coals together at the hard coking coal price, resulting in the average premium for semisoft coals rising to 52 per cent above the benchmark thermal coal price. This ‘bundling’ practice is not expected to continue this year and with growth in demand for semisoft and PCI coals in 2006 not expected to match significant increases in global supply, a fall in prices to US\$56 and US\$66 a tonne respectively in JFY 2006-07 is expected. This fall in prices represents a reversion to the long term premium average of semisoft coal over benchmark thermal coal prices.

Over the medium term, the reduced reliance on metallurgical coal, coupled with the projected increase in supply, will contribute to the expected fall in metallurgical coal prices.

## *coal – thermal*

### **production**

APEC accounts for around 70 per cent of global thermal coal production. China is the world’s largest producer of thermal coal, with an estimated production of around 2 billion tonnes in 2005. Recent coal supply shortages have stimulated significant investment to expand production capacity and infrastructure. Over the

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medium term, increased mechanisation of existing mines and the closure of less efficient mines will result in productivity improvements in China's coal industry.

Coal production in Indonesia is forecast to rise by 30 million tonnes in 2006 to 180 million tonnes. Further developments will be challenged by weak investment in exploration, a decline in coal quality and an increase in production costs. Australian exports of thermal coal are expected to increase by 4.4 million tonnes to around 111 million tonnes in 2005-06, as increases in exports volumes offset lower contract and spot prices. Over the medium term, Australian coal production is projected to increase in response to increased investment.

### consumption

Thermal coal is used extensively in electricity generation. In 2005, APEC economies accounted for 60 per cent of world thermal coal imports. Japan is the world's largest importer of thermal coal and is expected to maintain this position over the medium term.

Malaysia, Thailand, India, Korea and China are all planning to increase coal fired power generation capacity to meet rapidly rising electricity demand. In Malaysia, government authorities are encouraging the development of coal fired plants to increase energy supply security.

Imports of thermal coal in the European Union are expected to decline gradually over the medium term as member economies reduce greenhouse gas emissions to meet their obligations under the Kyoto Protocol. However, concerns over the security of energy supply are expected to slow the decline in coal production.

## thermal coal outlook – world

		2005	2006	2011	average annual growth 2005–11 %
Exports	Mt	578	611	636.3	1.6
Price (Japanese financial years)					
- nominal	US\$/t	52.5	52.5	43	-3.3
- real <sup>a</sup>	US\$/t	54	52.5	39	-5.3

<sup>a</sup> In 2006 US dollars.

China's government has been undertaking initiatives to encourage the use of cleaner energy sources in response to growing environmental concerns. Over the medium term most of China's thermal coal imports will be used in the south east coastal regions, which are further away from the main coal producing region in the north west.

### **prices**

Strong growth in coal fired electricity generation in Asia and a tightening of supply resulted in high thermal coal spot prices during early 2005. Increased supplies, mainly from an increase in thermal coal exports from Indonesia, spurred a decline in prices toward the end of the year.

Over the medium term, increased productivity, driven by competitive pressures in Australia, South Africa and Indonesia, is projected to reduce thermal coal prices in real terms. This will be partially offset by continued growth in demand for thermal coal in power generation.

## **copper**

### **production**

World mine production increased slightly in 2005 to 15.1 million tonnes. APEC economies accounted for 81 per cent of this amount.

Recent strong copper prices have encouraged an increase in global expenditure on exploration and investment in new capacity. However, an aggressive increase in capacity will be limited, to some extent, by an increase in project development costs and the substantial time to develop new copper mines. World mine production is projected to be over 18 million tonnes in 2011, with significant growth expected in South America. For example, Codelco's Gaby copper mine in Chile (annual production of 150 000 tonnes of copper) is expected to commence production in 2008. Codelco also plans to invest \$12 billion in a number of other projects in order to substantially increase production over the next six years.

World refined copper production increased by 5 per cent in 2005 to 16.6 million tonnes, with APEC economies accounting for around 70 per cent of production. Developments in China are expected to have an important bearing on total growth in world refined production over the medium term. Over the past five years, China's refined copper production has increased by over 60 per cent.

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## consumption

In 2005, world consumption of refined copper increased marginally to 16.7 million tonnes, of which around 67 per cent was accounted for by APEC economies. Over the medium term, world copper consumption is projected to rise by 24 per cent to around 20.7 million tonnes in 2011. China, India and the United States are expected to account for the majority of the growth in copper consumption.

China accounted for around 22 per cent of global copper consumption in 2005. Over the medium term China's copper consumption growth will continue to be the major determinant of global consumption growth. China's government continues to encourage investment in the copper intensive power generation (accounting for an estimated 46 per cent of copper consumption in China). Continued strong economic growth in China will also result in an increase in consumer incomes and higher demand for copper intensive consumer durables (such as electrical goods) and services (such as transport, electricity and housing).

The United States will continue to have an important bearing on global copper consumption over the medium term. The construction industry accounts for around half of copper consumption in the United States. Over the medium term, growth in consumption is expected to ease due to assumed increases in interest rates and a fall in housing affordability, reducing the demand for housing.

India is emerging as another potentially large consumer of copper over the medium term, driven by growth in electricity generating capacity and infrastructure.

## 10 copper (refined) outlook – world

		2005	2006	2011	average annual growth 2005–11
					%
Production	kt	16 599	17 448	20 410	3.5
Consumption	kt	16 699	17 360	20 680	3.6
Price (London Metal Exchange)					
- nominal	US\$/t	3 678	6 816	2 800	-4.4
- real <sup>a</sup>	US\$/t	3 788	6 816	2 524	-6.5

<sup>a</sup> In 2006 US dollars.

## prices

For much of the remainder of the decade, global copper production is expected to exceed consumption, resulting in a steady increase in copper stocks. This outcome is projected to result in lower world copper prices. However, continued strong growth in China's copper consumption over the medium term is expected to stop real prices falling to the low levels witnessed in 2001 and 2002. The intensity of copper use in China is still substantially below that of developed economies, such as the United States and Japan, implying that there is considerable scope for further strong growth in copper consumption in China.

## gold

### production

World mine production increased by more than 1 per cent to 2519 tonnes in 2005. This came largely from an increase in production in Indonesia, Peru, Mexico and China.

Over the medium term, mine production is expected to increase moderately. Despite recent increases in gold prices and greater global gold exploration, there are few major projects expected to commence over the medium term. World gold mine production is expected to be 2708 tonnes in 2011, 8 per cent higher than in 2005.

## 11 gold outlook – world

		2005	2006	2011	average annual growth 2005–11 %
Fabrication consumption	t	3 280	2 917	3 403	0.6
Mine production	t	2 519	2 506	2 708	1.2
Scrap sales	t	861	1 050	700	-3.4
Price (London Bullion Market Association A.M.)					
- nominal	US\$/oz	445	606	443	-0.1
- real <sup>a</sup>	US\$/oz	458	606	399	-2.3

<sup>a</sup> In 2006 US dollars.

## **consumption**

In 2005, world gold fabrication consumption is estimated to have increased by over 4 per cent to 3280 tonnes as a result of an increase in gold jewellery demand in the Middle East and India.

Over the medium term, China is expected to have a greater bearing on world gold fabrication demand as continued strong economic growth and rising urban incomes are expected to stimulate gold jewellery demand. This will be partially offset by demand for a greater range of competing luxury items, particularly competing jewellery options. World gold fabrication demand is projected to reach around 3400 tonnes in 2011.

## **prices**

Movements in world oil prices and the associated concerns over the possible implications for inflation increased investment demand for gold and had a strong influence on world gold prices, particularly in the latter part of 2005. A number of other factors supporting the gold price in 2005 included: indications that the central banks of the Russian Federation and South Africa were considering increasing their gold holdings; ongoing geopolitical tensions; continued subdued growth in world mine production; and an increase in fabrication demand in India, the Middle East and China.

Over the medium term, the gold price is projected to ease. This will be supported by a general easing in base metal prices and reduced concerns over inflationary pressures as oil prices stabilise. Constrained mine production and continued net dehedging is expected to prevent a dramatic fall in price.

## *iron ore*

### **production**

High prices have encouraged investment in new iron ore production and transport capacity. Over the medium term, significant production expansions are expected in Australia and Brazil. Reflecting these supply side developments, Australia is projected to export 375 million tonnes of iron ore and account for 43 per cent of world seaborne trade in 2011. Iron ore exports from Brazil are projected to rise by 114 million tonnes by 2011.

Supply from South Africa's Kumba Resources is also expected to increase substantially over the medium term – the company has announced plans to expand supply to approximately 72 million tonnes in 2011. Upgraded port and rail facilities are expected to allow further mine expansions.

### consumption

Iron ore is used almost exclusively in steel production; consequently, the outlook for the iron ore industry is closely linked to developments in world steel markets. Strong economic growth and expenditure on infrastructure in China and India is expected to underpin strong growth in steel consumption over the medium term. World steel consumption is expected to reach 1.41 billion tonnes in 2011, around 24 per cent higher than in 2005. APEC economies accounted for 70 per cent of iron ore imports in 2005.

### prices

Negotiated iron ore prices for the Japanese financial year 2006-07 increased, reflecting rising global steel production, limited growth in iron ore supplies and persistent high spot prices in China. Over the medium term, the world's largest three producers are expected to increase their seaborne supply capacity by around 100 million tonnes. The increase in iron ore availability, particularly from low cost producers, is expected to result in an easing of prices over the medium term.

## 12 iron ore outlook – world

		2005	2006	2011	average annual growth 2005-11
					%
Exports	Mt	719	799	882	3.5
Price (London Metal Exchange)					
- nominal	US\$/t	62.72	74.63	56.26	-1.8
- real <sup>a</sup>	US\$/t	64.60	74.63	50.71	-4.0

<sup>a</sup> In 2006 US dollars.

## lead

### production

Lead mine production in APEC economies amounted to 2.7 million tonnes in 2005, representing around 83 per cent of world lead mine production. Over the medium term, world mine production is expected to increase, supported by strong Asian demand.

In 2005, APEC economies accounted for over 69 per cent of world refined lead production, dominated by China. World refined lead production is expected to rise in 2006, boosted by significant increases in Chinese smelting capacity. These increases in world refined lead capacity will be sufficient to meet most of the projected growth in lead consumption over the medium term.

### consumption

Lead battery production accounts for over 75 per cent of total world lead consumption. Consequently, the demand outlook for lead is closely linked to developments in world automobile and industrial markets. APEC economies accounted for 66 per cent of world consumption in 2005, dominated by China and the United States.

Recent growth in consumption of lead has been dominated by the Asian region (excluding Japan), particularly China, while consumption fell in the United States and Western Europe. Over the medium term, it is expected that this consumption trend will continue as nations such as the United States and Japan relocate

## 13 lead outlook - world

		2005	2006	2011	average annual growth 2005-11 %
Production	kt	7 547	8 046	9 637	4.2
Consumption	kt	7 721	8 055	9 515	3.5
Price (London Metal Exchange)					
- nominal	US\$/t	967	1 255	598	-7.7
- real <sup>a</sup>	US\$/t	996	1 255	539	-9.7

<sup>a</sup> In 2006 US dollars.

automobile production facilities to nations with lower input costs, such as China, Korea and India.

Significant increases in automobile production in China are expected to underpin strong growth in lead consumption to 2011. Growth in lead consumption over the medium term will also be supported by significant investment in the technology and communications sectors, along with infrastructure such as railways and hospitals, which are reliant on stationary batteries for the provision of uninterrupted power.

## *nickel*

### **production**

World mine production increased to 1.38 million tonnes in 2005. APEC economies accounted for around 65 per cent of this amount, led by the Russian Federation, Canada and Australia.

Over the medium term, new projects are expected to be commissioned in Australia, New Caledonia and Brazil and, with this, world mine production is projected to increase to 1.7 million tonnes by 2011.

Refined nickel production increased by 3 per cent in 2005 to 1.29 million tonnes. Expansions in China, New Caledonia, Philippines and Indonesia are expected to contribute to higher output of 1.32 million tonnes in 2006. Over the medium term, production growth is projected to average approximately 5 per cent a year to reach 1.72 million tonnes by 2011.

## **14** nickel outlook – world

		2005	2006	2011	average annual growth 2005–11 %
Production	kt	1 293	1 316	1 722	4.9
Consumption	kt	1 243	1 337	1 700	5.4
Price (London Metal Exchange)					
- nominal	US\$/t	14 749	24 077	8 143	-9.4
- real <sup>a</sup>	US\$/t	15 192	24 077	7 339	-11.4

<sup>a</sup> In 2006 US dollars.

## consumption

Production of stainless steel accounts for over 65 per cent of total world nickel consumption and, hence, the outlook for nickel demand is directly linked to developments in world stainless steel markets. In addition to the total amount of stainless steel produced, the grade of the steel and the proportion of nickel sourced from scrap are important.

In 2005, world nickel consumption was around 1.2 million tonnes. APEC economies accounted for around 58 per cent of this amount. China is the largest consumer of stainless steel, with much of this growth being supported by strong demand in the industrial, manufacturing and construction sectors. China's increasing self sufficiency is expected to reduce stainless steel production in Japan, Chinese Taipei and the Republic of Korea.

Slower growth in the stainless steel sector implies that other end uses will become increasingly important to the demand for nickel. Over the medium term, growth in nonstainless nickel demand is projected to remain strong because of expansions in the aviation sectors of China and India and significant expansion in the world petrochemical industry.

## prices

The lead time required to develop new mine and concentrate production capacity is expected to constrain nickel supply growth prior to 2008. This constraint, coupled with moderate demand growth, is expected to keep nickel prices well above their long term average in the period to 2008. High prices will also continue to provide an incentive for steel mills to increase production of lower nickel content stainless steels as well as increase the use of nickel from scrap. As a result, both nickel supply and demand are forecast to increase only moderately in the period to 2008.

Beyond 2008, the addition of significant new mine supply and nickel production capacity is forecast to result in a rebuilding of world nickel stocks and a significantly weaker outlook for world nickel prices in real terms.

## tin

### production

In 2005, APEC economies accounted for around 90 per cent of world tin mine production. The region also accounted for 90 per cent of world refined tin production. World refined tin production is expected to increase by around 1 per cent in 2006. With high operating costs at many of the small scale (and sometimes illegal) operations in Indonesia and China, forecast lower world tin prices are likely to result in the closure of a number of these operations in the medium term. World refined tin production is projected to reach 465 000 tonnes in 2011.

### consumption

APEC economies accounted for 72 per cent of world tin consumption in 2005. Over the medium term, growth in world tin consumption is forecast to increase to 460 000 tonnes led by continued strong demand in China. Strong growth in China's production of electrical items for domestic consumption and export markets has led to a substantial increase in tin consumption. Given China's comparative advantage in labour intensive manufacturing and significant inflows of foreign investment, growth in China's exports of electrical and electronic items is expected to be high over the medium term.

### prices

For most of the projection period, world tin production is expected to exceed consumption. Consequently, prices are projected to decline from an average US\$7600 a tonne in 2005 to US\$4190 a tonne (in 2006 dollars) in 2011.

## 15 tin outlook – world

		2005	2006	2011	average annual growth 2005–11 %
Production	kt	377	380	465	3.6
Consumption	kt	349	390	460	4.7
Price					
- nominal	US\$/t	7 382	8 610	4 650	-7.4
- real <sup>a</sup>	US\$/t	7 603	8 610	4 191	-9.5

<sup>a</sup> In 2006 US dollars.

## uranium

### production

World uranium production increased by almost 6 per cent to just over 49 000 tonnes in 2005, with APEC economies accounting for 63 per cent of production. Recent high prices have encouraged mining companies to extend the operating lives of existing uranium mines. Output is expected to rise over the medium term, led by major production expansions in Canada and Kazakhstan. Australia has the world's largest deposit of low cost uranium, at the Olympic Dam mine. An expansion of this mine is being investigated and could underpin a significant increase in uranium production over the medium term.

### consumption

The only significant commercial use for uranium is as a fuel for nuclear power plants. As of August 2006 there were 442 nuclear power plants worldwide, with a total generating capacity of over 369 gigawatts electric (GWe). There has been a recent increase in interest in nuclear power in response to energy security concerns and actions by signatories to the Kyoto Protocol to discourage greenhouse gas emissions. APEC economies accounted for 60 per cent of world uranium consumption, dominated by the United States.

Over the medium term, additions to nuclear capacity in China, India, the Republic of Korea and the Russian Federation, as well as further power uprates (a power uprate is the process of increasing the maximum power level at which a commercial nuclear power plant may operate) at existing nuclear power plants in the

## 16 uranium outlook – world

		2005	2006	2011	average annual growth 2005–11
					%
Production	kt	49	49	65.4	4.9
Consumption	kt	79	77	84.6	1.1
Price (London Metal Exchange)					
- nominal spot	US\$/lb	28.5	49.3	32.5	2.2
- real <sup>a</sup>	US\$/lb	29.4	49.3	29.3	-0.1

<sup>a</sup> In 2006 US dollars.

United States, are expected to be the major factors behind an increase in world uranium demand. World uranium consumption is projected to grow on average by 1.1 per cent a year to exceed 84 000 tonnes in 2011.

## prices

In 2005, world  $U_3O_8$  prices increased by around 53 per cent, driven by diminishing uranium stocks and concerns over the future supply of secondary sources of uranium. Over the medium term, world uranium prices are expected to decline as concerns over supply availability are eased through strong growth in world mine production and steady supplies of secondary uranium becoming available.

## zinc

### production

In 2005, APEC economies accounted for around 72 per cent of total world zinc mine production. Recent high zinc prices and continued strong demand growth have encouraged the development of new and existing mines.

Refined zinc production from APEC economies amounted to 6.4 million tonnes in 2005, representing around 63 per cent of world production. World smelting capacity has grown at a faster rate than the world's mine supply, resulting in a shortage of concentrates. Limited growth in new concentrate supplies and the run down of mine and smelter inventories are expected to constrain growth in refined zinc production. As a result, refined zinc production is expected to rise by only 3

## 17 zinc outlook – world

		2005	2006	2011	average annual growth 2005–11 %
Production	kt	10 229	10 540	13 360	4.6
Consumption	kt	10 628	10 960	13 090	3.5
Price (London Metal Exchange)					
- nominal	US\$/t	1 382	3 285	1 143	-3.1
- real <sup>a</sup>	US\$/t	1 421	3 285	1 030	-5.2

<sup>a</sup> In 2006 US dollars.

per cent to 10.5 million tonnes in 2006, in line with mine production. Production in the medium term is expected to become increasingly concentrated in China as they seek to reduce their reliance on imports and reduce the cost of inputs for galvanised steel.

### **consumption**

Galvanising of steel accounts for over 50 per cent of total world zinc consumption and therefore, the outlook for zinc demand is largely determined by developments in world galvanised steel markets. The production of brass and bronze and other zinc based alloys are the other major uses for zinc, accounting for approximately 20 per cent and 15 per cent of total world consumption, respectively.

World zinc consumption rose by 2 per cent to 10.6 million tonnes in 2005. APEC economies accounted for 64 per cent of world consumption in that year, dominated by China and the United States.

Over the medium term China is expected to increase its share of total world zinc consumption. Strong expected growth in China's infrastructure, industrial, construction and manufacturing industries is expected to lead to higher zinc consumption in China. China has insufficient galvanised steel production capacity to meet domestic demand and as a result imports a large proportion of its requirements. However, over the medium term, significant additional capacity is planned, and is expected to substantially reduce China's dependence on galvanised steel imports.

### **prices**

In 2005, zinc prices rose strongly, driven by increased demand, limited supply growth and falling stocks. It is expected that demand will exceed mine supply in 2006, providing support for higher zinc prices.

However, over the medium term, prices are expected to ease as production responds to higher prices. In 2011, real zinc prices (in 2006 dollars) are projected to be around 28 per cent lower than in 2005.

# 4

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## key issues in the APEC minerals sector

The capacity of APEC economies to capitalise on future growth opportunities in global minerals markets is inextricably linked to their capacity to develop their mineral resources within an economically, environmentally and socially sustainable framework. The objective in this chapter is to examine the main issues affecting the sustainable development of the minerals sector in APEC economies, and identify specific actions to address these issues.

The key issues for the APEC minerals sector were broadly addressed at the first meeting of APEC ministers responsible for mining, held in Antofagasta, Chile in June 2004 (APEC 2004) and the second meeting of APEC ministers responsible for mining, held in Gyeongju, Republic of Korea in October 2005 (APEC 2005). These issues are structured under the APEC pillars and include:

- ✧ trade and investment liberalisation
- ✧ business facilitation and
- ✧ economic and technical cooperation.

The three broad issues form the framework for discussion and recommended actions in this chapter.

### *trade and investment liberalisation*

Traditional barriers to trade, such as tariffs, have declined substantially over the past fifty years as a result of multilateral trade negotiations under the General Agreement on Tariffs and Trade (GATT) and its successor, the World Trade Organisation (WTO). The global trade weighted average industrial, or nonagricultural, tariff is now in the order of 3.6 per cent; with about 85 per cent of world trade bound at tariffs under 5 per cent (Minerals Council of Australia 2005).

Further, global trade in mineral products is relatively unimpeded compared with trade in agricultural products and labour intensive manufactures. Nonetheless, there is significant diversity in the tariff rates applied to mineral commodities across

individual economies. Key importers of minerals, including China, Korea, Japan, the United States and the European Union, apply either zero or very low tariff rates to ores and concentrates (table 18), reflecting the importance of unprocessed minerals in supporting major metals industries in these economies.

However, barriers and distortions to trade remain in some of these markets. For example, some degree of tariff escalation is evident, whereby higher import duties are imposed on semiprocessed and finished products than on raw material (table 18).

## 18 most favoured nation applied duties on selected mineral ores and concentrates and metal products

Product description	European Union		Japan	Korea, Rep. of	Chinese Taipei	United States
	China					
Copper ores and concentrates	0%	0%	0%	1%	0%	1.7c/kg on lead content
Copper mattes, cement copper	2%	0%	0%	0%	0%	0%
Copper pipes, tubes	4-7%	4.8%	3%	8%	4.1%	1.4-3%
Nickel ores and concentrates	0%	0%	0%	1%	0%	0%
Nickel matte, interim products of nickel metallurgy	3%	0%	0-3%; 44 ¥/kg	1-2%	0%	0%
Nickel tubes, pipes and tube or pipe fittings	6%	0-2.5%	0-3%	8%	1%	2-3%
Lead ores and concentrates	0%	0%	0%	1%	0%	1.1c/kg on lead content
Unwrought lead	3%	0-2.5%	0-3%; 2.7-4.5 y/kg	2-5%	0%	2.5% on the value of the lead content
Lead tubes, pipes and fittings	6%	5%	3%	8%	1.7%	2%
Zinc ores and concentrates	0%	0%	0%	1%	0%	0%
Unwrought zinc	3%	2.5%	0-4.3 ¥/kg	5%	0-1%	1.5-3%
Zinc tubes, pipes and tube or pipe fittings	6%	5%	3%	8%	3.5%	3%
Tin ores and concentrates	0%	0%	0%	1%	0%	0%
Unwrought tin	3%	0%	0-2.1%	3%	0%	0%
Tin pipes or tubes and pipe fittings	8%	0%	3%	8%	1%	2.4%

Source: WTO (2005).

In addition to the WTO framework, APEC member economies have aimed to liberalise their trading regimes through regional arrangements. In the declaration made by APEC leaders in Bogor, Indonesia, in 1994, APEC aims, 'to achieve free and open trade and investment in the region by no later than 2020'. In recognition of the differing levels of economic development among APEC economies, different timetables to achieve this goal were set, with the developed member economies agreeing to achieve the objective by no later than 2010 and the developing member economies by no later than 2020. Individual action plans have been formulated by member economies on a voluntary basis as a vehicle to achieve the objectives of the Bogor Declaration. Mineral products, metals and precious stones are covered in these action plans.

There are also bilateral and regional arrangements between individual APEC members that affect minerals trade. Chile, for example, has free trade agreements with the United States, Canada, Mexico and Korea. This has resulted in the reduction of import tariffs for Chilean products to such markets, especially for high value added mineral products (Government of Chile, Ministry of Mines 2005).

**recommendation 2** - *Continue the process of trade liberalisation and facilitation.*

While many of the minerals industry's tariff issues have been resolved through multilateral, regional and bilateral arrangements, nontariff barriers to trade in the form of institutional, regulatory and legal impediments continue to affect the ability to produce and sell minerals and metals in world markets. These include a lack of streamlined customs and quarantine procedures as well as trade distortions resulting from monopolistic practices adopted by state owned enterprises. Nontariff trade related measures aimed at environmental, labour or other nontrade objectives also have the potential to inhibit access to markets.

**recommendation 3** - *Remove all nontariff barriers to trade affecting the minerals sector both directly and indirectly.*

**recommendation 4** - *Develop an integrated approach to respond to, and avoid, trade restrictive measures based on environmental, social and other nontrade objectives.*

In parallel with trade liberalisation, the APEC region has become more open to foreign direct investment (FDI) by eliminating barriers and improving measures for promoting investment. However, progress in achieving the Bogor investment liberalisation deadlines has been uneven. Caps on foreign ownership are still applied to foreign investment in the minerals sector in some APEC economies.

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**recommendation 5** – *Renew the ongoing commitment to liberalise investment regimes, particularly by removing restrictions on foreign ownership.*

**key recommended actions in support of trade and investment liberalisation**

- » Continue the process of trade liberalisation and facilitation.
- » Remove all nontariff barriers to trade affecting the minerals sector both directly and indirectly.
- » Develop an integrated approach to respond to, and avoid, trade restrictive measures based on environmental, social and other nontrade objectives.
- » Renew the ongoing commitment to liberalise investment regimes, particularly by removing restrictions on foreign ownership.

## *business facilitation*

The long term viability of the minerals sector in APEC depends on sustained investment in minerals exploration and development and on the provision of an enabling environment that also seeks to minimise business transaction costs.

The minerals sector is highly globalised and one of the most complex and competitive industrial sectors in the world. A survey of international mining companies undertaken by the United Nations identified mining companies' criteria for assessing investment conditions (table 19). While these criteria may have changed since the beginning of the 1990s to reflect growing physical security concerns, improved awareness of occupational health and safety issues, and the increasing importance of environmental and social issues, the results provide a representative assessment of the wide range of factors influencing investment in the minerals sector.

The factors influencing investment can be classified into four categories:

- » **geological potential**
- » **global market factors** – including the global outlook for minerals demand and supply, and current and anticipated world market prices
- » **economywide factors** – including macroeconomic and political stability, the strength of legal institutions, the effectiveness of regulatory frameworks governing trade, investment, the operations of private enterprises and environmental issues, access to infrastructure and governance

- ❖ **sector specific factors** – including market transparency, minerals licensing processes, security of tenure for minerals licences, land access, minerals taxation regimes, and other regulatory and institutional factors specific to the minerals sector.

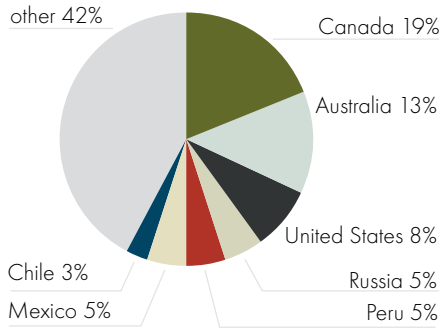
Consistent with recent global market developments that have led to record prices for key mineral commodities, there has been a significant increase in global exploration expenditure in recent years. In particular, worldwide exploration budgets of large mining companies and juniors reached US\$5.1 billion in 2005, an increase of 34 per cent from 2004 levels. This also brought total exploration budgets close to their 1997 peak of US\$5.2 billion (Metals Economics Group 2006).

## 19 ranking of investment decision factors for exploration and mining

Decision criteria	ranking (out of a total of 60 criteria)	
	exploration	mining
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 C **allocation of global exploration budgets, 2005**

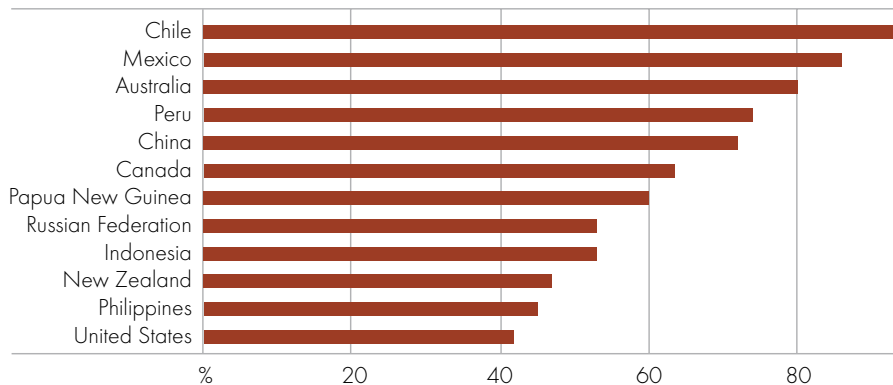


Given global market developments, the relative allocation of exploration budgets across different regions and economies is driven not only by prospectivity but, importantly, by access to an enabling investment environment. Of the ten top destinations for minerals exploration expenditure in 2005, seven were in the APEC region, accounting for 53 per cent of total world nonferrous mineral exploration budgets (figure C; Metals Economics Group 2006).

To a large extent, the relative ability of APEC economies to attract investment in minerals exploration reflects the diverse mix of policy and institutional settings in the region. This is highlighted by the survey undertaken by the Fraser Institute (2005) that shows the relative investment attractiveness of mining jurisdictions based on current geological potential and existing regulatory regimes (figure D).

A key development in recent years has been the significant increase in the popularity of Latin American economies, such as Peru and Mexico, for minerals exploration. This reflects the implementation of significant reform programs in these economies, involving a shift to privately owned / state regulated regimes from

fig D **mineral potential of APEC economies**  
assuming current regulations and land use restrictions



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.  
Source: based on Fraser Institute (2005).

state owned / state operated regimes, liberalised investment regimes and more effective environmental regulation. In Chile, such reforms were further strengthened by the comprehensive framework for the sustainable development of the minerals industry launched in 2005 through its 'mining policy of the bicentenary' (Government of Chile, Ministry of Mines 2005).

Also notable are the significant increases in exploration expenditure in the Russian Federation and China in recent years. In 2005, Russia moved to fourth place behind Canada, Australia and the United States, while China maintained its eleventh place position (Metals Economics Group 2006).

In comparison, exploration expenditure in the south east Asian region has been limited by a wide range of factors. Key drivers of minerals exploration are discussed below. These cover economywide factors that affect the general performance of an economy, including a stable macroeconomic environment, a nondiscriminatory regulatory environment, access to relevant infrastructure and human capital and a strong governance framework, and sector specific factors that affect principally the performance of the minerals sector. These include security of property rights related to mineral licences, clarity of land titles, particularly related to native title, attractiveness of taxation and royalty regimes and access to technologies and skilled labour.

## **economywide factors**

### ***competitive neutrality***

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. Issues related to competitive neutrality also arise within the minerals sector. There are instances whereby projects are encouraged, permitted or restricted depending on the mineral resource.

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.

**recommendation 6** – *Aim to have a clear sense of direction, vision and commitment to ensure that there is a level playing field across all economic sectors and within the minerals sector in terms of fiscal and other economic conditions.*

**recommendation 7** – *Minimise the involvement of state owned enterprises in the operation of resources sectors and remove any conflict of interest between the government as a regulator and developer of natural resources.*

**infrastructure**

Poor infrastructure undermines the attractiveness of investment across a wide range of sectors. The minerals sector is often based in remote regions, involving bulky and heavy commodities, which makes the sector dependent on a reliable supply of electricity, water, transport and other infrastructure services. Several APEC member economies have underdeveloped transport, communications and energy infrastructure.

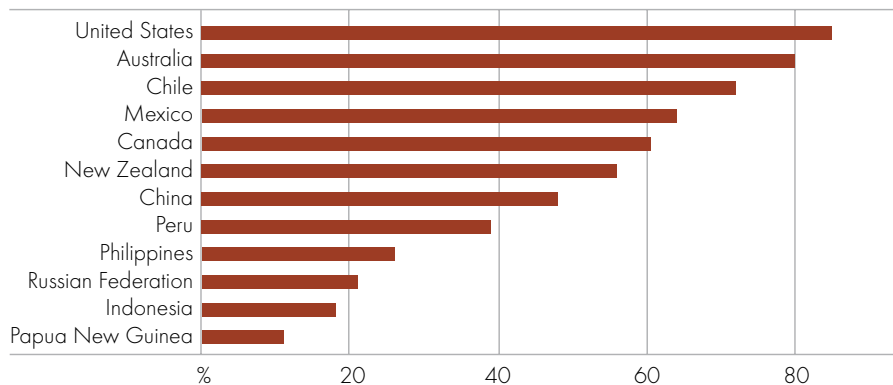
The lack of infrastructure services in some economies can be expected to have a negative influence on investors’ assessment of risk adjusted profitability in the minerals sector (figure E).

**access to finance**

The major issue in financing minerals projects with long exploration and development cycles is how to mobilise capital rather than the adequacy of supply of investment funds. The majority of APEC economies have well developed financial

**fig E quality of infrastructure**

proportion who consider this factor encourages, or is not a deterrent to, 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.  
Source: based on Fraser Institute (2005).

systems, and domestic and foreign investors are able to obtain access to finance for mineral development projects. However, in some APEC economies, poorly developed financial systems constrain domestic and foreign investment. These economies also tend to have a higher risk profile, adding to the costs of obtaining finance from major financial institutions.

**recommendation 8** – *Aim to achieve and maintain long term macroeconomic stability to minimise large fluctuations in output, employment and inflation that can add to uncertainty for investors.*

### **governance**

Governance is broadly defined as the sound exercise of political, economic and administrative authority to manage an economy's resources for development (ADB 1995). The capacity of institutions in charge of implementing regulatory regimes can be even more important than the regulations themselves; a workable minerals regulatory environment can be severely undermined by weak institutions (Morgan 2002). Good governance requires sound economic management, the enforcement of the rule of law, and participation, transparency, accountability and predictability in public administration (ADB 2004). Weak governance, in the form of weak rule of law, lack of transparency and accountability and lack of partnership between nongovernment organisations and the government is a challenge in some APEC economies and is an impediment to minerals sector development.

**recommendation 9** – *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 related sectors.*

**recommendation 10** – *Strengthen institutions to ensure that all levels of government 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.*

### **sector specific factors**

In addition to the broad set of issues that affect the costs of doing business in an economy generally, there is a range of issues that are specific to the minerals sector. These include market transparency, security of tenure, land access, taxation and royalty regimes, and access to skilled labour.

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### **market transparency**

Market transparency is a concept that has traditionally been associated with financial markets, where transparent markets are seen as a means of ensuring fair play, increasing liquidity and reducing the costs of monitoring and enforcing compliance with various laws and regulations. Over time this concept has been extended to a wider range of markets, including commodity markets, particularly in the light of strong and volatile commodity prices. Market transparency in the minerals sector has the potential to reduce transaction costs, enhance risk management and deliver more efficient investment and market outcomes.

Market transparency in the minerals sector can be divided into two broad aspects:

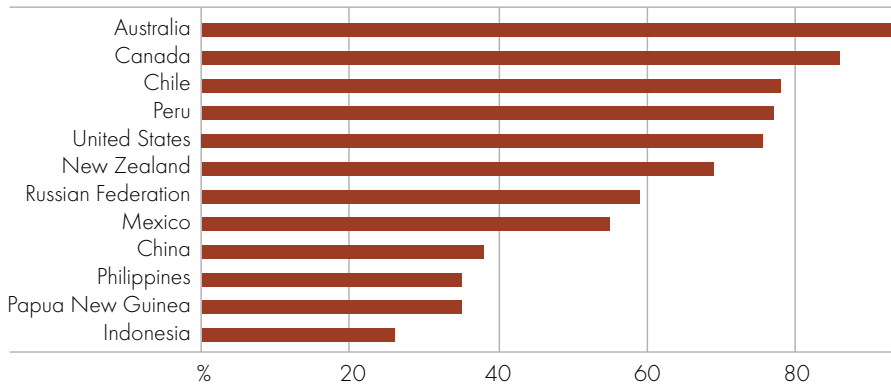
- transparency of minerals related information, such as geological information and statistical data and
- transparency of regulations in terms of scope, application and enforcement.

An essential element in increasing the transparency of minerals related information is the availability of a credible and publicly accessible geological database to support private exploration in the minerals sector. Mineral exploration – an investment in knowledge about the location, size and quality of mineral deposits – is high risk. Exploration is facilitated by access to geoscientific maps at a regional scale. Without this information, it is difficult for private explorers to pinpoint particular areas for detailed exploration, thereby increasing the costs and risks associated with mineral exploration. The role of government in the provision of basic geological information (a ‘public good’) is well recognised (Hogan 2003). Public geological surveys contribute to reducing both the costs and risks of private mineral exploration, and thereby facilitate private investment in the minerals sector.

The quality and accessibility of high level geoscientific data in APEC is mixed (figure F). At one end of the spectrum are economies such as Australia, Canada and Chile that have leading practices in place for the reporting of geological information. One example of leading practice in reserves reporting is illustrated by the Australasian Joint Ore Reserves Committee (JORC) which has led to an increase in the transparency of minerals related information in Australia and New Zealand (box 1). However, in some APEC economies, geological information is incomplete and out of date, difficult to access, and not available in a user friendly form. This lack of basic information on investment opportunities can make it difficult for these economies to attract investor interest in the minerals sector, despite significant geological potential.

fig F **quality of geological database**

proportion who consider this factor encourages, or is not a deterrent to, 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.

Source: based on Fraser Institute (2005).

**recommendation 11** – *Strive to provide high level geoscientific information through public geological surveys.*

**recommendation 12** – *In the presence of limited government resources, explore opportunities for partnerships with industry, academia and community organisations to provide that information.*

In addition to the risks inherent in the location, size and quality of mineral resources, the immobile or sunk nature of investments in the minerals sector exposes mining companies to particular risks if changes occur to government regulations and/or the implementation of regulations. The degree of ‘sovereign risk’ or regulatory uncertainty varies considerably across APEC economies (figure G).

Regulatory certainty, that determines the level of confidence in regulations and their implementation, can be a significant issue in some APEC economies. Imprecise minerals regulations leave open room for interpretation, thereby creating a major risk for investors, particularly in economies with immature minerals sectors and a lack of precedent in the implementation of mineral related regulations. Frequent changes to regulations and to the implementation of these regulations add a further degree of regulatory risk.

### box 1: leading practice in reserves reporting – Australasian Joint Ore Reserves Committee

The Australasian Joint Ore Reserves Committee (JORC) code is now well accepted in Australia and New Zealand, and in recent years has been used both as an internal reporting standard by a number of major international mining companies, and as a template for economies that are developing or revising their own reporting documents, including the United States, Canada, South Africa, the United Kingdom/Europe, Chile and Peru. The code is applicable to all solid minerals, including diamonds, other gemstones, industrial minerals and coal, for which the 'public reporting of exploration results, mineral ores and ore reserves' is required by the Australian and New Zealand Stock Exchanges.

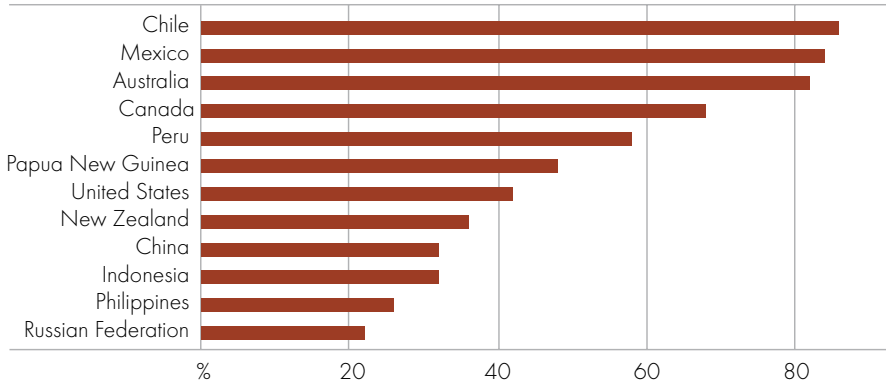
The purpose of the JORC code is to provide a minimum standard for reporting of exploration results, mineral resources and ore reserves, and to ensure that public reports on these matters contain all the information that investors and their advisers would reasonably require to make a balanced judgment about the results and estimates being reported.

The main principles governing the operation and application of the JORC code are transparency, materiality and competence. In order to implement the JORC code, a jurisdiction must:

- ❖ establish and prescribe the minimum standards for public reporting of exploration results, mineral resources and ore reserves
- ❖ set out a system for the classification of tonnage (or volume) and grade (or quality) estimates as either mineral resources or ore reserves and for the subdivision of each into categories that reflect different levels of certainty or confidence
- ❖ specify the qualifications and experience required for a competent person – typically, these involve membership of a recognised professional organisation and relevant experience in the sampling and analytical techniques applicable to the deposit under consideration
- ❖ set out the responsibilities of the competent person and companies' boards of directors for reporting of exploration results, mineral resources and ore reserves and
- ❖ provide a summary list of the main criteria that competent person(s) and others should consider in the course of preparing reports on exploration results, mineral resources and ore reserves – these cover an extensive range of technical, geological and economic criteria.

fig G **uncertainty concerning the administration, interpretation and enforcement of existing regulations**

proportion who consider this factor encourages, or is not a deterrent to, 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.

Source: based on Fraser Institute (2005).

Regulatory uncertainty is also affected by the processes for obtaining exploration and mining licences. The ability of private enterprises to obtain timely government approval of applications and effective processing of documents are vital for investment decision making in the sector. Licensing processes in some APEC economies are unclear and nontransparent, thus contributing to lengthy regulatory decision making processes.

Further, in some APEC economies, national or federal government efforts to promote a clear and transparent institutional framework for the development of the minerals sector are undermined by a multiplicity of regulatory regimes across different jurisdictions or provinces. Inconsistent internal regulatory regimes add a further layer of uncertainty for potential investors and increase the costs of doing business.

**recommendation 13** – *Ensure that the licensing process and other regulations and procedures are 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. In this context, consider the establishment of a ‘one stop shop’ for minerals sector investment.*

**recommendation 14** – *Consider the potential contribution of private sector firms in identifying the weaknesses in existing regulations and engage them in designing and delivering appropriate capacity building programs where appropriate.*

### **security of tenure**

Investors in all sectors place a high value on the security of property rights. Security of tenure is a particularly important consideration for minerals sector investors. In the minerals sector, property rights are enshrined in mineral licences. Generally, mining companies look for an assurance that if a viable deposit is found during exploration, they will obtain the necessary rights to extract the resource. In some of the less developed APEC economies the mining laws do not assure this and, thus, do not provide the basic tenets of security and certainty required for the investment of very large amounts of capital over long periods of time.

There are two main aspects to the concept of security of tenure. The first is the constancy, stability and continuity of exploration and mining rights granted, including the linkage between exploration and mining phases. In some APEC economies exploration and mining licences are formally separated, and clear protection of the rights of exploration companies that make commercial discoveries to move to the development stage is not provided. This lack of clear rights to the development of discovered mineral resources significantly reduces the incentive for mining companies to carry out exploration investment. The second aspect is the length of time for which rights are granted in relation to the actual time required in practice. Security of tenure can also be affected by government requirements on minimum work and expenditure commitments, obligatory relinquishments and filing of reports and plans (Morgan 2002).

**recommendation 15** – *Ensure that the requirements for investors to proceed from an exploration licence to a mining licence are clear and transparent.*

**recommendation 16** – *Ensure that mining rights are exclusive and transferable to other enterprises, provided that all technical, financial, environmental and other requirements are met.*

**recommendation 17** – *Ensure that the processes and procedures related to the issuance of exploration and mining licences are responsive enough to allow new information related to mining technologies, for example, as well as changes in economic factors such as minerals prices, to be taken into account.*

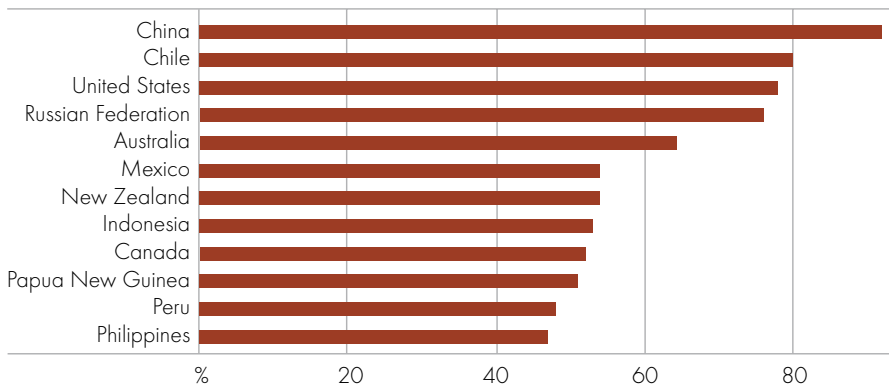
**land access**

The rising cost of access to land is a crucial issue facing the minerals industry globally. In many cases, the development of mineral resources has significant implications for competing land uses such as urban development and agriculture. In cases where property rights can be assigned to particular land uses, a market based system for determining the optimal allocation of land resources should be applied. When property rights cannot be assigned, administrative processes and procedures are required. In some APEC economies, the lack of an efficient mechanism through which to resolve land access disputes can lead to significant delays and costs for potential investors in the minerals sector, thus acting as a strong deterrent to investment.

Land access issues also arise in APEC economies with weak land tenement systems. In some economies land title is not always clear, or information on land titles is not available in a readily usable form. Uncertainty and lack of information about land ownership creates additional costs and significant uncertainty for minerals sector investors.

An issue relevant to both developed and developing APEC economies is uncertainty about native title claims (figure H). For example, in 1992 the High Court of Australia held that native title was capable of being recognised by common law provided that connection to the land has been maintained by native title holders

**fig H certainty concerning native land claims**  
 proportion who consider this factor encourages, or is not a deterrent to, investment



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 Source: based on Fraser Institute (2005).

since European settlement in Australia. The Australian *Native Title Act 1993* sets out procedures for future acts that affect native title. Similarly, in the Philippines, the *Indigenous Peoples' Rights Act 1997* recognises native title control and ownership of ancestral domains, including mineral and other natural resources within these domains.

Concerns about native title principally relate to the process for determining claims and the granting of approvals. The lack of process efficiency in addressing costly delays in accessing land, and the absence of a coordinated approach by key regulatory agencies can introduce unnecessary complications and delays to the exploration process.

**recommendation 18** – *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.*

**recommendation 19** – *Where property rights cannot be defined, adopt transparent and consistent administrative processes and procedures to remove the uncertainty surrounding access to land resources.*

### **taxation and royalty regimes**

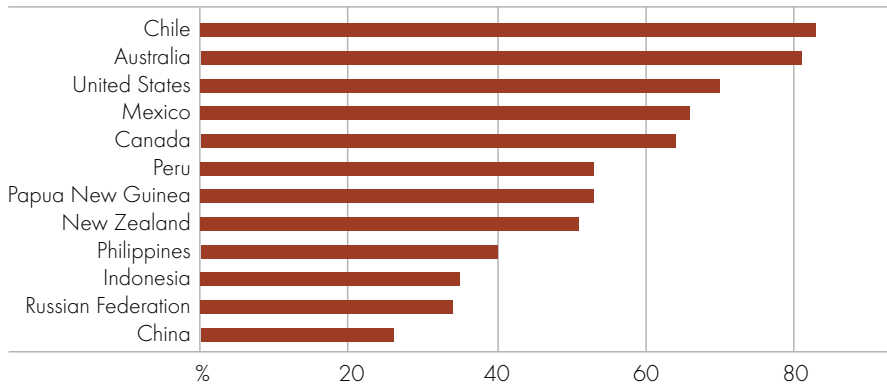
An important determinant of minerals sector investment is the design of taxation policies. Uncompetitive taxation regimes can make many potential mineral development projects unprofitable, and curtail investment in all but the most lucrative projects. The minerals sector is subject to a range of taxation instruments, including direct taxes, indirect taxes and quasi taxes.

Mineral royalties are specifically designed to address some of the unique features of extractive industries. There are several possible mineral royalty arrangements that may be applied to production (Hogan and Donaldson 2000). From an economic perspective, the resource rent royalty is a relatively efficient form of resource taxation, because it takes into account changes in prices, costs and output. However, administrative and compliance costs of a mineral royalty system increase with the amount of information required.

An important factor in attracting investment in mineral exploration in the APEC region is the relative competitiveness of taxation regimes across economies. The Fraser Institute survey data suggest that the international competitiveness of taxation regimes varies widely across APEC economies (figure 1). Over the past decade, the increasingly integrated global business environment has meant that

fig 1 **taxation regime and investment**

proportion who consider this factor encourages, or is not a deterrent to, investment



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Source: based on Fraser Institute (2005).

competitive taxation regimes have become even more important in attracting global capital to the minerals sector.

**recommendation 20** – *Move toward mineral taxation regimes that are simple, transparent, equitable and efficient.*

**recommendation 21** – *Where applicable, consider minerals sector taxation regimes in comparison with economies that have 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.*

### **access to skilled labour**

As the integration of the global economy continues, the competitiveness of the minerals sector in the APEC region will increasingly need to be supported by engagement in human resource development. In this context, the shortage of skilled labour is emerging as a potentially significant issue for the minerals sector worldwide. There is some evidence to suggest that the limited availability of skilled professionals, such as engineers and geologists, is affecting the timing and cost

of mining development projects. Such constraints have the potential to impede a rapid supply response to high minerals prices.

**recommendation 22** – *Respond to the current and emerging skills shortages through education initiatives that improve the quality of, and access to, physical, environmental and social science programs relevant to the minerals sector.*

### **key recommended actions in support of business facilitation**

- ❧ Have a clear sense of direction, vision and commitment to ensure that there is a level playing field across all economic sectors and within the minerals sector in terms of fiscal and other economic conditions.
- ❧ Minimise the involvement of state owned enterprises in the operation of resources sectors and remove any conflict of interest between the government as a regulator and developer of natural resources.
- ❧ Aim to achieve and maintain long term macroeconomic stability to minimise large fluctuations in output, employment and inflation that can add to uncertainty for investors.
- ❧ 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 related sectors.
- ❧ Strengthen institutions to ensure that all levels of governments 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.
- ❧ Strive to provide high level geoscientific information through public geological surveys.
- ❧ In the presence of limited government resources, explore opportunities for partnerships with industry, academia and community organisations to provide that information.
- ❧ Establish an APEC minerals database to cover high level geological information and key market data, such as production, consumption and trade, on an agreed, consistent and comparable basis. This should be complemented by capacity building in data collection and analysis in developing APEC economies.
- ❧ Ensure that the licensing process and other regulations and procedures are clear, efficient and transparent, while acknowledging that improving regula-

tory certainty in the minerals sector requires an enhancement of both regulations themselves and institutions that carry out their implementation; In this context, consider the establishment of a 'one stop shop' for minerals sector investment.

- ❧ Consider the potential contribution of private sector firms in identifying the weaknesses in existing regulations and engage them in designing and delivering appropriate capacity building programs where appropriate.
- ❧ Ensure that the requirements for investors to proceed from an exploration licence to a mining licence are clear and transparent.
- ❧ Ensure that mining rights are exclusive, and transferable to other enterprises, provided that all technical, financial, environmental and other requirements are met.
- ❧ Ensure that the processes and procedures related to the issuance of exploration and mining licences are responsive enough to allow new information related to mining technologies, for example, as well as changes in economic factors such as minerals prices, to be taken into account.
- ❧ 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.
- ❧ Where property rights cannot be defined, adopt transparent and consistent administrative processes and procedures to remove the uncertainty surrounding access to land resources.
- ❧ Move toward minerals taxation regimes that are simple, transparent, equitable and efficient.
- ❧ Where applicable, consider minerals sector taxation regimes in comparison with economies that have 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.
- ❧ Respond to the current and emerging skills shortages through education initiatives that improve the quality of, and access to, physical, environmental and social science programs relevant to the minerals sector.

## *economic and technical cooperation*

It is widely recognised that the minerals sector faces growing environmental and social challenges. Economic and technical cooperation can play a significant role in addressing those challenges by reducing the technological gaps across APEC members and by fostering capacity building in the pursuit of sustainable development.

Increasingly, environmental and social considerations are having a significant bearing on minerals sector development. Unregulated mining activities during the early development of the mining industry have left a legacy of unrehabilitated mine sites, polluted rivers and degraded land. Against this background, the minerals sector is increasingly seen as leaving behind environmental 'footprints' that can adversely affect the ability of rural and regional communities to earn and sustain their livelihoods and, consequently, the long term sustainability of the sector.

From the minerals industry's perspective, it is becoming increasingly clear that the institutions and systems that economies establish to regulate, manage and monitor the environmental impact of mining operations directly influence the extent of investors' interest in starting up a particular mining operation. In the face of strong social and environmental awareness by local communities and the public generally, mining firms, particularly multinational firms investing in developing economies, have become increasingly concerned about the reputational and financial risks from causing, advertently or inadvertently, social and environmental damage. Consequently, these firms are placing more emphasis not only on clear social and environmental frameworks, but also on competent government institutions that can effectively monitor and enforce compliance with these frameworks.

In some APEC economies, environmental regulation is well established and effective voluntary codes of conduct have been developed to encourage corporate social responsibility (box 2). In others, environmental regulations, and the enforcement of these regulations, act as a deterrent to investment (figure J).

**recommendation 23** - *Demonstrate government commitment to and ability to set appropriate and reliable environmental rules, consistent with international standards, and to monitor and ensure compliance with these rules in a credible and transparent manner, drawing on the experience of leading economies.*

**recommendation 24** – Consider leading practices in the region in developing strong underlying regulatory regimes to encourage the development of, participation in, and continued evolution of effective voluntary initiatives.

In addition to environmental issues, social issues are progressively forming an integral part of the sustainable development agenda in the minerals sector. These issues essentially relate to the impacts of companies' decisions on stakeholders other than shareholders.

**box 2: leading practice environmental management – voluntary industry codes of conduct**

With the importance given to environmental and social factors it is becoming clear that the financial success of mining firms is increasingly tied to environmental competence (Bond and Weber-Fahr 2002). Voluntary initiatives in the form of industry codes of conduct are emerging as important tools for addressing these issues.

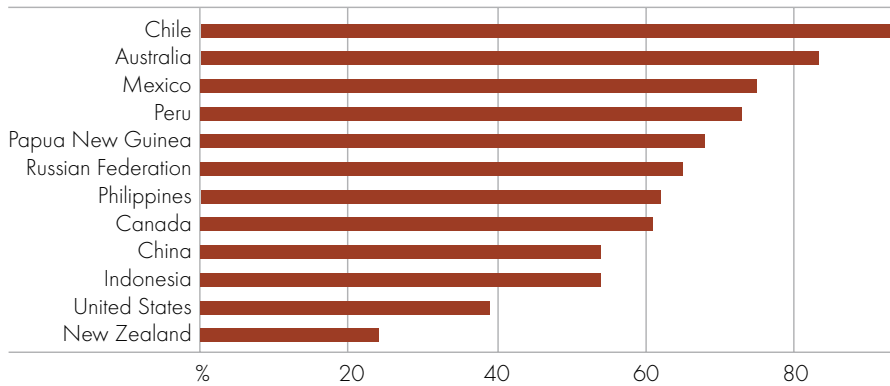
There are numerous examples of voluntary national initiatives already under way or proposed for the minerals sector across a range of economies (Greene 2002). These initiatives have a role in supplementing existing legal regimes, and can be used to address unregulated areas and encourage 'beyond compliance' performance in regulated areas. Typically, larger companies, already advanced in environmental management, are the first to adopt these voluntary initiatives.

At the global level, the International Council on Mining and Metals (ICMM) provides a focus to the sustainable development of the world's mining and metals industries. In particular, the ICMM's *Ten Principles for Sustainable Development* (2003) provides a framework for measuring sustainable development performance ([www.icmm.com](http://www.icmm.com)).

As members of the ICMM, several economies have developed their respective framework for pursuing sustainable development. For example, *Enduring Value – The Australian Minerals Industry Framework for Sustainable Development* was developed by the Minerals Council of Australia (2004) to guide the operational level implementation of the ICMM principles by the Australian mining industry ([www.minerals.org.au](http://www.minerals.org.au)). The framework provides a practical tool to assist the industry to operate in a manner that is aligned with the expectations of the community, and that seeks to maximise the long term benefits to society that can be achieved through the effective management of Australia's natural resources.

fig J **environmental regulations**

proportion who consider this factor encourages, or is not a deterrent to, investment



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Source: based on Fraser Institute (2005).

The social dimensions of mining vary significantly across APEC economies as a reflection of different socioeconomic and political conditions. While there has been a realignment of corporate cultures toward more socially responsible performance over the past decade, the priority accorded to these issues varies across APEC economies. Minerals projects are not always pursued in partnership with local government agencies and communities. The lack of stakeholder engagement in some economies continues to undermine community support for mine development. Further, in some APEC economies, mine safety is a particularly pressing issue.

**recommendation 25** – Consider and address more explicitly the social impact of mining, particularly on local communities, while striving to form mutually beneficial partnerships with indigenous people.

**recommendation 26** – Devote human and financial resources to address priority issues, taking into account that the methods employed for achieving environmental and social objectives will vary considerably on the basis of different local, natural, socioeconomic and cultural conditions.

APEC economies are at different points on the mining technological scale, with some economies using technologies that perform below world’s leading practice. This technological gap represents a significant opportunity for technology transfer across the region. However, there are both formal and informal barriers to the transfer of mining technologies and related services in some APEC economies.

**recommendation 27** – *Seek to improve technical skills in geology, mine engineering, environmental sciences and other disciplines related to the minerals sector through regional cooperation initiatives and public/private sector partnerships.*

**recommendation 28** – *Promote long term investment in the development of more efficient technologies through collaborative research efforts.*

**recommendation 29** – *Remove barriers to technology transfer and diffusion.*

**key recommended actions pertaining to economic and technical cooperation**

- Demonstrate government commitment and ability to set appropriate and reliable environmental rules, consistent with international standards, and to monitor and ensure compliance with these rules in a credible and transparent manner, drawing on the experience of leading economies.
- Devote human and financial resources to address priority issues, taking into account that the methods employed for achieving environmental and social objectives will vary considerably on the basis of different local, natural, socio-economic and cultural conditions.
- Seek to improve technical skills in geology, mine engineering, environmental sciences and other disciplines related to the minerals sector through regional cooperation initiatives and public/private sector partnerships.
- Consider leading practices in the region in developing strong underlying regulatory regimes to encourage the development of, participation in, and continued evolution of effective voluntary initiatives.
- Consider and address more explicitly the social impact of mining, particularly on local communities, while striving to form mutually beneficial partnerships with indigenous people.
- Promote long term investment in the development of more efficient technologies through collaborative research efforts.
- Remove barriers to technology transfer and diffusion.

# 5

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## conclusion

The sustainable development of the minerals sector within APEC economies calls for a strong and effective policy framework. Governments are ultimately responsible for the regulatory and institutional settings within which minerals production takes place in a given jurisdiction, and their actions are critical to achieving sustainable benefits from the minerals industry for the national economy. More specifically, the sustainable development of the minerals sector is contingent on the provision of strategic direction; the requisite legal, regulatory and institutional frameworks to pursue economic, social and environmental objectives; accountability, transparency, and stakeholder consultation; and systems to deliver tangible benefits to the economy's citizens.

These conditions are also necessary for attracting the substantial levels of private sector investment required to underpin the development of the minerals sector in the APEC region. At a time when globalisation is creating new opportunities for investment and increasing competition for mining capital, maintaining a stable and facilitative policy climate is becoming more important, and more challenging than it has ever been.

While there is a need to acknowledge the individual circumstances of APEC economies in responding to the challenges attached to the sustainable development of the minerals sector, the value of cooperative efforts should be highlighted. Regional cooperation can provide significant opportunities in support of domestic policy efforts by building on complementarities and allowing the sharing of knowledge and experiences in relation to leading practices within the region.

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10.6

Agricultural Production Systems Research Unit	Independent Pricing and Regulatory Tribunal
Asia Pacific Economic Cooperation Secretariat	International Food Policy Research Institute
AusAid	Land and Water Australia
Australian Centre for International Agricultural Research	Meat and Livestock Australia
Australian Greenhouse Office	Minerals Council of Australia
Australian Government Department of the Environment and Heritage	Ministry for the Environment, New Zealand
Australian Government Department of Industry, Tourism and Resources	National Australia Bank
Australian Government Department of Prime Minister and Cabinet	Newcastle Port Corporation
Australian Government Department of Transport and Regional Services	NSW Sugar
Australian Wool Innovation Limited	Rio Tinto
CRC - Plant Biosecurity	Rural Industries Research and Development Corporation
CSIRO (Commonwealth Scientific and Industrial Research Organisation)	Snowy Mountains Engineering Corporation
Dairy Australia	University of Queensland
Department of Business, Economic and Regional Development, Northern Territory	US Environmental Protection Agency
Department of Premier and Cabinet, Western Australia	Wheat Export Authority
Department of Primary Industries, New South Wales	Woolmark Company
Department of Primary Industries, Victoria	
East Gippsland Horticultural Group	
Fisheries Research and Development Corporation	
Fisheries Resources Research Fund	
Forest and Wood Products Research and Development Corporation	
Grains Research and Development Corporation	
Grape and Wine Research and Development Corporation	
GHD Services	