

Vision 2040



Mining, Minerals and Innovation

Starting a national conversation about sustainable mineral production.

Consultation Paper - May 2011



Mineral Futures Collaboration Cluster

This publication has been produced as part of the research being conducted by the CSIRO Minerals Down Under National Flagship. Researchers from the Minerals Down Under National Research Flagship and five Australian universities have formed a collaboration cluster to address future sustainability issues facing the minerals industry in this country. One of the Minerals Down Under Flagship strategic goals is focused on delivering national benefit and an ongoing license to operate for the Australian minerals industry through research into commodity futures, technology futures, and regions in transition. More information about the cluster can be found at:

<http://www.csiro.au/partnerships/mineral-futures-collaboration-cluster.html>

About the authors



Leading the work on commodity futures is the Institute for Sustainable Futures (ISF). ISF was established in 1996, to develop sustainable futures through research and consultancy work with industry, government and the community. Our mission is to create change toward sustainable futures that protect and enhance the environment, human well-being, and social equity. We seek to adopt an inter-disciplinary approach to our work, and engage collaborators in processes that emphasise strategic decision-making for long-term benefit.

See more at www.isf.uts.edu.au

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+ Introduction

Australia's Mineral Future in 2040

Australia's economy is now riding on the trucks, trains and ships that carry our minerals to the international market. But the resources boom we're now experiencing will not last indefinitely.

We need a conversation about how our vast mineral endowment can provide all Australians with sustained benefit over the next 30 years and more.

This discussion should focus on what strategies, innovations or policies might deliver equitable and sustainable benefit from minerals into the future. The issues in this conversation are complex, and open discussion among all stakeholders can help us to reframe problems, find solutions and identify the opportunities change will bring.

This document aims to begin this conversation by asking for your input on a vision for a sustainable mining

industry in Australia, and how this vision can be achieved.

This work is part of the Minerals Futures Collaboration Cluster (2009-2012), which unites five university research institutions in collaboration with CSIRO to address the future of sustainability challenges for the mining industry in Australia.

Part of this research aims to answer the following questions:

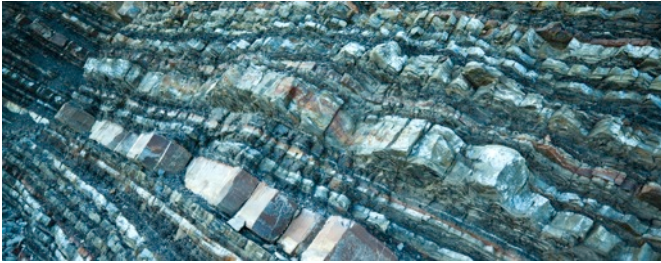
What should we as Australians be doing with our mineral endowment in the next 30 years to underpin long-term national benefit?

What strategies can deliver on a vision of a minerals industry embedded within a sustainable Australian community in a range of future scenarios?

What technologies should be given priority for research and development?

We invite your comments on this document, and ask you to respond using the survey on pages 20-22 or take our online survey at:

<https://www.surveymonkey.com/s/vision2040>



+ Mining and Minerals in 2040: Key Assumptions

Demand is rising

Demand for minerals is projected to rise. This assumes that demand for mineral products from developing countries such as India and China will continue to follow the pattern of the last two decades. However, recent developments in countries that manufacture goods made with Australian minerals indicate that quality rather than quantity is going to be a future focus.

Doing business is costing more

The Australian mining industry's energy consumption has increased by a factor of 10 since 2001/02¹. This increase is an important consideration given that the cost of cost of electricity is rising significantly due to infrastructure upgrades, and the cost of fuels for generators and transport is also rising with the price of oil.

Conditions for mining are changing

Rates of discovery for new, high grade, ore bodies in Australia are declining. This creates more cost and more environmental impact for every tonne of mineral produced. At the same time, competitive mineral resources are being developed in other countries.

Higher risks, from adverse weather events, such as recent floods in Queensland, and cyclones in Queensland and Western Australia, are also affecting

mining operations, infrastructure, and communities.

More scrutiny is being applied to mineral production and how it delivers a 'benefit' to Australians - it is becoming clear that this relies on investment strategies for the revenues and a more holistic view of the public investments being made in infrastructure that facilitates a low value trade in bulk commodities.

Cumulative Impacts

In areas where mining operations are already in place, additional mining activities often add to these impacts – creating a 'cumulative' impact that can be much bigger than the individual operations would create on their own. Changes to operations that increase the use of water, or which put water sources at risk are also of particular concern for Australia. Other concerns come from dust and high levels of exhaust from diesel fuels, used in generators and in mining vehicles, are also a health concern for surrounding communities.

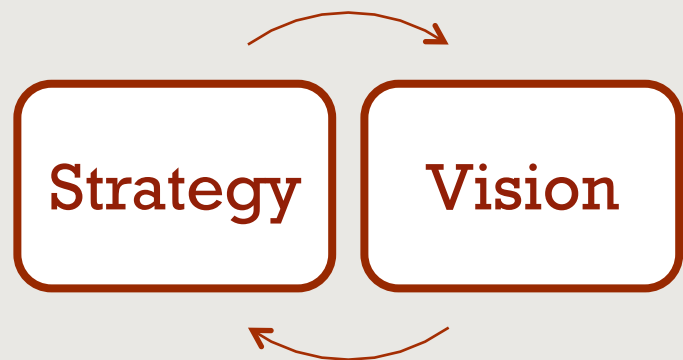
Social Licence to Operate (SLO) harder to secure and maintain

Technological developments that reduce the cost of labour are also reducing the social benefit of mineral production to local communities. As mining operations become less viable, the benefits to local communities may be reduced.

+ A pro-active approach to developing a long-term vision and national strategy for Australia's minerals

The uncertainty and complexity of long-term thinking about the future makes an ongoing assessment of the objectives and strategies imperative.

The key elements of the vision and the strategy that will help achieve the objectives of the vision are outlined below:



+ Long-term National Benefit

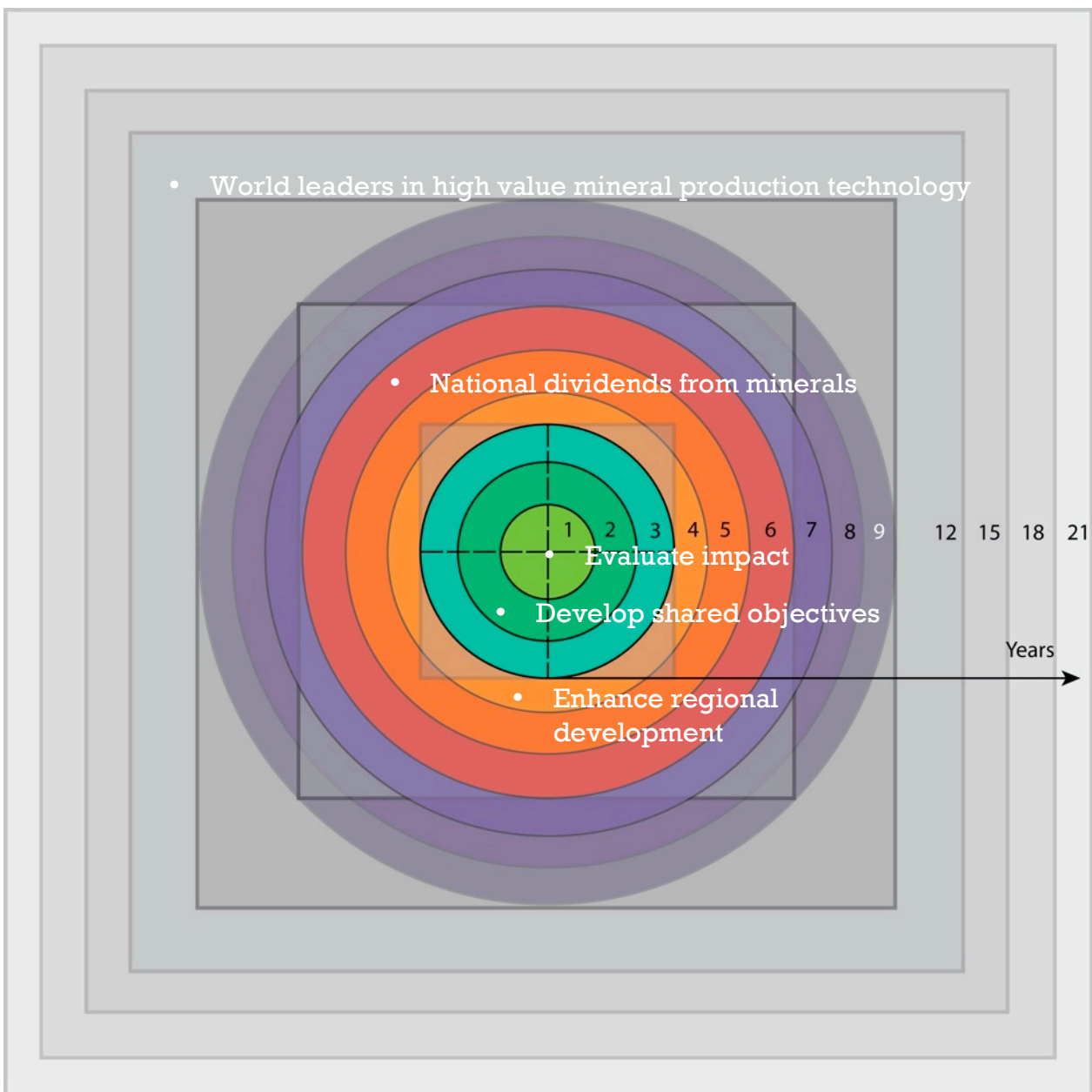
How can we think about the long-term?

Business Cycles, Planning Cycles

The circles and squares in the diagram below represent our existing ways of thinking about innovation in industry. Each circle represents a business year, while the squares represent a business cycle of 3 years.

Inter-Generational Benefit

Currently our thinking about the future focuses on the three years at the centre, and yet at least seven more business cycles will pass before we can say that benefit is actually being passed to another generation.



We have placed some key initiatives into the picture already.

Where would you place the initiatives and strategies on page 7 (opposite)? Are there other initiatives or strategies that you would nominate as being important to delivering a long-term national benefit from minerals? Where do they fit?

- **Develop new governance structures that enable long term strategic thinking and planning**
 - Address lack of coherence between levels of Government
 - Ensure governance structures fit regions
 - **Assist industry and communities to develop shared objectives**
 - Develop appropriate measurements for economic, environmental and social impacts from mineral production
 - Develop policy for identification and distribution of benefits (national/global)
 - Develop strategies to reduce the association of significant change with high costs, time constraints and technology lock in
- **Investment in new technologies that reduce environmental impact**
 - Extract value along the supply chain (mining > production > use > recycling)
 - Evaluate de-materialisation as a strategy for reducing impacts
 - Address resources scarcity (e.g. peak oil, workforce) and rising input costs
 - Include Life Cycle Assessment on all processes and products
 - **Evaluate impact** (e.g. energy/water) per unit on all goods/services
- **Greater emphasis on people – greater involvement with mining communities and the wider Australian community**
 - Increase trust across industry/government/community
 - Empower indigenous communities and support initiatives towards greater autonomy for indigenous people
 - Develop strategies to **enhance regional development**
- **Develop new measures of mineral ‘wealth’ that align with community values**
 - Make consumers aware of value and impacts of products and services
 - Develop consistent reporting and monitoring of national indicators
 - Examine economies of scale that operate against regional diversification
 - Examine economic reward systems
 - Implement monitoring and evaluation to ensure production reflects true costs (internalising externalities)
- **Increase investment in human capital (i.e. transferable skills)**
 - Prioritise **world leadership in the areas of high value mining services and innovation**
 - Improve relationship between urban and regional communities
 - Invest mineral wealth, so that it **pays dividends** to the national community - education, health, infrastructure and innovation



Rethinking the myths:

Reframing the problems, finding solutions



“Don’t kill the goose that lays the golden eggs”

In this story, the problem is seen as a need to “protect” Australia’s ***natural resource industries*** so that they can remain Australia’s main economic engine.

This view assumes that the benefits of mineral production are adequately harnessed in Australia’s national interest, that they are well distributed and that community well being is achieved through short-term benefits.

Solutions are believed to come from investing in research, to develop technologies that can lift production at lower cost.



“Don’t sell the family silver”

In this story, the problem is seen as a need to “protect” Australia’s ***natural resources*** as an inheritance that should be maintained for future generations.

This view assumes that the benefits of mineral production are not being adequately harnessed or distributed in Australia’s long-term national interest.

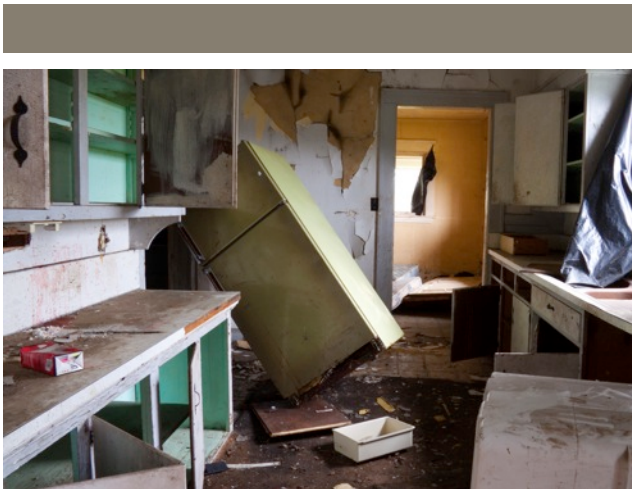
Solutions are believed to come from ensuring that resources are used to generate long-term value through more efficient production - when prices are good and production is easy.



Changing the story:

Transforming relationships and outcomes

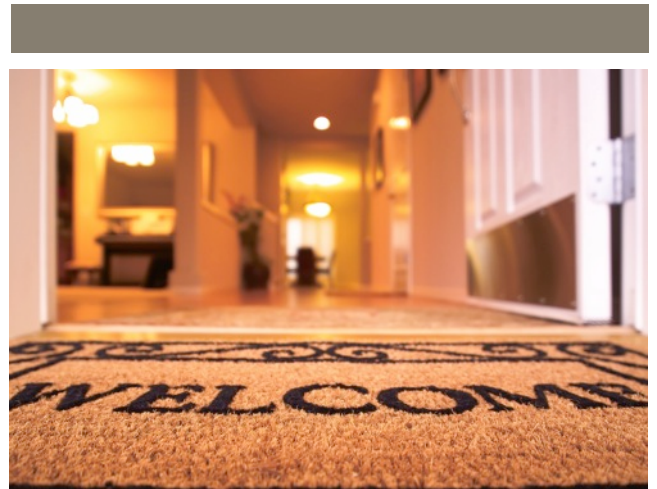
As an extractive industry, mining's viability will be determined by access to resources, capital, technology and social licence to develop. This in turn, is affected economic, social and environmental costs, and changes to market demand. Where an operation has been a bad tenant (causing more damage than benefits justified) it is unlikely that further activities in the community (or nation) will receive much support. However, if the relationship can be transformed into one where mining delivers as much, and more, than it takes away, then mining could be seen as a guest that is welcome to return at any time.



The Bad Tenant

Mining practices cause environmental degradation, and the impacts of mining development in regional areas can have negative economic and social impacts.

Where mining drives regional development during operation years, this is rarely sustained when mines close down, and attempts to keep increasing costs to a minimum, either by automating mining operations, or using a 'fly-in-fly-out' approach to managing mine workers are less likely to deliver benefits to regions. Where mining takes place near existing communities, the economic, social and environmental impacts may outweigh any benefits, due to environmental degradation, escalated housing prices and pressure on community support services.



The Welcome Guest

Planning for a transition to a post-mining future is essential to creating a future in which mining delivers a net positive benefit.

Some suggestions for how the mining industry might achieve the status of a 'welcome guest' have included investing in local communities via infrastructure that drives long-term economic development (such as schools and non-mining local businesses), as well as increasing the extent and quality of rehabilitating environments affected by mining operations. Another suggestion has been to expand mineral industry services - selling our know-how as well as rocks - so that it can continue to significantly support Australia's economic development.

+ Key Themes 1: *Long-term national benefit*

The Brundtland definition² of sustainable development: development that meets the needs of the present without compromising the ability of future generations to meet their own needs.



What is national benefit?

Lower impact mining and minerals processing does not automatically equate to sustainable mining and resource processing, nor does a mineral resources boom mean that Australia is wealthy. A national conversation is aimed at getting a better idea of what we want from our nation's resource wealth. One way to go about this is to work with industry and the national community to develop shared objectives.

How can governments, communities and the mining industry develop a common understanding of “a sustainable Australia” and the role of the mining industry in this?

What makes something beneficial?

Natural materials and objects hold different meaning for different members of our society, and this influences how we attribute value. Whether economic, cultural or physical, the attribution of value designates what we consider to be resources. The value we place on *resources* is determined by the function or functions those materials or objects perform in our society. We are familiar with the idea that we all benefit from the money that selling our resources brings in, but is it enough?

Are there other goals, or new ways of measuring prosperity that might help us get more benefit from our national endowment?

Worth thinking about...

In 2001, the World Bank assessed Australia as being one of the lowest performers amongst developed countries when natural resource depletion and land degradation were considered. Our investment in our human capital is not keeping up with our use of our natural capital³.

Getting “practical” about delivering national benefit from minerals and mining

Other countries are thinking very hard about how they manage their mineral wealth for long-term national benefit. Some, like Norway, are taking the money and setting it aside in sovereign wealth funds for the generations who won't have these resources to sell. A number of mineral producing countries are also using these funds to make investments in areas that will keep their communities healthy, wealthy and wise long after their minerals are gone. Some countries aren't selling their minerals, at all – Chile is looking at renting them out and getting them back to sell again!

Could Australia take this further, moving from a 'dig and sell' approach to a 'dig, sell, recover and sell again' model? Can we extend beyond selling ores to developing new sources of minerals, as well as exporting our knowledge and technology?

What are the big ideas that Australia should pick up on to make sure that our grandchildren are better off than we are today?

Sovereign Wealth Funds

The term sovereign wealth fund (SWF) refers to any government-controlled fund that manages and invests government savings...

Commodity –based sovereign wealth funds have been created for the purposes of reducing negative economic impacts from mining (high currency value) and ensuring that future generations can continue to share in this wealth⁴.

Could Australia continue to be a major supplier of minerals in the future?

Australia is in a unique position to shape its mining and minerals processing operations to eliminate negative impacts, strengthen positive impacts, and begin a new story by embedding itself within systems of sustainable resource use and reuse. After all, Australia makes more from exporting its mining technology than it makes from selling refined copper. What else could we do if we put our minds to it?

Some have suggested that a good way forward would be to develop policy that fast tracks the use of clean production technology, because manufacturers are now thinking much harder about whether they can sell products with low performance on environmental issues like water and energy.

Could 'Brand Australia' minerals have an edge by developing and using technology that delivers the metals without the high social and environmental price tag?

+ Key Themes 2: *Costs, Benefits or Value*

While consumers demand precious metals and gems as final goods, these only account for a small fraction of total mineral demand. The main use of minerals is as inputs for final products and services⁵.

Does thinking about costs and benefits over a longer period change how you manage them?

The benefits and impacts of mineral resource extraction and processing in Australia are changing. As Australia's largest export industry, mining brings financial benefits to the nation and whilst our vast endowment of minerals will not be exhausted soon, extraction and production are becoming more challenging.

How can we mitigate the impacts of resource depletion, or its consequences for an extractive minerals industry?

If we need to start making a transition to new ways of doing things, where do you think we should be focusing our efforts?

Price versus Value

Although physical depletion may not present an issue in the short-term, continued production combined with falling resource quality brings greater technological, environmental and social expense, and the likelihood of economic depletion.

**What are we using minerals for?
How can we better value resources in the future?**



Worth thinking about...

Different types of mineral involve different processes to make into materials and products that we recognise. For example, it takes 2 grams of gold to make a wedding ring, which can be produced from 10,000 kilograms of gold ore or 10 kilograms of mobile phones.

A minerals industry that delivers a net positive benefit

Obtaining a “social licence” to undertake particular mineral production processes, or extract particular mineral commodities, has become more difficult as public attitudes to environmental, health, social and economic aspects of mining, minerals, and sustainability have changed over time.

It has been suggested that a minerals industry embedded in a more sustainable economy must shift its activity to include active stewardship and must seek opportunities to use less metal for service provision, and maximise ecological, social and economic value from mineral resources.

Is it possible for the mining and minerals industry to delivery a net positive benefit? Can you see how you, or someone in your role, might assist?

Sustainable mining or sustainable minerals?

New ideas about how we use and create value from natural resources, and pressure arising from the need to reduce carbon emissions, increasing energy prices and water conservation will be powerful drivers to encourage resource conservation, efficiency, recycling and reuse.

Alongside increasing public interest in protecting other important land uses, biodiversity and other aspects of our ecosystems, there are many reasons to think hard about what mineral industries will be expected to deliver in the future.

What would need to change or improve if mining and mineral production is to deliver a net positive benefit? For example, how could mining and mineral production increase biodiversity or reduce fossil fuel use in Australia?



Key Themes 3: *Present & Future Prosperity*

As Australia purchases more goods and services from overseas than the value of goods and services it exports⁶, what we choose to spend our export proceeds on and how we structure an economy that can continue to pay for these goods and services in the longer term is a fundamentally important question.

Prosperous or just well paid?

While Australia's mineral endowment is vast, the mineral income stream continues to be highly dependent upon demand from a global market, stable regulation, low cost for energy, and for transport.

What will happen when any of these aspects change? Are we prepared for leaner times? Can we do with the proceeds of mining to sustain long-term benefit?

Present prosperity

Notwithstanding our economic dependence on mineral resources, many aspects of our global society are socially and/or culturally dependent on minerals and metals. Consequently, almost every aspect of our daily lives is affected by the availability of many mineral resources, and the current mineral production and consumption patterns reflect the values we implicitly or explicitly attribute to these resources.

What things do you do, or encounter in your everyday life that depend on metals? Are any of these things responsible in some way for feelings of being 'prosperous'? How different would your life be with less of them?

Worth thinking about...

In 2008/09 Australia made more from selling mining software than it made from sales of zinc and uranium ores combined.

Regions and Prosperity

Currently, regional planning by governments focuses on issues of economics, housing, population and environment, while peak industry bodies have considered infrastructure requirements to realise increased commodity trade. In the face of increasing environmental and social impacts, or significant change in the global trading context, how can regional communities (indigenous and non-indigenous) be empowered to have meaningful involvement in determining their futures?

How can trust between government, companies and regional communities be increased? What are the strategies that will involve regional communities in discussions of regional development?

Worth thinking about...

During the 1950s Australia's economy was thought of as 'riding on the sheep's back'. However, by the 1970s prices for raw bulk agricultural commodities were falling and by the early 1990s we were making a transition to an economy that relies on the 'golden goose' of minerals. However, during the past 15 years, the lifetime of some of our most important mineral resources have shrunk significantly. For example, economically demonstrated iron ore resources have reduced from 250 years to 65 years⁷.



Future Prosperity

The prospect of a more dematerialised economy and closed-loop production/consumption cycles have consequences for commodity futures, technological innovation and the sustainability of mineral-rich regions.

How do we plan for a future based on *renewable* economic development? Where are the opportunities for innovation and transition in technology and policy?

+ Key Themes 4: *Innovation*

This discussion is not just about how the minerals industry can be more sustainable, but rather, what a minerals industry would look like if it was an integral part of a sustainable society.

Opportunities and challenges for innovation

If minerals and metals are going to continue to play an important role in underpinning the future prosperity of our society, however, to confront the challenge of sustainability, the way in which resources are currently used, and might be used in future, requires a serious discussion. More equitable global consumption, increasing corporate social responsibility, and goods and services whose social and environmental costs are included on the price tag are likely to be just the start.

“For the minerals industry, this could mean we move beyond ‘dig more, sell more’ to ‘dig once, and get paid three times’ – once for the mineral, once for the know-how and technology we can develop and export and once for managing and recycling the metal and selling it again” - Professor Göran Roos.



Did you know?

That it takes approximately 95% less energy to recycle scrap aluminium than to create new aluminium from ores?

Developing technologies for sustainable minerals

In a world with growing resource, water, energy and carbon constraints it is prudent to consider how Australia might play a strategic role in minerals futures as a leading centre of minerals stewardship and recycling, not just as a major centre for minerals extraction.

**What role is seen for new technology for the minerals industry?
What problems are these technologies attempting to resolve?**

Worth thinking about...

**If cities are the mines of the future,
what are the issues for how these
new mines will operate?**

Changing priorities

The prospect of a more dematerialised economy and closed-loop production/consumption cycles have consequences for commodity futures, technological innovation and the sustainability of mineral-rich regions.

What are sustainable patterns of production and consumption, nationally and globally, with which Australian resource extraction and processing can link?

National Peak Minerals Forum (Sydney)

- **29 April 2010**

25 participants identified four key areas for positioning the minerals industry within a more sustainable Australian economy, including technological advances, new structures for long-term decision making, new approach to business (not a 'quarry' but a 'mineral services hub'), and better distribution of impacts and benefits.

Proposed Actions: A national 'mining' strategy and an assessment of key resources.

World Economic Forum Scenarios Workshop (Melbourne)

- **28 September 2010**

The World Economic Forum, Minerals Council of Australia, CSIRO and the Institute for Sustainable Futures, UTS collectively hosted an interactive workshop looking at the future of Australia's mining and metals industry. Over the course of the day, the group of 30 participants explored the implications of global megatrends for Australia under three scenarios prepared by the World Economic Forum's scenario planning team.

Proposed Actions: A national 'mining' strategy and a sustainability rating system for mining operations.

Vision 2040 (Brisbane)

- **28 November 2010** The *Vision 2040: Innovation in Mining and Minerals Forum* (Vision 2040) provide an opportunity for stakeholders to explore and analyse plausible future scenarios as input to developing a preferred vision for Australia's mining and minerals future.

Proposed Actions: Develop a national 'mining' strategy for creating truly sustainable mineral production and systems to evaluate progress towards this goal.

Stakeholder Consultation (Nationwide)

- **May- June 2011**

This is your opportunity to take part in the national conversation.

Final Vision and Strategy Launch (Perth)

A vision for mining and minerals in 2040

Feedback

Vision 2040

- Mineral Production makes a net positive contribution to a sustainable Australian economy.

Strategy

- Develop new governance structures that enable long term strategic thinking and planning
- Investment in new technologies that reduce environmental impact
- Greater emphasis on people – greater involvement with mining communities and the wider Australian community
- Develop new measures of mineral wealth that align with community values
- Increase investment in human capital (i.e. long term employment outcomes, transferable skill development)

Initiatives

- We're interested in your ideas for initiative that could be included within the strategy, and any additional strategies that can help us achieve the vision.

Survey

You can take this survey online at:
<https://www.surveymonkey.com/s/vision2040>



1. Which of the following areas are you involved in? (please circle all that apply)

- | | | | |
|-------------------------|-------------|------------|---------------|
| Mining | Government | Finance | Community |
| Minerals/Metals | Shareholder | Research | Environmental |
| Manufacturing/Recycling | Citizen | Consulting | Other: |

2. How would describe your role in your current work?

3. How much longer do you see yourself working in this area? (please circle)

- 1-5 years 6-10 years 11-15 years more than 15 years

4. In your opinion, what are the benefits of mining and mineral production?

Short term:

Long term:

5. Do you believe the benefits of mining and mineral production could be increased? If so, please tell us how you think this might be achieved.

6. Which of the following groups, if any, should receive more of the benefits of mineral production? (please circle all that apply)

- | | |
|------------------------|--------------------|
| Mining communities | State government |
| Indigenous communities | Federal government |
| Shareholders | Citizens |
| Other: | |

7. In your opinion, what are the cost or impacts of mining and mineral production?

Short term:

Long term:

8. Do you believe the costs and impacts of mining and mineral production could be reduced? If so, please tell us how you think this might be achieved.

9. Do you feel that there are some groups that bear a larger share of the costs or impacts of mineral production? Please tell us who or what you are concerned about in the space below:

10. The following statements are key elements of the draft vision and strategy. Please tell us whether you believe these statements provide a useful direction by **circling 'yes' or 'no'**. Typed notes can be included in postal submissions of this survey.

Vision for Sustainable Mineral Production in 2040:	Yes	No
“Mineral production makes a net positive contribution to a sustainable Australian economy”.		

Are there changes you would make to the vision statement (above)?	Yes	No
If so, please tell us about them in the space below:		

Strategy Elements:

- | | | |
|--|------------|-----------|
| 1. Develop new governance structures that enable long term strategic thinking and planning | Yes | No |
| 2. Investment in new technologies that reduce environmental impact | Yes | No |
| 3. Greater emphasis on people – greater involvement with mining communities and the wider Australian community | Yes | No |
| 4. Develop new measures of mineral wealth that align with community values | Yes | No |
| 5. Increase investment in human capital (i.e. long term employment outcomes, transferable skill development) | Yes | No |

Do these strategy elements provide a clear path to achieving sustainable mineral production?	Yes	No
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Are there other strategies that you believe would be useful?	Yes	No
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If you have additional information you would like to provide on strategies, please feel free to include them as typed notes along with this survey.

Please **rate** the following initiatives in terms of how useful you believe they would be in achieving the vision of sustainable mineral production in Australia (tick the most appropriate box).

	Yes	Uncertain	No
Address lack of coherence between levels of government			
Develop policy for identification and distribution of benefits			
Address resources scarcity (e.g. peak oil, workforce)			
Address rising input costs (e.g. energy)			
Increase trust across industry/government/community			
Develop strategies to enhance regional development			
Empower indigenous communities and support initiatives towards greater autonomy for indigenous people			
Create one or more sovereign wealth funds that will act as a 'trust' for future generations			
Develop new measures of wealth that community values and desire for a sustainable future			
Use tax concessions to promote the take up of sustainable technology such as renewable energy infrastructure to power mining and processing			
Create one or more sovereign wealth funds that will reduce the negative impact of the mineral boom (such as high currency values).			
Invest mineral wealth so that it pays dividends to the national community - education, health, infrastructure and innovation			
Prioritise world leadership in the areas of high value mining services and innovation			
Develop minerals under "Brand Australia" - a source of minerals with high environmental and social performance			
Develop policy to improve the development and take up of clean production technology			
Make information on the impacts of mineral products and services available to consumers			

Are there other initiatives that you would like to see as part of a national strategy for sustainable mineral production?

Please send pages 20-22 (along with any typed notes you would like to include) to: **Vision 2040 Consultation, Institute for Sustainable Futures, PO Box 123, Broadway NSW 2007, Australia.**



+ Contact Us

Participants and other interested stakeholders are welcome to continue the dialogue concerning the issues raised at Vision 2040 online at

<http://resourcefutures.net.au>.

In particular, it is hoped that continuing involvement will help to identify mineral resources suitable to the project of long-term production trends, and the associated impacts for case study commodities.

We would be very keen to stay in touch with you during the progress of the research, and would welcome your input and feedback at any time.

Contact ISF

Dr. Damien Giurco

+61 02 9514 4978

Damien.Giurco@uts.edu.au

Dr. Tim Prior

+61 02 9514 4956

Timothy.Prior@uts.edu.au

Postal Address:

Vision 2040 Consultation, Institute for Sustainable Futures, PO Box 123, Broadway NSW 2007, Australia.

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1. ABARE (2009). Australian energy consumption, by industry and fuel type - Tables f-f8, Australian Bureau of Agricultural and Resource Economics, Canberra.
2. World Commission on Environment and Development (1987). *Our Common Future*, United Nations, Oxford University Press.
3. Brown et al (2005). "How Useful Is the Genuine Savings Rate as a Sustainability Indicator?" in *The Australian Economic Review*, , December 2005, University of Melbourne.
4. Devlin, W., Brummit, B. (2007). *A few sovereigns more: the rise of sovereign wealth funds*, Economic Roundup Spring 2007, Australian Treasury.
5. Maxwell, P. and Guj, P., (eds.) (2006). *Australian Mineral Economics: a survey of important issues*. Monograph 24edn. AUSIMM, Melbourne.
6. ABARE (2009). *Australian Commodity Statistics 2009*. Australian Bureau of Agricultural and Resource Economics, Canberra.
7. Geoscience Australia (2004). *Australia's identified mineral resources 2004*. Geosciences Australia, Canberra.



For more information

Mineral Futures Discussion Paper: Sustainability Issues, Challenges and Opportunities

<http://epress.lib.uts.edu.au/dspace/bitstream/handle/2100/926/giurcoetal2009mineralfuturediscussion.pdf?sequence=1>

Peak Minerals: A Review of Changing Impacts and Benefits

<http://www.isf.uts.edu.au/publications/giurcoetal2010peakmineralsreview.pdf>

WEF Future Scenarios Workshop Summary, September 2010, Melbourne

http://resourcefutures.net.au/sites/default/files/WEF_Australian_Workshop_Session_Summary.pdf

National Peak Minerals Forum Summary, April 2010, Sydney

http://resourcefutures.net.au/sites/default/files/UTS-WK-1-3-MinFutures_Peak_Min_Forum_Summary.pdf

World Economic Forum Mining and Metals Scenarios to 2030

<http://www.weforum.org/en/initiatives/Scenarios/MiningandMetalsScenarios/index.htm>

“Agriculture and Mining - how can these two important sectors co-exist in a sustainable way?” A debate on land use conflict at the Royal Easter Show, Sydney 2011

<http://livestre.am/IxI1>



Vision 2040: Mining, Minerals and Innovation

**Starting a national conversation about
sustainable mineral production.**

May – June 2011