IPENZ
ENGINEERS NEW ZEALAND

Realising our Hidden Treasure:

RESPONSIBLE MINERAL AND PETROLEUM EXTRACTION

Contents

What does this report say?

New Zealanders aspire to have living standards similar to other highly developed countries. Realising this aspiration requires economic growth, particularly export-led growth which improves New Zealand's overall balance of payments. A diverse economy is important and agriculture, tourism and high technology manufacturing can all make their contribution to New Zealand's economic growth. IPENZ believes the mineral and petroleum extraction sectors can also be increased to contribute to growing our exports.

Many New Zealanders do not realise just how well-endowed New Zealand is. The country has large quantities of gold, coal, lignite, ironsands, phosphate and petroleum. The mining, quarrying and petroleum sectors make up between eight to 10 per cent of New Zealand's export earnings and contribute 1.1 per cent to New Zealand's gross domestic product[1] (GDP). This contribution to GDP could easily be increased to over three per cent within the next 10 years which would take the contribution to export earnings well past 10 per cent. This increase would grow New Zealand's economy, raise labour productivity and help ensure New Zealanders' aspirations can be realised.

A significant number of New Zealanders believe minerals and petroleum cannot be extracted while maintaining the quality of our environment. IPENZ considers the environmental impacts of minerals and petroleum extraction are more manageable than many New Zealanders think. Extracting minerals and petroleum whilst maintaining the quality of our environment is possible, but requires checks and balances including world-class regulatory controls and expert management of the impacts of minerals and petroleum extraction. The current checks and balances have shortcomings and IPENZ recommends a number of changes to address this. These changes include separate legislation for mining and petroleum, reviewing the capabilities and funding for oil spill responses, and addressing skill shortages.

The Government must lead this work by setting and enforcing relevant policies and world-class standards and by adequately resourcing regulators with technical expertise. This will ensure those regulators involved in decision making and regulatory enforcement appropriately balance environmental protection and economic growth.

The Resource Management Act 1991 gives New Zealanders the opportunity to contribute to local decision making and we need to ensure our views are considered. In addition we need to demand the public release of performance data on the regulatory system and regulated entities to ensure extraction activity does not compromise the quality of our environment.

What is the New Zealand conundrum?

New Zealand faces a conundrum. It trades on the quality of its environment. As New Zealanders we are proud and protective of our country, its reputation, resources and environment. At the same time we aspire to living standards similar to other highly developed countries and these living standards are not free – economic growth is required to achieve them.

New Zealand's GDP per capita has fallen over time. In 1950 New Zealand had the third highest GDP per capita in the Organisation for Economic Co-operation and Development while it is now in twenty-first place out of 33 countries[2]. Not helping the situation is the fact that New Zealand's labour productivity is low[3] – it is 30 per cent lower than Australia's labour productivity, and 45 per cent lower than the United States'[4]. If this decline continues New Zealanders' aspirations will not be realised.

To meet New Zealanders' aspirations the country needs export-led growth to raise export earnings and improve its balance of payments. The decades of believing the agricultural sector alone can achieve New Zealand's goals are over. Tourism helps bring in overseas revenue but the jobs it creates lower labour productivity. High technology manufacturing can certainly make a contribution but more is needed. Expanding the extraction of minerals and petroleum might also be a way of boosting economic growth.

In this paper we address four questions:

- What is the potential economic impact of extracting our minerals and petroleum – is there a gain worth pursuing?
- Can New Zealand extract minerals and petroleum without adversely affecting its environment?
- Are the current checks and balances appropriate to ensure the concerns of New Zealanders are adequately addressed?
- What more needs to be done to realise our resource wealth and protect our environment?

How much does New Zealand currently make from minerals and petroleum?

The minerals and petroleum sectors currently make a significant contribution to the economy. Minerals and petroleum contribute approximately eight to 10 per cent of New Zealand's export earnings[5] and approximately $1.5 billion or 1.1 per cent to New Zealand's total real GDP[6]. In the year to September 2011 $2.1 billion of crude oil and $0.2 billion of petroleum products were exported, representing five per cent of all exports[7]. In addition New Zealand exported iron, gold and other minerals, and although the statistical classification is not clear cut, it seems the minerals' component of New Zealand's exports is of a similar order of magnitude to petroleum. This suggests the total contribution of minerals and petroleum to New Zealand's export earnings is around eight per cent.

In addition to export earnings extracting minerals and petroleum results in employment, with approximately 6,800 people currently employed in the mining, quarrying and petroleum sector. These employees tend to be well-paid, receiving median earnings 70 per cent higher than the national median[8]. The sectors also indirectly employ a further 8,000 people, providing direct financial benefits to those employed and to the community.

The mining, quarrying, and petroleum sector has very high labour productivity. In 2009 the sector's average value per employee was $223,971, 3.6 times higher than the average across all New Zealand of $61,600 per employee[9]. Thus, increasing the extraction of minerals and petroleum and the associated rise in the number of people working in those sectors will raise New Zealand's overall labour productivity, resulting in a better-paid New Zealand workforce.

The mining, quarrying, and petroleum sector also provides revenue for the Crown. In the year to June 2009 the sector paid the Crown over $519 million in royalties and $38 million in energy resource levies[10]. The Government also received general taxation, goods and services tax, and the indirect benefits of jobs, the development of associated supplying industries, and other flow-on effects to the rest of the economy.

How much could minerals and petroleum contribute to the economy?

This country is rich in minerals and petroleum. Onshore we have gold, coal (bituminous, sub-bituminous and lignite), ironsands and phosphate. These resources are currently actively extracted in the North and South Islands. Their location is shown in the map (Figure 2) on page 11. Offshore, we have considerable reserves of ironsands, phosphates and petroleum (oil and gas). The quantity and approximate economic value of New Zealand's resources are shown in Table 1.

Table 1: Potential quantity and value of resources

RESOURCE	POTENTIAL RESOURCE	APPROXIMATE TOTAL ECONOMIC VALUE[11]
Gold*	1,200 tonnes[12]	$76 billion
Bituminous coal	324 million tonnes[13]	$56 billion
Sub-bituminous coal	1,083 million tonnes[14]	$53 billion
Lignite	5.6 billion tonnes[15]	$248 billion
Onshore ironsands (concentrate)	874 million tonnes[16]	$149 billion
Phosphate	100 million tonnes[17]	$23 billion
Oil	238 million m^3 [18]	$187 billion
Natural gas	239 billion m^3 [19]	$45 billion

*This is from 1999 data

Based on current production rates, these resources could be extracted for many decades as shown in Figure 1:

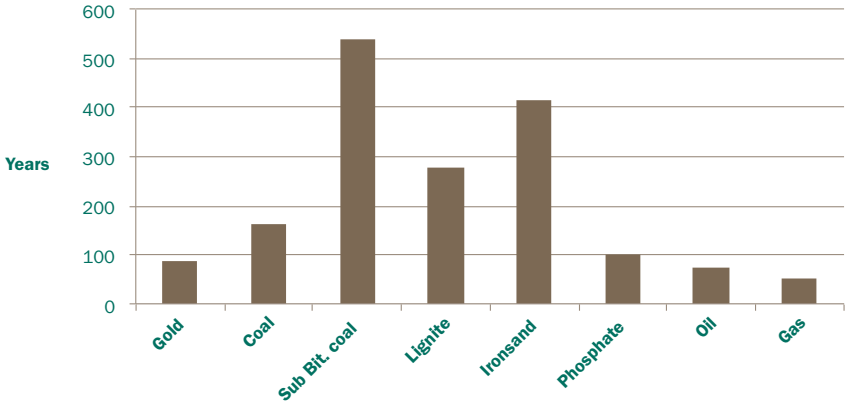


Figure 1 – Proportion of resource by years of resource at actual extraction rates (note: the years for lignite are based on a projected production rate)

Table 1 and Figure 1 show the indicative size of New Zealand's mineral and petroleum resources. Contrary to perceptions, New Zealand is well-endowed with large quantities of gold, coal, lignite, ironsands, phosphate, and oil and gas.

The Australian Department of Statistics contrasted Australian and New Zealand exports in 2010[20]. Primary production contributes 67 to 68 per cent of exports in both countries. In New Zealand primary production exports are dominated by food with minerals and energy contributing between eight and 10 per cent of total exports compared to Australia where minerals and energy contribute over 48 per cent of total exports. Given the large energy and mineral reserves in New Zealand, the Australian comparison shows we may be vastly under-utilising these resources, and our unwillingness to capitalise on them may be a partial explanation of the gap between New Zealand and Australia.

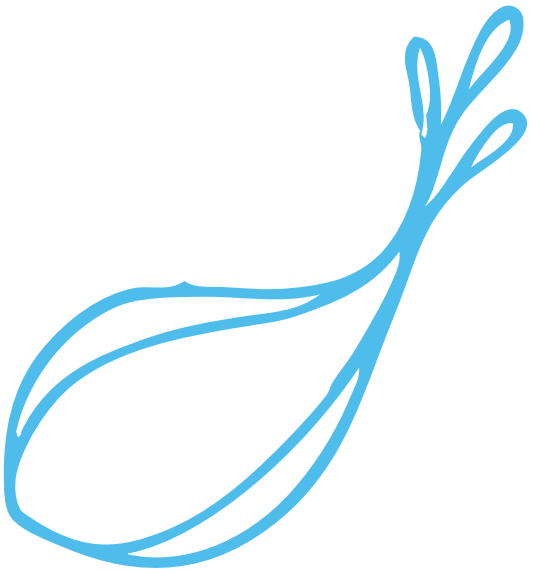
Extracting many of New Zealand's minerals and petroleum (such as gold and high quality coal) is financially viable. The extraction of gold and high quality coal are examples. In addition, future coal prices look sound[21] which means bituminous coal could be a valuable export commodity. Oil and gas extraction could be expanded. The best and immediate oil and gas prospects are in the onshore and near inshore Taranaki Basin; the minimum field size threshold for commercial success of other fields around New Zealand is relatively small[22]. Indeed, the *New Zealand Energy Strategy 2011–2021* suggests New Zealand could become a net oil exporter by 2030[23].

As an indication of future potential, the New Zealand Institute of Economic Research[24]. has modelled the development of a hypothetical 42 tonne (1.5 million ounce) goldmine and a 50 million barrel oilfield. Over the life of the goldmine and oilfield (15 years and 12 years respectively), these developments would increase New Zealand's GDP by 1.8 per cent, or $3.3 billion.

This increase in extraction is possible as New Zealand is seen as attractive by minerals and petroleum exploration companies. New Zealand has the fourth lowest petroleum royalty and taxation regime in the world (*Journal of World Energy Law and Business*)[25] The mining and petroleum industries take part in the Fraser Institute Annual Survey of Mining Companies[26] and the Fraser Institute Global Petroleum Survey[27]. These surveys seek companies' views on how government policies and resource potential affect new exploration investment. New Zealand rates highly in relation to trade barriers, political stability, and security which makes it a favourable place to do business. Mining and petroleum companies consider New Zealand is becoming a more attractive place to do business, with the Fraser Institute's 2011 petroleum survey showing "New Zealand has jumped ahead of the majority of Australian States[...]to become the most attractive jurisdiction in the region".

Based on NZIER modelling New Zealand could easily increase the contribution of minerals and petroleum to GDP from the current level of 1.1 per cent to over three per cent in the next 10 years. This would also boost export earnings to above 10 percent of exports with major flow on effects to lift New Zealand's labour productivity.

But can New Zealand increase its extraction of minerals and petroleum while maintaining its environment?



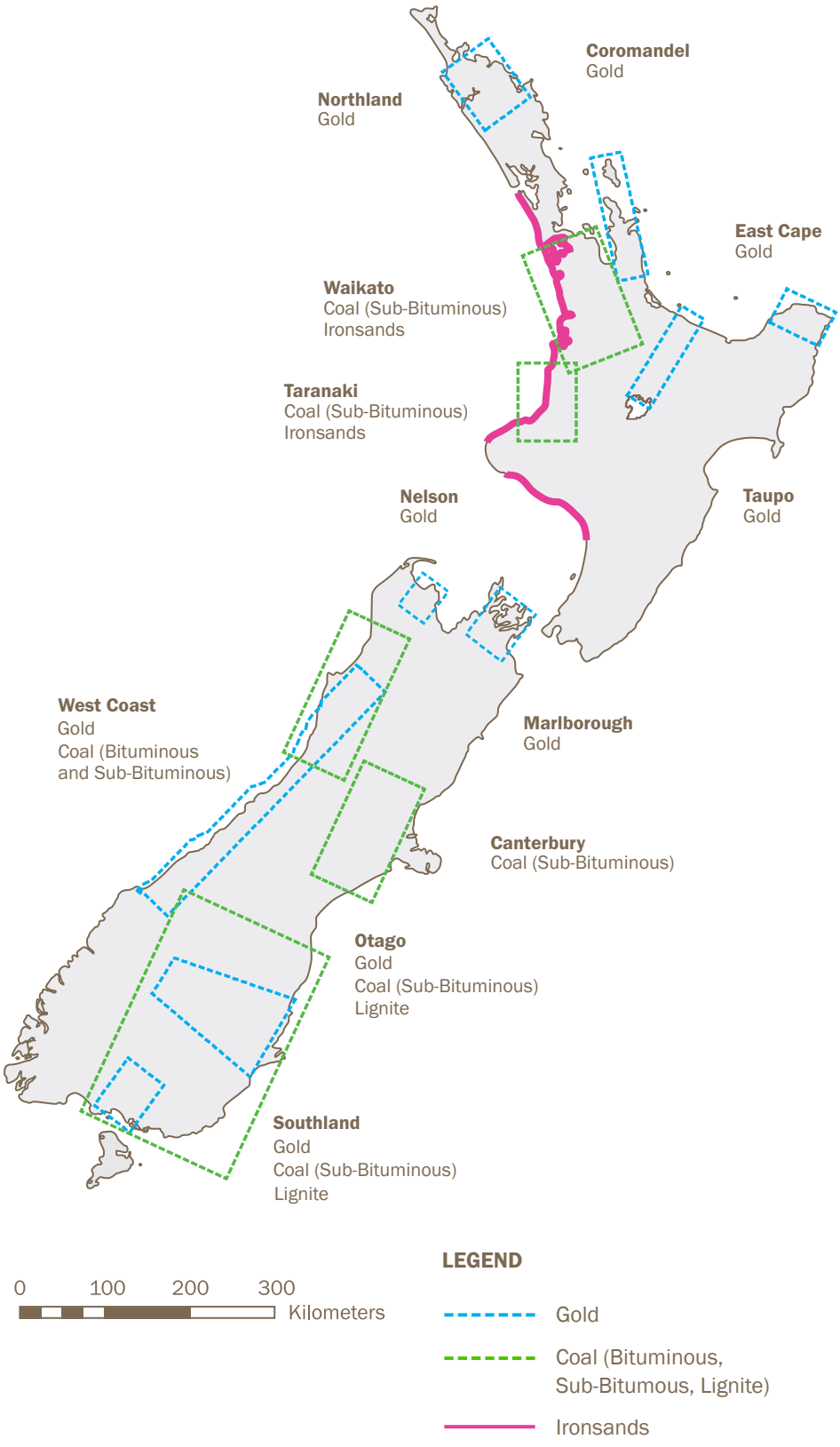


Figure 2 - Location of New Zealand's onshore minerals. *Map and information on mineral deposits supplied by Office of the Parliamentary Commissioner for the Environment. Information of the location of New Zealand Coalfields and Resources supplied by New Zealand Petroleum & Minerals.*

Is mining a good way to boost the economy?

The minerals' sector can be an efficient user of land. As Table 2 shows, the sector uses considerably less land than either viticulture or dairying[28].

Table 2 – Contribution of the minerals sector to the economy, compared with other sectors (for 2008)

	LAND AREA (HA)	EXPORT REVENUE ($M)	CONTRIB-UTION TO GDP ($M)	EXPORTS PER HECTARE ($/HA)	GDP PER HECTARE ($/HA)
Minerals	4,000	2,710	$2,150	$680,000	$537,000
Viticulture	29,810	900	$450	$30,000	$15,200
Dairying	2,116,000	9,200	$7,180	$4,300	$3,400

While viticulture and dairying can involve perpetual land use (with appropriate environmental controls) compared to minerals extraction which has a limited life, the minerals' sector's contribution to exports and GDP per hectare is significantly higher than the other sectors. This means where minerals are present, their extraction may make more efficient use of a given area of land for creating wealth.

New Zealanders need to recognise this fact.

New Zealanders have a number of concerns about extracting minerals and petroleum, including:

- Whether extraction can occur in the conservation estate without irreparable damage
- How well land can be restored after mining ceases
- How well discharges to natural water sources can be managed
- The safety of extracting minerals and petroleum
- Whether New Zealand is acting immorally or inappropriately by extracting minerals and petroleum. Some New Zealanders might believe our resources should be left in the ground.

Continued and expanded mineral and petroleum extraction requires checks and balances to be in place to address concerns. As New Zealanders we should also take the opportunity to participate in decision making to ensure our views are heard and considered.

What are the current checks and balances?

The checks and balances needed to manage mineral and petroleum extraction include sound regulatory controls, adequate regulatory capability, and appropriate management of mining and oil and gas extraction impacts. The current regulatory framework for Crown owned minerals and petroleum for onshore and offshore activities is shown below. The 12 mile limit, the Exclusive Economic Zone and the extended continental shelf are shown in Figure 3 on page 17.

Table 3 – Existing regulatory arrangements for Crown owned minerals and petroleum

ISSUE	ON LAND	WITHIN 12 MILE LIMIT (TERRITORIAL WATERS)	FROM 12 MILE LIMIT TO EXCLUSIVE ECONOMIC ZONE AND CONTINENTAL SHELF
Land Access	Owner/ occupier approval		
Allocation	Permits granted under the Crown Minerals Act 1991 Administered by the Ministry of Economic Development's New Zealand Petroleum & Minerals business unit		Licences issued under the Continental Shelf Act 1964 Administered by the Ministry of Economic Development's New Zealand Petroleum & Minerals business unit
Environment	Resource Management Act 1991 Administered by regional and territorial authorities	Resource Management Act 1991 Administered by regional councils	Marine Transport Act 1994 (relates to discharges and oil spills) Administered by Maritime New Zealand International agreements
Safety	Health and Safety in Employment Act 1992 and related Regulations Administered by the Department of Labour		

For land based activities the organisation seeking to extract minerals or petroleum must gain the landowner's or occupier's permission to access land. If the landowner or occupier refuses permission, an arbitration process begins. As shown in Table 3 permits under the Crown Minerals Act 1991 and licences under the Continental Shelf Act 1964 are required, and are granted by the Ministry of Economic Development's New Zealand Petroleum & Minerals business unit (formerly Crown Minerals) for prospecting, exploration and mining.

Mining is prohibited on land in Schedule 4 of the Crown Minerals Act 1991, but is permissible in the wider conservation estate where there are currently 57 mines[29]. The conservation estate includes national parks (three million hectares all in Schedule 4), conservation parks (1.9 million hectares), ecological areas (0.2 million hectares), stewardship areas (two million hectares – no protected status), and others (one million hectares – typically reserves). In addition to a permit, an access agreement with the Minister of Conservation is required typically with conditions, and a resource consent is also required.

Opportunity for wider public input in land based activities and within the 12 mile limit is through the resource consent processes of the Resource Management Act 1991. These consents are usually notified to the public and, if approved, are monitored and enforced by local authorities. The Resource Management Act 1991 was established for the purpose of providing a credible and meaningful process by which the concerns and potential benefits of activities can be debated and evaluated to reach a decision in step with community and national values.

Safety management is covered by the Health and Safety in Employment Act 1992 which is administered by the Department of Labour. Safety management for industries or activities where accidents are infrequent but potentially catastrophic has been a recent area for examination by the Department of Labour, which has concluded coal mining and oil and gas extraction are both high hazard industries[30]. As a result the Minister of Labour has announced[31] the formation of a High Hazard Unit which will work with the petroleum production and mining industries to ensure legislation and best practice is followed.

In the Exclusive Economic Zone, as shown in Table 3, some international agreements apply. These include the Convention on the Prevention of Marine Pollution by Dumping of Wastes or Other Matter 1971 (known as the London Convention)[32] which New Zealand has ratified, and the International Convention for the Prevention of Pollution from Ships 1973 which New Zealand intends to ratify. These conventions set standards for the design and operation of ships and off-shore facilities.

A number of commentators have expressed concerns about the inability to control environmental effects in the Exclusive Economic Zone. As an example of this, Atkins, Holm, Joseph, Majury Ltd, consultants for the Ministry of Economic Development, have pointed out that the international treaties and conventions to which New Zealand is a signatory are not designed to assess or regulate broader environmental implications[33]. Similarly the Environmental Defence Society has expressed concerns that recent changes to the marine protection rules do not require potential environmental impacts and risks of offshore mining activities[34] to be assessed. The Waitangi Tribunal[35] believes the current laws and processes for managing petroleum are not compliant with the Treaty of Waitangi. The Tribunal recommends petroleum royalties be used to support iwi and hapū participation in petroleum management processes, and a Ministerial Advisory Committee be established to provide advice on Māori perspectives.

As a result of these concerns, in August[36] the Government introduced legislation to manage the environmental effects of activities in the Exclusive Economic Zone and Extended Continental Shelf. The Bill makes the new Environmental Protection Authority responsible for consenting, monitoring and enforcement of activities impacting on the environment. This would include petroleum exploration, seabed mining, deepwater aquaculture and marine energy development. The Bill requires public consultation on regulations and consents and enables activities to be classified as permitted, discretionary or prohibited. If passed, it is intended this Act would come in to effect on 1 July 2012. IPENZ considers it vital this legislation proceeds and that the proposed timeframe of 1 July 2012 be adhered to.

The Government is also putting interim measures in place to ensure a smooth transition to the new regime. Environmental impact assessments will need to be undertaken and submitted to the Environmental Protection Authority for offshore oil and gas drilling operations. Operators will be required to comply with or exceed the drilling safety rules developed in the United States following the inquiries into the Gulf of Mexico disaster.

In addition to the legislative framework other supporting initiatives are under way, including:

- Combining the review of the Crown Minerals Act 1991, with the review of the minerals and petroleum programmes and the associated regulations, to improve permitting processes.
- The $4.7 million programme of new minerals data collection that includes airborne geophysical surveys of the Northland and the West Coast, South Island regions and prospectivity studies.

IPENZ believes these moves are a start but that further work is needed, as set out on page 21.

HOW CAN WE MANAGE THE IMPACTS OF MINING?

The development and operation of a mine can result in environmental impacts including dust, noise, vibration, sediment, acid mine drainage and long term change to the environment. These environmental impacts can be managed and mitigated through techniques and remedies including:

- The use of modern mining techniques
- Minimising the surface footprint of excavations
- Carefully engineered tailings embankments (the area that collects tailings) for stability and safety with minimal impact on landforms
- Designing tailings embankments to enable water surface runoff to be treated
- Managing mine water and acid mine drainage
- Monitoring effects and taking remedial actions when needed
- Early planning and regular reviews for mine closures
- Undertaking land remediation progressively during mining and at completion.

Remediation is a common practice to return mining areas to landscaped areas, new lakes or productive land. At New Zealand's two largest coal mines (Stockton and Rotowaro) overburden (the rock, soil and other material that lies above the mined area) is being returned to areas that were previously mined. These areas are then contoured, landscaped and where appropriate returned to pasture or forestry, or planted with native seedlings.

Biodiversity offsets are another way mining companies can compensate for the effects of mining projects. Biodiversity offsets have been used to a limited extent in New Zealand so there is no net loss of biodiversity. There are issues with biodiversity offsets: they are inappropriate for example in some cases (such as where threatened species are involved[37]) and they require a transparent quantification of values to enable compensation to be measured. IPENZ understands the Department of Conservation[38] is currently developing best practice guidance on developing, implementing and monitoring biodiversity offsets.

By requiring best practice outcomes as a condition of resource consents, the effects of minerals and petroleum extraction can be kept to a minimum.

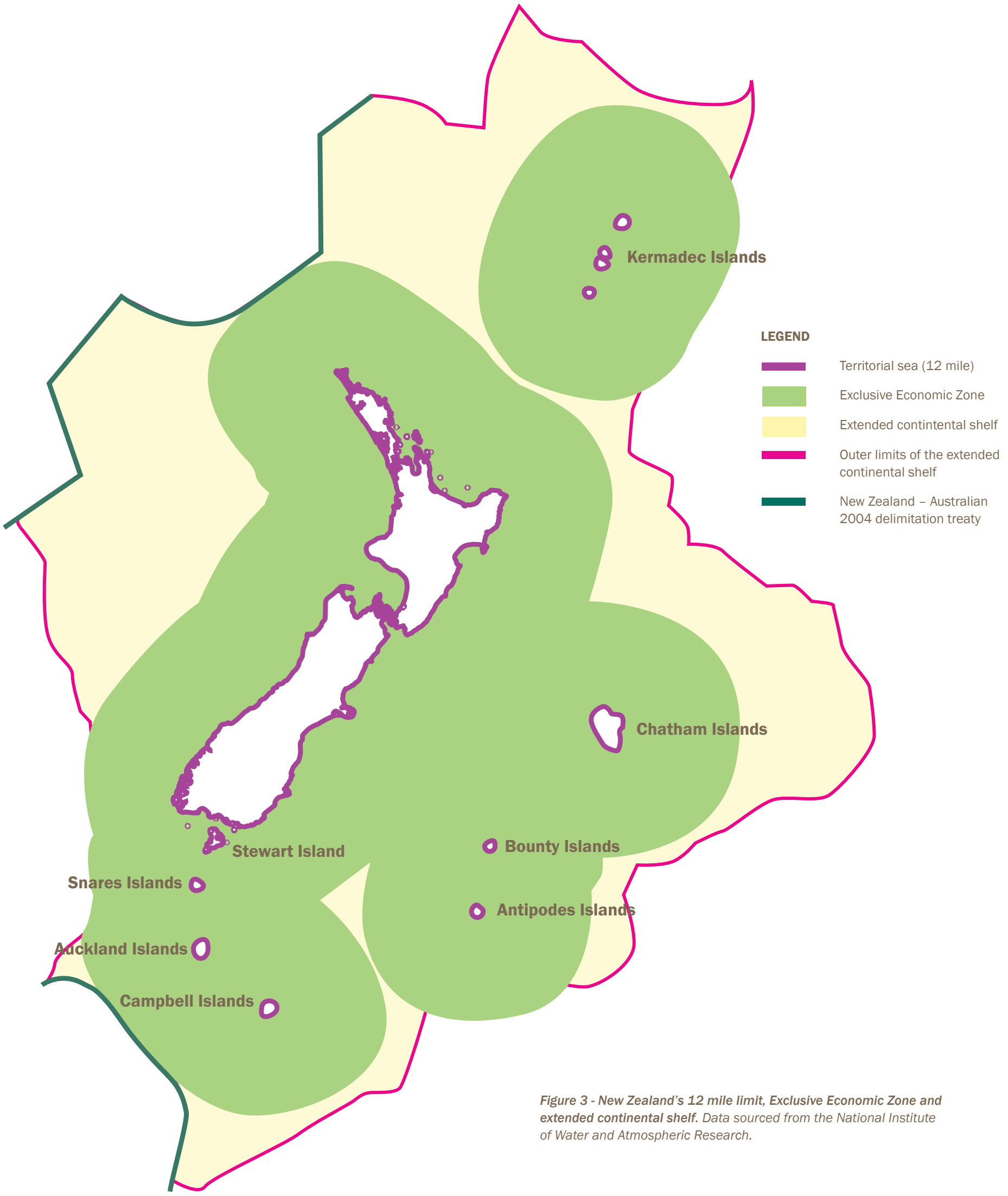


Figure 3 - New Zealand's 12 mile limit, Exclusive Economic Zone and extended continental shelf. *Data sourced from the National Institute of Water and Atmospheric Research.*

CAN WE MANAGE THE IMPACTS OF OIL AND GAS PRODUCTION?

Environmental impacts from petroleum activities include the dumping of drill cuttings and the discharge of drilling fluids, oil, oil separated water and other untreated fluids. The offshore oil spills that occurred in New Zealand between 1995 and 2007 spills were all small volume events, with less than 10 tonnes spilt[39]. The oil spill from the grounding of the ship *Rena* in the Bay of Plenty in October 2011, while not related to oil and gas production, is a timely reminder of an oil spill's potential environmental effects.

New Zealand has a three-tier oil spill response approach. In general terms tier one is for transfers to ships and onshore/offshore sites, tier two for regions out to the 12 mile limit, and tier three is beyond the 12 mile limit and may require international assistance. Maritime New Zealand is responsible for maintaining a nationwide oil spill capability up to a spill of 3,500 tonnes.

The consequences of a serious oil spill can be devastating. However, the probability of such an event occurring is very low based on historical data[40]. In the United States four major spills have occurred in the last 30 years[41] and performance has increased recently, with a 30 per cent reduction in annual spillage in the past decade. Three very high profile events in history – the Exxon Valdez spill in 1989, the Montara Blowout in 2009 in the Timor Sea, and the Deepwater Horizon spill in 2010, were all the result of failures by operators to follow documented industry standards and regulations.

New Zealand operators and regulators are taking measures to ensure such failures do not occur here. IPENZ considers New Zealand should do more, as set out in pages 21 to 23.

CAN WE MANAGE GREENHOUSE GAS EMISSIONS?

A global decision has been made that the responsibility for minimising greenhouse discharges lies with fossil fuel users, not producers. The New Zealand regulatory environment already provides direct economic signals to private investors so fossil fuel users and producers are able to operate in a market that embodies the effect of greenhouse gas emissions. IPENZ considers New Zealand should not penalise itself or forego economic opportunity by leaving its minerals and petroleum in the ground. It is not immoral or inappropriate to derive economic benefit from these resources.

However, it is acknowledged that in a review in 2010, the Parliamentary Commissioner for the Environment highlighted New Zealand's international emission reduction obligations and the unlikelihood of the country meeting its targets. The review also noted the Emissions Trading Scheme is the only significant mechanism currently available for curbing growth in the country's greenhouse gas emissions. This is a wider issue for New Zealand to consider, rather than one industry.

Solid Energy New Zealand Limited has recently began constructing a pilot lignite briquetting plant near Mataura in Southland. Solid Energy is also investigating converting lignite to ammonia and urea fertiliser, or to liquid transport fuels[42]. Each of these products has different carbon emission intensity and this will need managing. Solid Energy is aware of this issue and has stated it intends to explore ways of reducing emissions, offsetting emissions by plantings or purchasing carbon credits, or carbon capture and storage[43].

What are our current shortcomings?

The current checks and balances for extracting minerals and petroleum have shortcomings and further work is needed, as discussed below.

THE CROWN MINERALS ACT 1991 REVIEW

The Government has decided[44] to combine its review of the Crown Minerals Act 1991, the Minerals Programme for Petroleum, the Minerals Programme for Minerals (excluding petroleum) and the associated regulations. The Government needs to consider how iwi and hapū can participate in these new processes.

This review also needs to consider separating the legislative framework for allocating the rights to prospect, explore and extract petroleum from the framework for minerals, rather than the Crown Minerals Act 1991 covering both. The nature of petroleum and its development are very different from other minerals. The review of the Act also needs to ensure that industry has certainty on royalty regimes, permit conditions and durations, and on the clarification of the rights to convert a prospecting permit to an exploration permit, and then to a mining permit.

ARE WE PREPARED FOR OIL SPILLS?

The oil spill from the *Rena* has raised questions in the public's minds on New Zealand's preparedness for an oil spill and the timeliness of the response.

For this reason IPENZ supports a review, as a means of restoring public confidence.

Maritime New Zealand's *Review of New Zealand's Oil Preparedness and Response*[45] in February 2011 highlighted that time is of the essence in spill response and regional councils believed that more could be done to facilitate a faster response to an incident through the provision of lighter weight, more easily deployed equipment. The review also raised a number of issues relating to funding.

Maritime New Zealand is improving equipment through their ongoing replacement programme[46], and as a result of the review of the Oil Pollution Levy, is proposing a threat based levy system[47]. The existing levy is based on ship tonnage or a fixed levy for installations. The proposed levy would be based on the type and volume of oil, environmental and human sensitivity factors, and the time spent in the environment.

Introducing a levy based on the impacts of oil spills is a sound approach, and in the interests of regulatory certainty should be introduced as soon as possible, along with any recommendations from a formal review."

DO WE HAVE THE REGULATORY CAPABILITY?

Regulators need to have adequate and relevant industry expertise. Mumford[48] points out that one of the attributes of best practice regulation is capable regulators. Specifically, the regulator needs to have the people and systems necessary to operate an efficient and effective regulatory regime.

This has been recognised in part by increasing the Ministry of Economic Development's New Zealand Petroleum and Minerals' business unit's capability[49], the Department of Labour's High Hazard Unit's formation.

There needs to be an ongoing appreciation by the Government of the importance of regulators retaining a high level of technical expertise within the relevant government agencies. IPENZ suggests capability assessments be under-taken at regular intervals, with those assessments being subject to independent review.

Technical expertise is also vital for regional councils and territorial authorities given their respective roles in assessing, approving and monitoring resource consent applications for land based mineral and petroleum operations. In some circumstances, where the regional council and/or territorial authorities do not have sufficient expertise it may be appropriate for the Environmental Protection Authority to assist in assessing and approving applications for mineral and petroleum operations. This is particularly appropriate in situations where this is of widespread public concern or interest.

New Zealanders also need to be involved. We need to demand that performance data on the regulatory system and regulated entities be publicly available to inform us and to enable public confidence in the minerals and petroleum sector. We also need to participate in well informed debates to ensure the uniqueness of our values is considered during the development of national policy and in local decision making.

DO WE HAVE THE SKILLS TO RUN THE MINING AND PETROLEUM SECTORS EFFECTIVELY?

Extracting minerals and petroleum in an exemplary manner compatible with New Zealand's natural environment requires sufficiently skilled and capable individuals.

The New Zealand petroleum industry has skills shortages and these are forecast to increase, particularly if there is a substantial resource discovery in New Zealand. The current oil and gas industry workforce in Taranaki is an ageing one, with the average worker being nearly 50 years old. This will lead to issues in coming years when these workers retire. More young people are needed to join the oil and gas industry workforce.

The Petroleum Skills Association has been working with Auckland University, and with polytechnics and private training enterprises to address this issue. The Society of Petroleum Engineers New Zealand is also working closely with university schools of engineering in promoting graduate entry to the petroleum industry by way of scholarships, summer student vacation work experiences, and field visits to oil and gas facilities in Taranaki.

Careers New Zealand reports[50] that employers, especially at underground coal mines, often have trouble filling vacancies. The employers also report skill shortages of both lower-skilled workers, such as trainee miners, and highly skilled workers, such as mining engineers and geologists. The skills shortages are due, in part, to the need to recruit about 500 workers a year to maintain current production levels at all mines. Mining engineers also appear on Immigration New Zealand's long-term skill shortage lists[51].

IPENZ considers the Government should remain engaged with the petroleum and mining sector to assist the sector with employment issues.

What would success look like?

Success will be realised when:

- The minerals and petroleum sectors have increased their contribution to New Zealand's export earnings to well over 10 percent, resulting in the sectors' contribution to GDP rising to over three per cent
- New Zealand's labour productivity has lifted due to the increased extraction of minerals and petroleum
- Highly reputable international companies have been attracted to New Zealand by a fair and certain public policy framework to prospect, explore, extract and process minerals, oil and gas
- New Zealanders are engaged in local decision making to ensure their views are heard and reflected in decisions on and conditions applied to commercial operators and to wider policy
- New Zealand has excellent, world leading regulatory people, systems and policies supported by technical expertise that provides a high level of safety and protects our exemplary environmental quality
- International companies have heard and understood the uniqueness of our values and the importance New Zealanders place on the quality of their environment, and this understanding is reflected in their practices
- Information on regulatory systems and regulated entity performance is publicly available to maintain the confidence of New Zealanders including iwi
- New Zealand trains, retains and recruits technically skilled people to meet the labour demands of a vibrant resource extraction sector.

What does IPENZ think?

New Zealand is a well-endowed country, with potentially large quantities of gold, coal, lignite, ironsands, phosphate and petroleum. The mining, quarrying and petroleum sectors already make up between eight and 10 per cent of New Zealand's export earnings and contribute 1.1 per cent to New Zealand's GDP[52]. The sectors' contribution to GDP could easily be increased to over three per cent within the next 10 years, with the contribution to export earnings reaching well past 10 per cent. This increase would grow New Zealand's economy, raise labour productivity and help ensure New Zealanders' aspirations can be realised.

The environmental impacts of minerals and petroleum extraction are more manageable than many New Zealanders think, provided world-class checks and balances are in place. The current checks and balances have shortcomings. IPENZ thus recommends a number of changes including having separate legislation for mining and petroleum, a review of capabilities and funding for oil spill responses, public disclosure of performance and the addressing of skill shortages.

The Government must take the leadership role by setting and enforcing relevant policies and world-class standards and by adequately resourcing regulators with technical expertise.

As New Zealanders we should demand the public release of performance data on the regulatory system and regulated entities. This will ensure public confidence in our checks and balances and that extraction activity does not compromise our environment's quality.

References

1 Layton, B., Branson, J., Gall, C., Schilling, C. & Zuccollo, J. (2010), *Diamond in the Rough: The current and potential economic contribution of New Zealand's mineral resources sector*. Wellington: NZ Institute of Economic Research.

2 Organisation for Economic Co-operation and Development (2010), *National Accounts at a Glance - 2010 edition*. Retrieved from stats.oecd.org/index.aspx?queryid=558

3 New Zealand Institute (n.d.). *NZ ahead: Labour productivity.* Retrieved from www.nzinstitute.org/index.php/nzahead/measures/labour_productivity1/

4 The Treasury (2008), *Putting Productivity First (NZ Treasury Productivity Paper 08/01)*. Wellington: The Treasury.

5 Statistics New Zealand (2011), *Exports of main commodities.* Retrieved from stats.govt.nz/browse_for_stats/industry_sectors/imports_and_exports/OverseasMerchandiseTrade_HOTPSep11/Tables.aspx

6 Layton, B., Branson, J., Gall, C., Schilling, C. & Zuccollo, J. (2010), *Diamond in the Rough: The current and potential economic contribution of New Zealand's mineral resources sector*. Wellington: NZ Institute of Economic Research.

7 Statistics New Zealand (2011), *Exports of main commodities*. Retrieved from stats.govt.nz/browse_for_stats/industry_sectors/imports_and_exports/OverseasMerchandiseTrade_HOTPSep11/Tables.aspx

8 Layton, B., Branson, J., Gall, C., Schilling, C. & Zuccollo, J. (2010), *Diamond in the Rough: The current and potential economic contribution of New Zealand's mineral resources sector.* Wellington: NZ Institute of Economic Research.

9 Ibid.

10 Ibid.

11 Christie, A. & Braithwaite, R. (1999), *The Mineral Potential of NZ.* Wellington: Institute of Geological and Nuclear Sciences.

12 Ibid.

13 Ibid.

14 Ibid.

15 Barry, J., Duff, S & Macfarlane, D. (1994), *Coal resources of New Zealand (Resource information report 16)*, Wellington: Ministry of Commerce.

16 McDouall Stuart (2009), *Stepping Up: Options for Developing the Potential of New Zealand's Oil, Gas and Minerals Sector*. Wellington: McDouall Stuart.

17 Ibid.

18 Ministry of Economic Development (2011), *Technical Guide: Energy Outlook Modelling, Version 1.1*. Wellington: Ministry of Economic Development.

[19] Ibid.

[20] Department of Foreign Affairs and Trade (2010), *Trade in Primary and Manufactured Products Australia.* Canberra: Department of Foreign Affairs and Trade.

[21] Denne, T., Bond-Smith, S. & Hennessy, W. (2009), *Coal Prices in New Zealand Markets.* Auckland: Covec.

[22] Adams, M., (2009), *Production and Cost Estimates for New Zealand's Petroleum Resources*, New Plymouth, Michael Adams Reservoir Engineering.

[23] Ministry of Economic Development (2011), *Developing our energy potential: New Zealand Energy Strategy 2011–2021 and the New Zealand Energy Efficiency and Conservation Strategy 2011–2016.* Wellington: Ministry of Economic Development.

[24] Layton, B., Branson, J., Gall, C., Schilling, C. & Zuccollo, J. (2010), *Diamond in the Rough: The current and potential economic contribution of New Zealand's mineral resources sector*. Wellington: NZ Institute of Economic Research.

[25] Johnson, D. (2008), "Changing Fiscal Landscape", *Journal of World Energy Law and Business*, 2008, 1(1), 31-54.

[26] McMahon F., and Cervantes M., 2008/09 and 2010/11, *Annual Survey of Mining Companies*, Fraser Institute.

[27] Angevine G., and Cervantes M., 2009 and 2011, *Global Petroleum Survey*, Fraser Institute.

[28] Straterra (2010). *Submission to the Ministry of Economic Development on 'Maximising our Mineral Potential: Stocktake of Schedule* 4 of the Crown Minerals Act and Beyond'. Wellington: Straterra.

[29] Parliamentary Commissioner for the Environment (2010), *Making Difficult Decisions: Mining the Conservation Estate.*

[30] Department of Labour (2011), *Practical Proposals for Improving the Department of Labour's Approach to High Hazard Industries.* Retrieved from www.dol.govt.nz/News/Media/pikeriver/high-hazard-industries/index.asp.

[31] Wilkinson, K. (2011). *High Hazards Unit to be Established.* Retrieved from www.beehive.govt.nz/release/high-hazards-unit-be-established.

[32] Ministry for the Environment. (2010). *Multilateral Environmental Agreements.* Retrieved from www.mfe.govt.nz/laws/meas/

[33] Ministry of Economic Development (2010), *Comparative Review of Health, Safety and Environmental Legislation for Offshore Petroleum Operations,* Wellington: Ministry of Economic Development.

[34] Peart, R. Mulcahy, K. & Serjeant, K. (2011), *Governing our Oceans: Environmental Reform for the Exclusive Economic Zone*, Auckland: Environmental Defence Society.

[35] Waitangi Tribunal. (2011). *Report on the Management of the Petroleum Resource (WAI 796 Waitangi Tribunal Report)*. Wellington: Waitangi Tribunal.

[36] Smith, N. (2011). *Environmental protection laws for oceans introduced.* Retrieved from www.beehive.govt.nz/release/environmental-protection-laws-oceans-introduced.

[37] Norton, D. (2008). "Biodiversity Offsets: Two New Zealand Case Studies and an Assessment Framework", *Environmental Management, 43(4), 698-706*.

[38] Department of Conservation (2011), *Biodiversity Offsets Programme Update*, retrieved from www.doc.govt.nz/upload/documents/conservation/biodiversity-offsets-factsheet.pdf.

[39] Maritime New Zealand (n.d.), *An Introduction to Marine Pollution Response For Marine Oil Spill Response Support Role*s. Wellington: Maritime New Zealand.

[40] Schmidt, D. (2009) *Analysis of U.S. Oil Spillage (API Publication 356)*. Washington DC: API Publishing Services.

[41] Ibid.

[42] Solid Energy (2010) *Southland Lignite*s, retrieved from www.coalnz.com/index.cfm/3,169,368/lignite_factsheet.pdf.

[43] Ibid.

[44] Brownlee, G. (2010). *Minerals Reviews Combined*. Retrieved from www.beehive.govt.nz/release/minerals-reviews-combined.

[45] Thompson Clarke Shipping (2011, *Review of New Zealand's Oil Preparedness and Response Capability*,retrieved from www.maritimenz.govt.nz/Publications-and-forms/Environmental-protection/OPPRC-Review-February-2011.pdf.

[46] Maritime New Zealand (2011) *Oil Pollution Preparedness and Response Capability Action Plan*, Wellington: Maritime New Zealand

[47] Maritime New Zealand (2010) *Review of the Oil Pollution Levy Industry Consultation Document*, Wellington: Maritime New Zealand

[48] Mumford P. (2011). "Best Practice Regulation – Setting Targets and Detecting Vulnerabilities". *Policy Quarterly*, 7(3), 36-42.

[49] Brownlee, G. (2010), *Government to expand Crown Minerals*, retrieved from www.beehive.govt.nz/release/government-expand-crown-minerals.

[50] Careers New Zealand (2010), Mining and Quarrying - About this industry. Retrieved from www.careers.govt.nz/default.aspx?id0=10104&id1=4F326355-5C15-4C26-B130-E9F0763D7655#contentset-21

[51] Immigration New Zealand (2011), *Essential Skills in Demand Lists*. Retrieved from www.immigration.govt.nz/migrant/stream/work/skilledmigrant/LinkAdministration/ToolboxLinks/essentialskills.htm

[52] Layton, B., Branson, J., Gall, C., Schilling, C. & Zuccollo, J. (2010), *Diamond in the Rough: The current and potential economic contribution of New Zealand's mineral resources sector.* Wellington: NZ Institute of Economic Research.

The Institution of Professional Engineers New Zealand Inc.
Pūtahi Kaiwetepanga Ngaio o Aotearoa

PO Box 12 241, Wellington 6144, New Zealand
E ipenz@ipenz.org.nz **W** www.ipenz.org.nz

The Institution of Professional Engineers New Zealand Incorporated (IPENZ) is the non-aligned professional body for engineering and technology professionals in New Zealand. It seeks to contribute to the community of national interest. One part of its contribution is to issue position papers, which gave a learned view on important issues, independently of any commercial interest. Such papers are not consensus papers of the Institution membership. Others are free to quote or use materials from this paper.

December 2011