9th March 2018

Garry Reed

[redacted]

Email: [redacted]

Committee Secretary - Economics and Governance Committee
Parliament House George Street Brisbane Qld 4000

Email: egc@parliament.qld.gov.au

Submission to parliamentary committee inquiry into the Mineral and Energy Resources (Financial Provisioning) Bill 2018

Dear Committee Secretary, please accept my submission on this critically important Bill.

I am a landholder in the Collinsville coal mining and agricultural area of North Queensland. Our area has a grazing history from the 1850s and coal mining from 1919.

I have been involved in a protracted and very costly process over the last 7 years trying to get the proposal to divert and mine Coral Creek on the QCoal Sonoma mine lease properly assessed, finding that there are fundamental problems with *imbalance in power* and *conflict of interest* in the assessment and approvals processes.

The rehabilitation of mines is critically important yet avoidable hazards like residual voids and spoil heaps are being approved on Environmental Authorities while significant damage is being allowed that will be impossible to rectify at any cost. The damage to subsurface water, aquifers and the hyporheic zone of waterway diversions will have consequences that will last forever.

The necessity to mine coal has been diminishing for decades now as the renewable alternatives have been developing rapidly. It is a major failure of policy to allow an environmentally damaging activity when alternatives exist but it is a tragedy to see unnecessary developments and abuses of the assessment and approvals processes for short term advantage and profit. It is no wonder that trust in mining companies and government is being lost.

I have lost most of the last 7 years of my life, my financial capital and the development of our farm, working on a job that is the responsibility of the government. The large number of court hearings, government inquiry submissions and media exposure has so far failed to save our water security from the high risk proposal to divert and mine the very reliable Coral Creek.

I would like to catalogue the media and government submissions over the last 7 years of our attempts to save Coral Creek, beginning with the latest.

https://www.dailymercury.com.au/news/ive-spent-my-life-savings-fighting-a-mine-company/3339867/

'I've spent my life savings fighting a mine company'

By TROY KIPPEN - 20th Feb 2018 –

SCOTTVILLE resident Garry Reed saw a bulldozer last week clearing land near the

Collinsville Airport, his heart sinking.
He believed that the bulldozer was clearing Sonoma Mine land where a proposed Coral Creek diversion was planned to increase the life of the mine.

A diversion he had been fighting the company, QCoal for almost a decade to stop.

The local farmer said he had heard from other concerned residents that QCoal's Sonoma Mine was going to start the diversion work of Coral Creek soon so it could access coal under the existing watercourse, under works approved by the State Government in 2010.

Acting on the rumours, Mr Reed passed the area each time he went to town to check if any work had started, but he found the bulldozer quite by accident.

On the day he saw the bulldozer, he had stopped to move a big grey kangaroo off the road. It was only when he stopped that he heard the bulldozer.

"I drove around to the airport and I still couldn't see it. So I climbed onto the back of the ute and could see the top of the bulldozer."

He said in that moment he knew the battle he had been fighting for almost a decade was lost.

But, QCoal said yesterday, the recent activity was ongoing maintenance and development of tracks to 'operational areas'.

"At present Sonoma Mine is not contemplating expansions beyond its current approval," a QCoal spokesperson said.

"Sonoma's long term plan has several approved mining areas remaining including a minor diversion of Coral Creek. With respect to recent activities, as always, there has been development and maintenance of access tracks to operational areas of the mining leases and ongoing vegetation management." **(It is obvious from the aerial photo that the clearing is more than maintenance of access tracks – additional comment)**

The spokesperson said the company kept the community updated on the going-ons at the mine with a regular community meeting.

"QCoal values our community with over 50 per cent of the operational workforce living locally and significant indigenous employment," he said.

"QCoal utilises local and regional networks to promote business and employment opportunities for the benefit of the local community."

Mr Reed had inherited his farm downstream from the mine from his father about 10 years ago. His father used to grow tomatoes, citrus and grapes on the property, but despite grand plans Mr Reed had not continued the farm because of ill health.

LONG FIGHT: Scottville's Garry Reed is concerned about the future of the creek as QCoal clears land.

He said when the Land Court made its decision in support of the mine's expansion he had no money left to appeal the decision.

He said he already spent about $250,000 in legal costs to stop the mine and was penniless.

"I started out on my challenge to the diversion and mining of Coral Creek in the Land Court with the help of the public interest solicitors, the Environmental Defenders Office of North Qld and a private barrister, and was threatened with $3.7million of costs by QCoal's lawyers before the election of the Newman LNP government that quickly defunded the two EDOs in Queensland," he said.

"I went on to pay over $250,000 to private lawyers, spending all of my and my father's savings and most of my superannuation."

Concerns about the future of the creek as QCoal clears land.

Mr Reed said the diversion of the creek would not work and cause excessive sediment run-off and destroy the subterranean water course underneath Coral Creek.

"My dad was a man ahead of his time and was always concerned about the sediment in the creek and topsoil that was lost," he said. Mr Reed said the diversion of the creek threatened to put more sediment down.

"The cost of damage to the reef from that sediment would run into millions of dollars," Mr Reed said.

According to an EIS, QCoal is required to record the quality of the water at several points above and below the mine site.

The company is also required to monitor underground water quarterly from 10 bore sites. According to the conditions, the only contaminate permitted to be release is treated sewerage.

The mine, about six kilometres south of Collinsville, produces four million tonnes of hard coking and thermal coal each year.

Read Garry's letter to us in full:

The rumour that the Bowen Basin QCoal Sonoma coal mine were about to proceed with the diversion and mining of Coral Creek was confirmed on the 11 February when the vegetation between the creek bank and the Collinsville Aerodrome boundary was bulldozed. It appears

that QCoal Sonoma did not have a Fauna Spotter Catcher as promised in their Species Management Plan and that is a mandatory Qld Government requirement.

Over 40 locals made submissions and objections to the approvals and licences to carry out the highly risky digging up of our very reliable Coral Creek that landholders and ecosystems downstream depend on including the Birralee - Pelican Creek Aggregation Nationally Important Wetland.

QCoal Sonoma has ignored local knowledge and abused their power to break our struggle to challenge the inadequate and faulty approvals process. Our governments have a responsibility to protect the community from the rapacious and greedy who exploit those in a weaker position. QCoal Sonoma should never have been given an exploration lease let alone a mining lease over Coral Creek.

I started out on my challenge to the diversion and mining of Coral Creek in the Land Court with the help of the public interest Solicitors: the Environmental Defenders Office of North Qld [EDO NQ] and a private Barrister, and was threatened with $3.7 million of costs by QCoal's Lawyers before the election of the Newman LNP Government that quickly defunded the two EDOs in Queensland. I went on to pay over $250,000 to private Lawyers spending all my and my Father's savings and most of my superannuation.

The highly unreliable constructed diverted part of Coral Creek proposed is predicted to produce at least 100,000 tonnes of sediment that will flow downstream and out to the Coral Sea and contribute to a reduction in water quality on the Great Barrier Reef. The costs of damage to the reef from that sediment would run into millions of dollars.

It is also galling to understand that the defunding of Australia's Energy Research & Development Corporation by the Howard Government in 1996 when we were leading the World in solar panel efficiency, resulted in the loss of a key scientist to China which is now leading the World in solar panel manufacture and is the source of the panels used in most of the solar farms under construction.

We are finding that trees and crops that used to flourish are now struggling or dying under the impacts of global warming, which has been predicted for decades. Our governments have failed us criminally by favouring industries that offered short term rewards at the expense of other industries and future generations. Australia's reputation is going down the drain. (End of online article)

I had a letter to the editor published in the *Bowen Independent* - 24.1.18, after I heard a rumour that the diversion and mining of Coral Creek was proceeding.

When QCoal proposed the Sonoma mine in 2005 it promised the Collinsville community that it would protect Coral Creek with a buffer zone and employ people from town – neither was honoured as 2 years into operation an application was made to divert and mine Coral Creek and we got a big donga camp.

When Sonoma mine was caught in 2010 pumping pit water into an unauthorised discharge point with the water running into Coral Creek, the Qld Department of Environment and Resource Management tested the water and found it had elevated levels of heavy metals including uranium. Sonoma Mine Management was issued with a Penalty Infringement Notice under the Environmental Protection Act.

I commissioned independent scientific analysis of the design of the Coral Creek diversion and mining and found the mine's consultants had misrepresented the major creek as minor - we know it can run for years with surface water and the subsurface flow has never been known to dry up in the history of Collinsville. The loss of the subsurface water would be disastrous for landholders and ecosystems downstream – somehow the significant risks to our water have been downplayed to insignificant.

We also learn that the design guidelines for waterway diversions are written by ACARP [Australian Coal Association Research Program] that has a history of over 77 failed diversions and the latest designs still do not recreate the subsurface water zone to the quality of a natural creek.

Sonoma mine have suggested that their diversion of Two Mile Creek [locally Belmore Gully] is an example of what they want to do to Coral Creek – this is an insult to our intelligence and common sense. The drought sensitive Black Ironbox [Creek Coolabah] does not grow in Two Mile Creek but is abundant in Coral Creek.

The amount of coal under Coral Creek is about 0.14% of the resource on the QCoal Sonoma, Cows, Jax and Drake mining leases that go all the way down to the bank of the Bowen River.

Scientists tell us that Creeks and Rivers should not be diverted unless absolutely necessary, so with hundreds of years of coal in the Bowen Basin, and given the rate of development of alternatives to thermal and coking coal, the resource is far in excess of requirements.

The expansion of the Sonoma mine to the boundary of the Collinsville Aerodrome would bring it even closer to town and seeing that it is upwind of prevailing winds would increase dust that is already an issue. Coal dust is known as a significant health hazard.

I call on QCoal Sonoma to plan for the rehabilitation of the mine up to the southern bank of Coral Creek and leave our vital waterway for those downstream and future generations.

15th October 2015 – Email letter to state and federal politicians:

Dear Australian political representative, I am writing to you at this time with urgency because of the crisis I believe we are in after decades of disastrously bad decision making. It seems that the failures of governance are a result of conflict of interest and inherent biases and shortcomings in the economic and scientific analysis and political processes.

My family was one of the first to move to Collinsville in the early 1920s to set up a coal mining town and they also worked an agricultural farm. My Grandfather died in an accident while working at the mine in 1932 when my father was 10 years old.

On the 13th October each year a Memorial Day commemorates the loss of 23 people in the local coal mines over their history. On the 13th October 1954, 7 men and 2 pit ponies died from suffocation in a Carbon Dioxide outburst in the underground mine.

I worked in the local coal fired power station from the age of 16 and have gone on to work in the coal industry and across the electrical trade on commercial and industrial construction. Over the last 7 years I have been managing the family farm.

My father was deeply committed to caring for our land and water as I am so it was devastating when a coal mine upstream of our farm on Coral Creek applied to divert and mine the vital waterway. The approval process took 5 years and all of our finances. It is now clear that the cost of offsetting the sediment runoff onto the Great Barrier Reef alone will amount to more than the royalties and taxes payable on the coal without considering the loss of heritage, habitat and the catastrophic consequences from a loss of our water.

You can see a report from last year that covered our case. **QCoal expansion at Sonoma mine: farmer Garry Reed faces financial ruin after failed legal challenge - 7.30** – 30.4.14 http://www.abc.net.au/news/2014-04-29/farmer-faces-ruin-after-losing-coal-mine-court-fight/5417394

There is strong opinion that I could have appealed the decision to divert and mine Coral Creek but I had exhausted my resources and public interest legal assistance when that was possible. Thankfully my Lawyers were able to appeal the costs order pro-bono and no win-no pay. The appeal was allowed by the Land Appeal Court – 1.10.14. http://www.courts.qld.gov.au/__data/assets/pdf_file/0004/433606/LAC003-14-Reed.pdf

This community has suffered greatly over the years and is known to have an issue with cancer and health problems related to the mine dust and spontaneous combustion coal fire smoke. The failure to deal with this problem is set out on page 32 (**Senate Committee Inquiry into the Impacts of Air Quality on Health-March 2013**) in my submission:

113 - Certain Aspects of Queensland Government Administration –November 2014 (See attached) We can report that measures to deal with the coal fire problems are now underway.

It is infuriating when people trying to protect their land, water and environment for their communities and future generations are labelled anti-coal or economic illiterates. I relate and expand on my experience in submission: **581- Register of Environmental Organisations – May 2015 (See attached)**

When the consequences are a matter of life and death you can't afford to ignore, deny or cover up risks and dangers. We are very dependent on the coal industry and any decline will affect us greatly. Collinsville has suffered severe depression in the past and only a decade ago went through a boom in real-estate values. Most people want to believe the future is bright

for our community but are realistic about the future of coal so that we make sound decisions for the adaptation and transformation ahead, which are critically important.

I attended the inaugural conference of ANZSEE (Australia New Zealand Society for Ecological Economics) in 1995 in Coffs Harbour - NSW. A report was published by the Federal Department of the Environment in 1996: ***Subsidies to the use of natural resources, environmental economics paper no 2*. (See attached in 2 parts)**

(Additional excerpt: ***1996 - DEST - Subsidies to the use of natural resources, environmental economics paper no 2*. (Part 1)**
Table ES1: Summary of subsidies, removal policy instruments -
Resource sector/use: Energy production and consumption: Fossil fuels – coal – natural gas – oil
Financial subsidies: Direct subsidies, low access fees, tax treatment, public agency costs.
Environmental subsidies: Atmospheric emissions (CO2, SOx, NOx, CH4, particulates); also land and water impacts of these activities.
Subsidy removal instruments: Removal of financial subsidies (competitive neutrality, recovery of public agency costs, etc.), improved pricing (user charges) and imposition of environmental charges (externality pricing, levies). Regulation (standards, tradable quota instruments).

Work followed on *Triple Bottom Line* accounting but only seems to have been given lip service.

It seems Ecologically Sustainable Development (ESD) initiatives have been sidelined. If a holistic and transparent economic analysis had continued to have been applied we would likely be in a much better position for the future and would have saved a great deal of *natural capital* and resources wasted on infrastructure that is now going to be redundant. It is madness to continue to make decisions without considering all of the costs and benefits in the short and long term.

It is essential that our governments send representatives to the coming ANZSEE 2015 Conference, ***Thriving Through Transformation – Local to Global Sustainability***, being held at University of New England Business School, Armidale, NSW from 19-23 October 2015. http://anzsee.org/anzsee2015conference/

I would also like to take this opportunity to share this with you - the technology to make biofuel and biodegradable plastic viably has been around for decades; a transition to more sustainable produce by using solar energy and atmospheric CO2 is urgent. See the report below-page 8: *Algal oil and carbohydrate byproducts include plastics, synthetic and natural textiles and paper, which are also largely imported into Australia, paving the way for a revival of manufacturing activity and employment in these areas – and potentially even exports. Biodegradable plastics made from algae can potentially replace the 100 million tonnes of petro-plastics produced worldwide each year and now posing one of humanity's biggest waste disposal problems and global environmental threats.*
http://www.futuredirections.org.au/publications/associate-papers/1044-food-and-fuel-forever.html

Sub 113 - Certain Aspects of Queensland Government Administration –November 2014 – page 4:

The issues I raised about voids in the submission are of serious concern and yet are only now being tagged for future work after approving a major project as in the Byerwen CG report:
Byerwen Coal project: Coordinator-General's evaluation report on the environmental impact statement – July 2014
5.1.6 Open-cut mine pit voids
I consider there is a need to understand the best environmental, economic and social outcomes achievable with regards to mine pit management and the long-term implications of creating pit lakes and permanent residual voids in the Bowen Basin. I consider it is appropriate for DEHP or DNRM as lead agency to undertake investigations into the consequences of establishing a deep linear void trending parallel to many subsurface structural lineaments, including faults, across the entire Bowen Basin. Initially the research should determine the current location, number, area and depth of both operational mine pits and residual voids post mine closure as this information is not currently available for analysis. An approach to pit management and backfilling of future mine proposals could then be developed based on the known combined voids in the Bowen Basin and their economic impact on land use.

http://www.abc.net.au/news/2014-05-05/qcoals-james-mackay-developing-environmental-policy-for-lnp/5431008

QCoal's James Mackay developing environmental policy for Newman Government in Queensland - By the National Reporting Team's Mark Solomons and Mark Willacy – 5.5.14

Excerpt: Mr Mackay has chaired the LNP's state environment and heritage protection committee, which develops policy for discussion at the party's annual conference, since being voted on to the committee in 2012.

Shortly after coming to power in 2012 the LNP introduced a bill to remove "green tape" or what it considered to be unnecessary or superfluous environmental regulation. (We have experienced 3 large mine pits and spoil heaps appearing across the creek from our farm houses without any notification yet we are neighbours – we were not given any opportunity to share local knowledge or object – we have suffered more noise and dust, and unknown impacts on our groundwater.)

Mr Mackay also worked as campaign manager for Transport Minister Scott Emerson MP during the 2009 state election. QCoal did not respond to detailed questions about its links to the LNP or Mr Mackay's role working for the party, citing employee privacy, and Mr Mackay did not return a call seeking comment. The LNP spokesman said there was "no conflict of interest involving Mr Mackay, who has disclosed his employment with his company".

The spokesman said that since Mr Mackay became chairman of the committee it had suggested policy ideas on animal and land conservation, environmental protection and an animal ambulance service.

http://www.abc.net.au/7.30/coal-companys-creek-plans-threaten-100-year-family/5419398

Coal company's creek plans threaten 100-year family farm - Tue 29 Apr 2014

Excerpt: DR SCOTT RAYBURG, RIVER MORPHOLOGY EXPERT: There's a very good chance that that river system is going to have significant impacts, loss of habitat, significant physical and biological changes that can last many, many human lifetimes.

MARK WILLACY: Dr Scott Rayburg, who was engaged by Garry Reed when he took his case to Queensland's land court, was highly critical of the modelling done by QCoal presented to the court supporting the diversion.

DR SCOTT RAYBURG: The quality of the modelling that was presented to me I wouldn't accept from a first year undergraduate student. It's probably the worst piece of work I've ever seen in terms of hydraulic modelling.

MARK WILLACY: Delivering its verdict the land court accepted QCoal's modelling and not only rejected Garry Reed's appeal but it ordered him to pay some of the company's costs.

PATRICIA JULIEN: What Garry's loss will be is a message to the community; don't stand up for your rights. Where does that leave us in a democracy?

MARK WILLACY: Garry Reed's failure at the final hurdle to stop this creek diversion came just as Queensland's Auditor General was releasing a report into the environmental regulation of the resources sector and what a damning report it was. Finding that the mining sector in this State was running virtually unchecked with 97 per cent of projects not even being monitored to see if they were sticking to their environmental conditions.

The environmental Defenders Office believed the Auditor General's report highlights the challenges facing landholders like Garry Reed.

JO BRAGG, ENVIRONMENTAL DEFENDERS OFFICE: There are thousands of Garry Reeds in Queensland. We see these people every day and it's not a fair fight because they don't have the resources to put their case whereas the mining companies have immense resources for lawyers and experts.

Thank you for this opportunity to make a submission on this critically important parliamentary committee inquiry into the **Mineral and Energy Resources (Financial Provisioning) Bill 2018.**

Yours sincerely, Garry Reed

18th November 2014

Garry Reed

Select Committee into Certain Aspects of Queensland Government Administration
PO Box 6100
Parliament House ACT 2600
Email: qga.sen@aph.gov.au

Dear Committee members,

Please accept this as a submission to the Select Committee on Certain Aspects of Queensland Government Administration related to Commonwealth Government Affairs.

Terms of Reference:

(1) That a select committee, to be known as the Select Committee on Certain Aspects of Queensland Government Administration related to Commonwealth Government Affairs, be established to inquire into and report on:

(a) the amount of Commonwealth funds allocated or paid to the State of Queensland since 26 March 2012, with particular reference to:

(i) the purposes for which the funds were appropriated by the Parliament,

(ii) performance measures in relation to Commonwealth funds paid to the State of Queensland,

(iii) identified breaches of funding agreements or conditions,

(iv) the proportion of the Queensland State budget derived from Commonwealth funds, and

(v) whether any Commonwealth funds have been used by the State of Queensland for state government advertising or party political purposes,

(b) the administration of the Queensland courts and judicial system insofar as it relates to cross vesting arrangements, with particular reference to judicial independence and separation of powers;

(c) approval process for the development of projects for the export of resources or services insofar as they are administered by the Commonwealth or under a bilateral agreement with the Commonwealth;

(d) the extent to which Queensland State Government policies and practices are consistent with Australia's obligations under international environmental law instruments;

(e) whether it is appropriate for the Federal Minister for the Environment to delegate his approval powers to the Queensland State Government under the Environment Protection and Biodiversity Conservation Act 1999 by way of approval bilateral agreements or strategic assessments;

(f) the extent to which Queensland State Government policies and practices are consistent with Australia's obligations under international human rights instruments, with particular reference to:

(i) the administration of prisons, and

(ii) detention without trial; and

(g) any other matter the committee considers relevant.

(2) The committee will inquire into and report on the adequacy of Commonwealth oversight of the approval of coal seam gas projects in Queensland.

(3) That the committee presents its final report on or before 27 March 2015.

(4) That the committee consist of 5 senators, 1 to be nominated by the Leader of the Government in the Senate, 2 to be nominated by the Leader of the Opposition in the Senate, 1 to be nominated by the Leader of the Australian Greens, and 1 to be nominated by the Leader of the Palmer United Party.

I am a landowner in the Bowen and Burdekin River Catchments.

Our family have farmed and cared for this land for almost 100 years. We have seen many governments come and go over the years. We have also seen great loss of the local biota and watched large amounts of soil run past our property. It is evident to me and it seems most of the rest of the world now that we must consider all of the costs and benefits of our land-use at this critical time.

The LNP seem to be the last adherents to neoclassical economics that puts ecological and social considerations outside of their economic equations. The loss of skilled staff in health, governance and environmental assessment and regulation seems to be having serious consequences in this state.

The sacking of the Social Worker Psychologist from the Bowen Hospital at a time of great disruption in the community was a very short-sighted decision at the beginning of the Newman Government. There has been at least 2 adolescent drug overdoses subsequently and many stress and depression related behavioural problems in the Bowen and Collinsville communities.

The labelling and demonisation of those speaking out about environmental issues by the LNP politicians has also contributed to angst and illness in this community.

I have made several submissions to the Australian and Queensland Governments over the last 2 years that relate to the Newman Government Administration. See the following submissions attached.

Senate Committee Inquiry into the Impacts of Air Quality on Health – Sub111-Reed – March 2013

Pages 2 to 3

In March 2012 a serious gas poisoning event at the Collinsville Xstrata open cut mine occurred. A Collinsville Air-shed Air Quality Testing/Monitoring Group was formed including the State Government regulation authority (DERM) and the local coal mine operators; Xstrata, Qcoal, Sonoma Mine Management and rail operator QR National/Aurizon. There had been a significant increase in dust in Collinsville after the Sonoma Coal Mine was opened. There is also a strong view in the local community that the Collinsville area has a high rate of cancer and respiratory disease. It seems that the Air Quality Group was abandoned after the Newman LNP Government came to power.

Pages 6 to 20

I relate my experience of suffering major financial constraint after the Newman Government stopped all funding to the EDONQ. There are also details of the failure and lack of rigor with environmental assessments, winding back of environmental standards and the critical importance of local knowledge that is now threatened.

My comments on the MQRA (Modernising Qld Resource Acts program) Mining Lease Notification and Objection Discussion Paper. March 2014

This submission and subsequent confidential submissions to the Parliamentary Inquiry into the Mineral and Energy Resources Act reform seems to have been in vain as my concerns and experiences were not reflected in the final Act. The following recommendation from the NSW ICAC would have saved a lot of us a lot of time and money if it had been applied to Coral Creek Collinsville.

http://www.icac.nsw.gov.au/

ICAC (Independent Commission Against Corruption – NSW) list of corruption prevention recommendations in relation to operations Jasper and Acacia - Wednesday 28 October 2013

Recommendation 8
That the assessment panel provides a triple bottom line assessment of the environmental, social and economic factors of allocating an EL (Exploration Lease) and reports its findings to the steering group.

The issues I raised about voids in the submission are of serious concern and yet are only now being tagged for future work after approving a major project as in the Byerwen CG report:

Byerwen Coal project: Coordinator-General's evaluation report on the environmental impact statement – July 2014

5.1.6 Open-cut mine pit voids

I consider there is a need to understand the best environmental, economic and social outcomes achievable with regards to mine pit management and the long-term implications of creating pit lakes and permanent residual voids in the Bowen Basin. I consider it is appropriate for DEHP or DNRM as lead agency to undertake investigations into the consequences of establishing a deep linear void trending parallel to many subsurface structural lineaments, including faults, across the entire Bowen Basin. Initially the research should determine the current location, number, area and depth of both operational mine pits and residual voids post mine closure as this information is not currently available for analysis. An approach to pit management and backfilling of future mine proposals could then be developed based on the known combined voids in the Bowen Basin and their economic impact on land use.

Sub 75 - House of Representatives Standing Committee on the Environment -
Inquiry into streamlining environmental regulation, 'green tape', and one stop shops – April 2014

Pages 4 to 7

I refer to the reforms to the Vegetation Management Act and my on ground experience with the failures and losses of biodiversity and topsoil from poorly designed legislation. There has been no rectification of the inadequacies as far as I know and the failures are continuing around here, leading to more runoff in the Bowen River catchments contributing to the poorest water quality into the Coral Sea from the Burdekin River mouth. I expect other river systems are also suffering from the changes to the Act.

I again set out in this submission the failure of the processes to improve the assessment standards and the great difficulties that landowners experience trying to get proper representation and expert consultants especially now that the public interest Environmental Defenders Offices (EDO) are not receiving government funding so that disadvantaged landowners have access to justice.

I hope my submission is of value to the Committee for this critically important inquiry.

Yours Sincerely, Garry Reed

End: Select Committee into Certain Aspects of Queensland Government Administration – Reed – 18.11.14

28th March 2014

MQRA Program Team
Department of Natural Resources and Mines

Garry Reed

Dear Sir or Madam, I am writing to submit my comments on the Mining Lease Notification and Objection Discussion Paper.

I expect you have received detailed submissions on the technical and legal issues in the discussion paper. As my expertise has been more on ground I will relate my personal experience over the last 50 years on the family farm on Coral and Pelican Creeks, Collinsville in the Bowen and Burdekin River catchments.

I remember as a teenager my father testing the water in Corduroy Creek with litmus paper for the acidity of the discharge from the CHPP at the Collinsville mine. The water flowed into Pelican Creek and rusted out all our pumps, pipes and tanks; something we were never compensated for and my father went to his grave aggrieved about.

In 2005 QCoal came to Collinsville with a proposal for a coal mine on Sonoma Station. The mine pit was going to come within we thought 100 meters of Coral Creek. (In fact it has been allowed 30 meters from the top bank.) My father and I were very concerned about the impact on the water from Coral Creek as it had a more reliable supply than Pelican Creek. I can remember as a child my father scratching the sand below a rock bar in Coral Creek to see if there was any moisture there during a severe drought as we had a citrus orchard with over 3000 trees and the season's tomato crop to plant.

When the Environmental Impact Statement (EIS) came out in 2006 for the Sonoma Coal Project, I had a look at the documents at the library and was impressed with the detail and thought that in this day and age the government and mining companies would have far higher standards than the 1970's and would not allow environmental damage. There were explicit promises made to protect Coral Creek with a buffer zone and monitoring of ground and surface water.

It was with shock and disbelief when in 2010 a public notice appeared proposing the diversion of Coral Creek to mine the coal underneath. My first reaction was that this proposal would put our water supply and quality at risk and result in a scar on the landscape as Coral Creek and this area is known to be very demanding on vegetation and liable to bank erosion.

I had little expertise in hydrology and tried to gain financial assistance from other landholders downstream to engage an expert but there was little interest in financing something that was considered the government's responsibility.

In the process of consulting others in the community I learned that another landholder affected by another mine had had a very expensive experience of trying and failing to get compensation for the loss of their orchard and water quality.

We decided to do our best to interpret the water licence application documents and received assistance from some conservation groups who had technical expertise and experience with submissions. It became evident that our local knowledge was valid and we underwent a steep learning curve.

From my objection of 15.4.11 to the Water Licence, *to Interfere with the flow of water in Coral Creek by changing the course of flow*, the document: Coral Creek Water Licence Application: 517907 - ***Responses to Request for Information*** from Sonoma Mine Management Pty Ltd. Dated 6.1.11 - ***Geotechnical Design***
It states that the diversion channel will be excavated into a variety of geological strata which dip downwards in a southerly direction towards the pit and that the cobble layer which is mostly colluvium but also contains sandy gravels and gravelly sands in some areas has a seepage potential between the channel and the pit. It also says that the underlying rock layer generally consists of sandstones and siltstones, with varying degrees of fracturing that could also, in some areas, pose seepage potential between the channel and the pit. It goes on to say that a clay layer [no depth is specified] covered with geotextile and rip-rap and one metre of topsoil into which trees are to be planted will minimise the potential of seepage to the pit. The same technique is to be used to seal the sand layer over the rock of the original creek bed.

We also discovered that the Sonoma mine was going to leave a 90ha void to a depth of 145m behind when it finished mining and relinquished the mining lease. No wonder we had fears that the supply of water to our farm would be threatened. There are also water holes in Coral Creek near its junction with Pelican Creek that have never been known to dry up even in the most severe droughts, being the closest natural surface water to Collinsville with another 12 km to the Bowen River waterholes.

The problem of hazardous voids that concentrate salts and heavy metals and sterilise productive ground has only become evident to us while working on the documents concerned with the Coral Creek diversion. When I enquired with a DERM officer about the leaving of voids I was told that because there was little public opposition they were not able to require them to be rehabilitated because the mine proponent would challenge the requirement.

I find many people, even mine workers and regional councillors have no idea that the voids will be left behind saving the mining company rehabilitation costs but costing the public and future generations. I have certainly become very proactive about raising the issue in EIS, mining leases (ML) and environmental authorities (EA) when they come up for public comment and approval as I feel it is a civic duty to give assistance to the regulators to uphold and improve standards and outcomes in my region. The Drake Coal Project EIS process took weeks of work for me and despite a great deal of community concern received only 2 public

submissions. Fortunately the local council and a number of government departments made submissions that concurred with our concerns based on local knowledge and substantial improvements were made to the mine design. This illustrates the importance of local knowledge. Another issue that is very important to me is the dust from the Drake mine as my residence is listed as a receptor. (See end notes- (1) Drake Coal Project- Land Use – Air Quality)

Which brings me to one of the points in the discussion paper, that is restricting objections to the direct landholders and the local council. In the case of the Jax mine ML and EA applications the local council were unable to uphold the objections that they had previously made. There was no EIS in this case and the ML and EA were the only avenues for objection. I have given the link to the full Land Court decision and have copied the most relevant points. The Member makes some pertinent comments at numbers 27 to 38 about the objection process. The situation for the Whitsunday Regional Council at the time was uncertain as a new administration was cutting staff and going through a transition as a result of an amalgamation that seems to have gone from difficulty at that time to crisis over the last year. The Mackay Conservation Group (MCG) was overloaded as were I and the Environmental Defenders Office (EDO) who could have helped with my objection. The EDO has subsequently lost state and federal funding and would have even less ability to help the community. The WRC could have benefited from some sort of public interest legal help with their objection. Any changes to increase the work load on councils will need to be supported by governments and local government associations. The Jax mine case illustrates the need for improvements to the approvals process and the imbalance in power and resources between mining companies and the community. (See end notes- (2) Jax mine case)

The classification of mining activities as low or high risk and excluding most objectors seems to me from my experience to be a recipe for disaster. In our case with Coral Creek the present system has failed us and the situation is likely to get worse by restricting scrutiny of assessments and ability to stop unacceptable proposals or increase the quality and standards of the conditions of mining activity. I presume that a proposal the size of the Drake Coal Project would not be classed as low risk and restricted. It is concerning that the EIS for the Drake Coal Project was presented to the public with a number of completely unacceptable design features like co-disposal dams in flood zones too close to the Bowen River. (See end notes.1-EIS Assessment Report)

It is known that the problem of cumulative impacts is increasingly being understood and attention given to it. In the case of the EIS for the Drake Coal Project the regulating authorities have drawn attention to the failure of the proponent to properly consider cumulative impacts and a lack of vigour in the EIS. (See end notes 1-EIS Assessment Report-Commonwealth Independent Expert Select Committee.)

In the case of the diversion and mining of Coral Creek, expert reports conservatively estimate the sediment erosion from the diversion to be 100,000 tonnes and the latest determinations of costs for Reef Rescue type measures to reduce sediment by farmers or graziers and the federal government, at $200 per tonne resulting in a cost of $20million.

So for the diversion of Coral Creek with royalties and taxation calculated on today's coal prices, the benefit to the public is likely to be negative considering the loss of amenity, heritage, natural habitat and risks to water quality and supply.

I see in the summary of the discussion paper *that if all the recommendations are implemented there will be on average an estimated saving to industry of approximately $6.0 million per year*. Frankly I think it is madness to be upturning a complex and critically important regulation system for such a marginal saving when one mistake could cost a very great deal more than the entire saving and could do incalculable harm to the reputation of the state and industry.

When you consider the case of the proposed diversion and mining of Coral Creek that was not necessary for the viability of the mine and has alienated much of the local community and to date has cost landholders over $250,000 and public interest contributions over $500,000, the value of good decision making at the outset is illustrated.

I would suggest that some of the staff cut from the Queensland government mining assessments be reinstated and the quality of approvals is increased as I understand that many inside the industry, academia and the community believe that the process needs very significant improvement.

It seems that the drive and ideology behind the changes proposed are largely based on maximising production rather than optimising development. It is expected that most mining companies would try to maximise production but if the government who are responsible for regulation loose the balance between resource production and environmental and community health management there is a risk of conflict of interest and moral hazard.

It also is looking increasingly like coal is in terminal decline because of the development of advanced energy systems and the changes to the world energy structures. (See end notes. 3-Economics) Therefore fast tracking new mines at a time of declining markets will result in a glut and a loss of viability for existing mines at a time when communities depend on those mines and will need time to diversify their economic base and work on transition and adaptation.

Also there are large scale liability issues from the existing mines including hazardous voids and spoil heaps, inadequately rehabilitated watercourse diversions, coal seam and spontaneous combustion spoil heap fires, all contributing to a loss of water and air quality. If the existing mines become unviable before commitments are made to make good and upgrade environmental bonds, it is possible that the mining company liabilities will become a public and government responsibility. One estimate of Queensland's total liability for derelict mines is $1 billion. (See end notes.1 - Land Use)

I hope my contribution is of benefit for the important work of review and possible reform of the critically important mining lease notification and objection protocols.

Yours Sincerely, Garry Reed

End Notes (1) Land Use

25th June 2012 – Garry Reed – EIS Submission:

Drake Coal Project: Environmental Impact Statement
Volume 1 – Chapter 2

5.3.3 Land Use and Suitability
Direct Impacts
The Project will temporarily alter the existing cattle grazing land use to coal mining. The proposed term of the mining lease is 30 years, following which it is intended rehabilitation will be complete. The proposed post mining land use is cattle grazing, however, some of the Project site will not be available for this use as there will be residual voids remaining in the pits.

There will be 7 residual voids with a total area of 582ha with depths up to 195m on this site. This area is large and begs the question about whether a cost benefit analysis, that considered the indefinite loss of that land area and the costs of returning more of the void areas to a useful land condition, has been done.

5.3.4 Topography and Landscape Features - Rehabilitation
Co-disposal storage faciities (not my typo) *or voids may be retained as stock water storage structures to support grazing use post rehabilitation subject to agreement with the post-mine landowner. Rehabilitation may involve backfilling or re-grading embankments, capping of any residual saline material, and contour ripping and seeding*

In this EIS and the Jax Mine EA material it has been admitted that the voids would concentrate salts through evaporation over time and become brackish. Heavy metals would also be expected to concentrate over time.

Storage – Hazard Assessment
Co-Disposal Storage - Initial Co-Disposal Facility - Failure to Contain
Loss or harm to humans: There are no known homesteads or water supply bores along the flow path between the co-disposal facility and Bowen River. The nearest homestead is about 20 km from the mine site along the Bowen River, however, it is understood that Bowen River is used for recreational purposes. Known water supply bores are situated to the east of the mine site and therefore not along expected flow paths.
Overflows from the co-disposal facility will occur during extreme rainfall events and are likely to coincide with more widespread storm events resulting in elevated flows within Bowen River. Inspection of the catchment areas indicates that flows in Bowen River are likely to be several orders of magnitude greater than discharges from the co-disposal facility. Therefore, any incremental effect on water quality or water levels and velocity generated by outflows from the storage facility would be limited - ***Significant (Risk)***

A significant risk assessment is too high and the placement of this facility should be in a less hazardous location.

Co-disposal Storage Facility Break
Loss or harm to humans: There are no known homesteads or water supply bores along the flow path between the co-disposal storage facility and Bowen River. The nearest homestead is about 20 km from the mine site along the Bowen River, however, it is understood that Bowen River is used for recreational purposes. Known water supply bores are situated to the east of the mine site and therefore not along expected flow paths. If a sunny day failure occurred the expected discharge (3,000 m 3/s) is likely to have a significant impact on

water levels and velocity along the immediate reach of Bowen River and it is conceivable that recreational users of Bowen River could be at harm. However, the flood wave is likely to have dissipated to some degree by the time it reaches the first homestead and residents would be at lesser risk. – ***High*** (Risk)

It is know that the part of the Bowen River in front of this proposed facility is a high visitation area and this risk assessment would probably require that it is made out of bounds to the public. If the public cannot be excluded from the river (which I think is unacceptable and expect would encounter severe community opposition) the facility should not be located in a position where it can endanger the public.

26th November 2012 - Response to the Draft Supplementary EIS. (DSEIS)

The response to my question GR 9 and answered at MCG 8 gives the impression that the voids will not exist and therefore does not answer the question asked.

Progressive rehabilitation of the Project site will aim to construct a final stable landform consisting of out of pit overburden dumps, in-pit overburden dumps and rehabilitation of final voids. These are typical rehabilitation methods for Queensland Coal Mining.

The rehabilitation standards are not high in Queensland and some aspects are the poorest in the developed world, even South Africa requires voids to be completely filled with the strata of material removed and rehabilitated to useful landforms. The idea that the post mine landholder will need 582ha of watering points for stock is obviously ridiculous. The quality of the water in the voids is unlikely to be suitable for cattle and is likely to be hazardous to wildlife and to the community. The voids will also be hazardous with depths up to 195m and steep banks. It is understandable that the proponent might want to obscure the reality of this situation. I understand that there is a desire to improve mine rehabilitation standards from government and industry groups, so it is very disappointing to see the lack of progress made with this proposal.

Q-18. The serious issues I have raised do not seem to have been adequately addressed. Below is a copy of the presentation of my question in the Draft SEIS, I have corrected typos or text corruptions that were not in the electronic document that I submitted, in heavy type.

Comment GR 18
*Co-disposal Storage Facility Break Loss or harm to humans: There are no known homesteads or water supply bores along the flow between the co-disposal storage facility and Bowen River. The nearest homestead is about 20 km from the mine site along the Bowen River; however; it is understood that Bowen River is used for recreational purposes. Known water supply bores are situate/***(d)** *to the east of the mine site (Figure 14) and therefore not along expected flow paths.*
If a sunny day failure occurred the expected discharge (3 00m s/s) ***(3,000 m3/s)*** *is likely to have a significant impact on water levels and velocity along the immediate reach of Bowen River and it is conceivable that recreational users of Bowen River could be at harm. However, the flood wave is likely to have dissipated to some degree by the time it reaches the first homestead and residents would be at lesser risk. High (Risk)*
It is known that the part of the Bowen River in front of this proposed facility is a high visitation area and this risk assessment would probably require that it is made out of bounds to the public. If the public cannot be excluded from the river

(which I expect would encounter severe community opposition) the facility should not be located in a position where it can endanger the public.

Response
There is currently no legal access to the river for the public on the privately held lease holders land. Under the Coal Mine Safety and Health Act, the Proponent is obligated to ensure that no access is provided to the public on the mining lease, which coincidently is currently on private land.

Where I have underlined you acknowledge that the Bowen river is used for recreational purposes. In fact in front of where your proposed mine abuts the Bowen River, people picnic, fish and often camp and during holidays like Easter and Christmas, staying for many days. Your response does not acknowledge that despite the legality of access to the river there are no effective barriers to that access in the area above and below the bridge.
When I have mentioned this to locals the reply has been almost unanimous that they will not be stopped from going to the river there and the mine will need to get used to trespassers. One person said they would not go to that part of the river if a coal mine and wash plant were nearby.
It is also obvious that the threat from the co-disposal dam will extend downstream and probably upstream further than the mine lease jurisdiction where there will be no ability to restrict access.
The co-disposal dam and the Coal Handling and Processing Plant (CHPP) must be located well away from the river and could easily be situated closer to the centre of the mine site. These facilities and the pits must be outside of flood zones and the hazardous dam bunded so that failure does not affect the river.

6th March 2013 submission to the Supplementary Environmental Impact Statement (SEIS) for the Drake Coal Project

SEIS Comments. In my EIS submission I included the references below but they were not included in the DSEIS or SEIS. I raised the issue of water quality being unacceptable for stock in my EIS submission and adversely affected by heavy metal contamination at GR 20 and GR 40.

Guidelines for preparing mine closure plans - June 2011
Western Australia Department of Mining and Petroleum & WA Environmental Protection Authority.
Metalliferous drainage can occur under circum-neutral or basic conditions.

http://www.dmp.wa.gov.au/documents/HG9.pdf
MINE VOID WATER RESOURCE ISSUES IN WESTERN AUSTRALIA by S. L. JOHNSON AND A. H. WRIGHT
Water and Rivers Commission - Resource Science Division
WATER AND RIVERS COMMISSION - HYDROGEOLOGICAL RECORD SERIES - REPORT NO. HG 9- 2003
Hazards • potential for harbouring water-borne diseases; • risks to fauna well-being or human health if void water becomes non-potable and is subsequently consumed.
A crucial hazard is the potential for spreading waterborne disease from bodies of open water, such as pit lakes. This is particularly significant in northern parts of Australia, where Ross River virus,Barmah Forest virus and Australian encephalitis are endemic. The availability of quiescent surface water bodies at abandoned mines may provide a permanent breeding habitat for mosquitoes, some of which could be vectors for these human diseases. Some mosquito species breed in saline water, so the long-term salinisation expected in some pits may not decrease the disease risk from this source.

DSEIS:
Comment GR 19
A crucial hazard is the potential/or spreading water borne disease from bodies of open water; such as pit lakes. This is particularly significant in northern parts of Australia, where Ross River virus, Bannah Forest vims and Australian encephalitis are endemic. The availability of quiescent surface water bodies at abandoned mines may provide a permanent breeding habitat for mosquitoes, some of which could be vectors for these human diseases.

Response
Noted. Environmental Representatives will identify and monitor the potential breeding grounds for mosquitoes where appropriate.

SEIS: **Comment GR 39**
Q-GR 19. This identified hazard was mainly referring to residual voids where there will be no staff to monitor and control mosquitoes. As I referenced, some mosquito species breed in saline water.

Response
This submission is new material that was received after the submission period ended. Refer to response GR 19.

SEIS Comment. The question about what happens after relinquishment and that the residual legacy voids will remain in the environment for the very long term has again not been answered.

https://www.ehp.qld.gov.au/management/impact-assessment/eis-processes/documents/drake-eis-assessment-report.pdf

EIS Assessment Report for the Drake Coal Project proposed by Drake Coal Pty Ltd (A wholly owned subsidiary of QCoal Pty Ltd) - 10th September 2013

2 Description of the Project – (Page 3):

Central Pits 1 and 2 and East Pits 2 and 4 would be completely backfilled (see changes to mine plan below). A total surface area of 458ha of final voids of varying size and depth would remain for the other six pits (see Table 1).
Table 1 - Mining pit rehabilitation and remaining surface area of non-beneficial land use….

Amendments to the mine plan (page 4)

The total area of surface disturbance was initially identified in the EIS that was released for public notification to be approximately 3442ha. However, a number of submissions were received on the EIS in relation to impacts on remnant vegetation and the location of infrastructure in the vicinity of the Bowen River and associated floodplain area. Consequently, Drake Coal presented a revised the mine layout in the Supplementary EIS to address these concerns and further mitigate detrimental impacts. The major changes to the mine layout include:

☐ relocating sediment basins for West Pits 1 and 2 to areas not containing remnant vegetation

☐ relocating the haul road route to avoid remnant vegetation, where possible

☐ a detailed analysis of the volume of material requiring disposal in the initial co-disposal dam and relocating the dam about 750m further away from the Bowen River, to a smaller footprint adjacent to Central Pit 4

☐ a detailed analysis of the volume of waste rock generated from West Pit 1 and amending the out-of-pit spoil dump footprint extent to avoid endangered vegetation communities

☐ amending and expanding the MIA/CHPP disturbance footprint area

☐ completely backfilling East Pit 4, as well as the northern area of West Pit 1, resulting in a smaller final void.

The changes to the site layout have resulted in a reduction of the overall project disturbance footprint by around 90ha. The revised disturbance footprint is now 3352ha. A breakdown of disturbance activities is shown in Table 2.

EHP, the Mackay Conservation Group and one public submission commented on the EIS that the 1-in-1000-year levees proposed to protect West Pit 1 and East Pit 4 during operations would be insufficient to protect these voids from overtopping in the longer term after mining had been completed. EHP requested the proponent to revise the mine closure plan. The proponent provided further information in the SEIS and in additional correspondence received on 8 July 2013. As identified in section 2 of this report, the proponent has committed to completely backfilling the East Pit 4 void, removing the need for a levee after mining has been completed. The proponent also committed to reducing the final footprint of the West Pit 1 final void and ensuring that the void would be protected from floodwaters above the probable maximum flood (PMF) level. The commitments for the rehabilitation of West Pit 1 include:

☐ completely backfilling the northern void

☐ reducing the volume of the southern void

☐ construct a 10m high spoil buttress behind the operational levee to provide flood protection for the void above the PMF level.

4.18.5 Commonwealth Independent Expert Scientific Committee (page 69)

Points 1 to 3 of the IESC advice (Surface water-groundwater interaction and cumulative impacts)

Recommendation:

The proponent should liaise with the QAS to conduct a practice exercise at least once per year with the Drake Coal mine rescue service to test response capability.

The Water Management Plan in Volume 3 of the EIS also identified the overflow of the initial co-disposal dam as a potential hazard. Concerns were raised by a number of government, non-government and public submitters that the initial co-disposal dam was too close to the Bowen River, thereby creating an unnecessary risk of failure and associated consequences to those people who use the Bowen River for recreational pursuits and to the downstream environment. In response, the proponent relocated the proposed location of the co-disposal dam further away from the Bowen River (see section 4.6.2). The new location is well above the 1-in-5000-year ARI flood level of the Bowen River, which would significantly reduce the potential for structural failure during a significant rainfall event. In any case, the initial co-disposal dam has been identified as a regulated structure and as such would require specific management measures to be implemented, including:

☐ contingency and emergency action plans outlining operating procedures designed to avoid and/or minimise environmental impacts, including threats to human life resulting from any overtopping or loss of structural integrity of regulated structures

☐ annual inspections by a suitably qualified and experienced person, including preparation of an annual inspection report containing details of the assessment and recommended maintenance actions to ensure the integrity of the regulated structure, if required.

Consequently, EHP has determined that the initial co-disposal dam would be adequately managed by the implementation of the management and maintenance measures for regulated structures to be included as conditions in the project EA.

http://mines.industry.qld.gov.au/safety-and-health/abandoned-mine-lands-program.htm

Why is it important? There are currently over 15 000 abandoned mine sites across the state, with an estimated 3500 of those on state-owned land.

http://www.abc.net.au/news/2013-10-25/abandoned-mines/5046570

Corinne Unger is from the Centre for Mined Land Rehabilitation at the University of Qld.

Rehabilitating mines isn't a cheap process. Ms Unger estimates Queensland's total liability for derelict mines to be $1 billion.

http://www.abc.net.au/radionational/programs/backgroundbriefing/toxic-mine-water/4518922

Queensland's toxic Dee River reveals national mine waste problem – Background Briefing - 14.2.13 - A national problem

The types of issues associated with Mount Morgan and its legacy waste water are not confined to residents of the Dee River. The recent floods have exposed problems in many of the 15000 abandoned mines in Queensland, and the 50000 abandoned mines across the country. Rehabilitating them is left to the states, and there is no clear standard about how best to do it.

At the University of Queensland's Centre for Mined Land Rehabilitation, Corinne Unger, an expert in abandoned mines, says the problem has largely escaped scrutiny because it's out of sight.

'That is the history of abandoned mines,' she says. 'They're scattered across the state. They're largely in regional Queensland, and across the rest of Australia they're largely in regional areas.

They're not where most of the voters are. But are we living in a developed country or a developing country? That's really what we've got a ask ourselves.'

Media Release 24 March 2011

Dirty mine closures could cost taxpayers billions

One of Australia's leading soil scientists has warned that Australian taxpayers could end up with a billion-dollar environmental cleanup bill unless mine closures are managed better.

Phil Mulvey, CEO of Environmental Earth Sciences, told a mining seminar at the Holiday Inn in Townsviile today (Thursday, March 24) that more than 100 mining leases have yet to be surrendered back to State governments because of inadequate remediation at the mines' closure.

"The main environmental issues that prevent surrender of the mine lease at closure relate to the placement of mine waste, the waste's interaction with water, and colonisation by invasive weeds," he said. "The mine companies are not reaching the environmental benchmarks, and

the State agencies are refusing to take back the land."
Mr Mulvey, whose company specialises in groundwater and soil remediation, told the seminar attended by government officials and mining executives that State governments have been reluctant to take back leases for closed mines because the potential environmental liability is so great.
Mr Mulvey said mine owners would be spurred into action over the next two years with Australia's adoption of International Accounting Standard 137 which requires that companies fully cost environmental liability onto their balance sheets.

AIR QUALITY

SEIS:
Comment GR 41
Q- GR 22. The serious questions that I have raised and the reference material I have presented here and also the comments and material presented by the Q-MCG 34 were not answered by the response:
PM2.5 was modelled and assessed and found to have lesser impact than PM10. In fact the complete lack of response to the extremely serious issues raised about the effects of dust on the community and the resultant health implications and potential loss of life is derisory and could be seen as showing contempt for our community.
The Draft EA - MIN100942709 for Cows Coal Mine immediately to the south of Sonoma Coal Mine and to the north of the proposed Drake mine has called for PM2.5 monitoring. It should be understood by the proponent that the DERM and now the EHP require monitoring of PM2.5 on new coal mines. It shows bad faith and disrespect for the Collinsville community by QCoal Drake to attempt to roll back best practice environmental standards.
My research has found that 11 years ago, Australian governments resolved to adopt a standard for fine particle pollution (PM2.5). During that time the World Health Organisation has issued recommended guidelines and many developed nations have now adopted those standards.

Response
This submission is new material that was received after the submission period ended.

The Air Quality Assessment (Appendix K of the EIS) provides detailed information on impacts and mitigation measures associated with the Project. As described in this assessment, PM2.5 was modelled and assessed and found to have lesser impact than PM10. Dust monitoring will be in accordance with the environmental authority.

SEIS recommendation – PM2.5 must be measured in this, the 13th year of the 21st Century under a democratic developed first world government. Testing for PM2.5 is not rocket science so why is there so much reluctance to monitor PM2.5?

The evidence of adverse health impacts from the dust and pollution from coal mining operations is growing and given that this project proposal is upwind of the Collinsville and Scottville communities and there are long standing rumours of a cancer and respiratory disease cluster, epidemiological research that would be expected in future will require as high a quality of monitoring standards as possible.
Here are some more recent reports that are relevant to this coal mine proposal:

http://www.cancer.org/Cancer/news/world-health-organization-says-diesel-exhaust-causes-cancer

Article date: June 15, 2012 A group of experts from the World Health Organization (WHO) has classified diesel engine exhaust as a carcinogen – a substance that causes cancer. The International Agency for Research on Cancer (IARC), which is part of the WHO, based its decision on what it calls "sufficient evidence" that exposure to diesel exhaust causes lung cancer and "limited evidence" that it increases the risk of bladder cancer. The new classification moves diesel fuel from the category of "probably carcinogenic" to "carcinogenic."

http://mines.industry.qld.gov.au/safety-and-health/683.htm

There is a wealth of information on the Qld Government website about the hazards from blasting yet there are no references at all in the EIS Appendix K Air Quality Assessment. There are other concerns about this EIS Air Quality Assessment. On page 14 it states: *Note that the Project site and surrounding area have little to no intervening topographical features that would affect dispersion patterns, and is also not unduly influenced by coastal effects (such as sea and land breezes) due to being located 150 km inland from the coast.*

Anyone that has been to Collinsville would know that it is an 84km drive and less than 75km as the crow flies from the coast.

(2) Jax Mine Case

http://www.landcourt.qld.gov.au/documents/decisions/MRA726-11_Jax.pdf

Jax Coal Pty Ltd v Garry Reed and Mackay Conservation Group and Whitsunday Regional Council and Chief Executive, Department of Environment and Heritage Protection [2013] QLC 19

PROCEEDING:	A hearing for Application for Mining Lease and Objections to its Grant. Objections to draft Environmental Authority.
DELIVERED ON:	4 July 2013
DELIVERED AT:	Brisbane
HEARD AT:	Townsville
MEMBER::	His Honour, Mr WL Cochrane

1. **I recommend to the Honourable the Minister for Natural Resources and Mines pursuant to the *Mineral Resources Act* 1989 (Qld), that Mining Lease 10346 be granted over the application area.**

2 **I recommend to the Honourable the Minister for Environment and Heritage Protection, pursuant to the *Environmental Protection Act* 1994, that the draft Environmental Authority issued on 12 September 2011 be issued with amendment namely that Condition No. W42 be amended so that the proposed monitoring locations are described as MB01, MB02, MB03, MB04, BR782W, BR752W, JXWB01 and DK092W as set out at page 23 of the Geoaxiom Groundwater Report Appendix 5 to the Draft Environmental Management Plan.**

Selected Relevant Excerpts:

(18) It might at this stage be observed that the objection filed by the Whitsunday Regional Council is something of a pre-emptory strike in so far as they express some concerns about various issues but seek further information and request that the environmental authority address the issues raised by them.

(19) It should be noted, that with respect to the "scientific documentation, advice and anecdotal evidence regarding mine site construction, operation, best practice and rehabilitation" the Whitsunday Regional Council, at no time, sought to provide the Court with that material. Accordingly, it is axiomatic that the Council has failed to provide any evidence to the Court to support its objections.

(27) Each of the remaining respondents Reed, Mackay Conservation Group and Whitsunday Regional Council informed the Court that, pursuant to the provisions of Practice Direction 7 of 2009 they proposed to participate in the appeal as Level 1 Objectors.

(28) Level 1 Objectors proposed to rely upon their Notice of Objection only and not attend the hearing. That is to say they adduce no further evidence and do not choose to make submissions at the end of the hearing.

(29) Such an election to participate as a Level 1 Objector brings with it some difficulties for those parties who choose to do so.

(30) In the first place they elect not to call any further evidence. That often presents difficulties because, necessarily, what is set out in the Notice of Objection is often in short form and not properly supported by proper evidence.

(31) Secondly, such an election abandons the prospect of cross-examining witnesses called by either the statutory party or the applicant for the mining lease or for the environmental authority. Accordingly, Level 1 Objectors deny themselves the opportunity for some forensic investigation of the evidence adduced against them.

(32) In the third place it deprives the Court of any opportunity to hear forensic cross-examination of their evidence and so the Court is left with, effectively, a series of bald assertions against the application.

(33) In the fourth place, it denies the Objectors an opportunity, having considered what other evidence was placed before the Court in the course of a hearing, an opportunity to make submissions about such evidence has been placed before the Court.

(34) Those disabilities are not so profound in the case of an application for a mining lease where subtle issues of environmental impact and the need for appropriate protocols to ensure protection of sometimes very subtle aspects of the environment are concerned, in my view, a failure to participate often renders earlier and very thoughtful objections somewhat sterile.

(35) I well understand that for various reasons including a lack of familiarity with Court proceedings and financial constraints on a capacity to properly present a case are relevant considerations. It is an unfortunate and, in my view, inevitable outcome that the force of the objections made by objectors who elect to become Level 1 participants are somewhat diminished for the reasons set out in the paragraphs above.

(36) It is also a reality that a prudent applicant will, in framing the evidence to be adduced before the Court will consider what is contained invalidly made objections and respond to those objections an absence of cross-examination and challenge to those responsible creates a situation where in the absence of other evidence (for example from the relative statutory authority) that evidence becomes the only evidence that the Court has before it and accordingly is highly persuasive.

(37) Because this decision is in respect of both objections against the grant of the mining lease and objections against the terms of the draft Environmental Authority both the *Mineral Resources Act* 1989 (Queensland) ("*MRA*") and the *Environmental Protection Act* 1994 (Queensland) ("*EPA*") are called up.

(38) Section 268 of the *MRA* is the relevant section endowing jurisdiction upon this Court to hear the objections against the application and to make a recommendation to the relevant Minister.

(49) The evidence shows that on 4 December 2009 the Department of Environment and Resource Management ("DERM") issued a notice of EIS decision advising that an environmental impact statement was not required.

(3) Economics

http://www.environomics.org/environomics/econSustain.pdf

Economics and Sustainability: Conflict or Convergence? (An Ecological Economics Perspective) William E. Rees, PhD University of British Columbia - School of Community and Regional Planning, Vancouver, BC - StatsCan Economic Conference - Ottawa, Ontario - 5 June 2001

2) Maximizing income does not maximize well-being

Although economists seem strangely silent on the matter, extreme 'free-market' thinking as applied by international agencies and many governments actually perverts sound economics. Sound economic theory would, indeed, have us maximize welfare, but recognizes that production/consumption is only one factor in the equation. A healthy environment, natural beauty, stable communities, safe neighbourhoods, economic security, social justice, a sense of belonging, and countless other life-qualities contribute to human well-being. Thus, to the extent that people value any of these *public* goods more than they might value their next unit of material consumption, forgoing additional production/income growth to obtain these goods (eg, through taxation or other means of income redistribution) would actually be sound economics—it would increase net social welfare (Heuting, R. 1996. "Three Persistent Myths in the Environmental Debate" Ecological Economics 18: 81-88)

The point is that in different circumstances the technologies and tendencies to globalization (if not the expansionist version) could be turned to enhancing not only income security, but also many other values that make life worthwhile. By contrast, available data suggest that the current approach to international development may actually be destroying more unmeasured yet real economic value, much of it in the common pool, than is being accumulated by private interests. If so, this is gross market failure. In a total social cost/benefit framework, it is clearly uneconomic to allow the destruction of two dollars' worth of resources or the global commons so that some individual or firm can realize one more dollar of profit. Sound policy would give governments a legitimate role in protecting and enhancing the public interest whenever the market fails to do so. Yet, in today's world, government intervention in the economy is reviled – globalists all sing in the deregulation choir.

http://www.abc.net.au/lateline/content/2013/s3787338.htm

Australian Broadcasting Corporation - Broadcast: 21/06/2013 - Reporter: Kerry Brewster

A billion dollar coal industry fund, which was supposed to drive development of 'clean coal' technology, has changed its purpose allowing it instead to promote coal use here and overseas.

KERRY BREWSTER: The former chair of the Australian Coal Association Ian Dunlop is surprised Coal 21's funds may be diverted.
IAN DUNLOP, FORMER CHAIRMAN, AUSTRALIAN COAL ASSOCIATION: The Coal 21 fund is very specific research and development fund particularly to get carbon capture and storage up and working and to get other clean coal technologies. The money that is being spent is really minor compared with the total, I think it's a billion dollars overall. We spent around $200 million at this point in time. That that's taken place over the last seven years or so, or slightly more probably and I think that is just recognition that there is no serious intent to this forward. If you look at the climate problem, it is a global emergency.
KERRY BREWSTER: The Climate Commission has warned that up to 80 per cent of the world's fossil fuels have to stay in the ground to avoid dangerous warming. Its prediction is backed by numerous scientific organisations and the international energy agency, which says that under a business as usual scenario temperatures may rise six degrees this century. The coal and gas executive for decades Ian Dunlop says Australia must phase out coal.
IAN DUNLOP: They knew three decades ago that the constraint on carbon emissions was going to constrain the coal industry at some point and that point has now come. They need to stop pretending this is a minor problem, they can keep going the way they have done in the 20th century, get real about taking serious action and accept what their leaders now have to do is start the intelligence phase out of coal.

KERRY BREWSTER: The Coal Association rejects the notion.
NIKKI WILLIAMS: We are a $60 billion sector for this country. And employ 180,000 people directly and indirectly. And there are 1.2 million people in Australia at this time who work in energy intensive business and whatever the fate of the manufacturing sector which is looking not wonderful at this point in time, the fact is the manufacturing sector relies on coal. So the notion that coal can be switched off or should be switched off is not one that we clearly support if you talk about it from a vested interest point of view. But it is clearly not in the interests of Australians if they are unaware of that fact.
KERRY BREWSTER: The Climate Institute fears the industry will simply put profits before the planet.
JOHN CONNOR, CEO, THE CLIMATE INSTITUTE: We are at the brink now and seeing investors starting to wake up to this concept of unbearable carbon. I think that what we are seeing and what I fear seeing is just a dash to exploit a dash for cash on fossil fuels. That is just radically irresponsible and it's very disappointing to see the industry's fund being opened up to other uses and very disappointing to see the people like the Minerals Council start to attack as extremists those who even raise this notion of a carbon budget.

Coal facing a 'structural decline' by: *Andrew Burrell* From: *The Australian* June 29, 2013

COLIN Barnett (WA Liberal Party Premier) has delivered a downbeat outlook for Australia's two most valuable export commodities, arguing that coal is facing a long-term structural decline and warning that the iron ore industry's period of record growth has ended.

"The change in the coal price is beyond cyclical: it is a structural change," he said. "And while coal remains the world's most used fuel for power generation and other purposes, the world is making policy decisions which mean that coal usage, in my view, will progressively decline. It's a long-term structural change and that should not be dismissed as something that is purely cyclical."

http://www.icac.nsw.gov.au/

ICAC (Independent Commission Against Corruption – NSW) list of corruption prevention recommendations in relation to operations Jasper and Acacia - Wednesday 28 October 2013

Recommendation 8
That the assessment panel provides a triple bottom line assessment of the environmental, social and economic factors of allocating an EL (Exploration Lease) and reports its findings to the steering group.

http://www.forbes.com/sites/mikescott/2014/03/10/why-it-makes-sense-for-norway-to-sell-its-fossil-fuel-shares/

There is also a danger that these assets will become worthless simply because they are usurped by renewable energy and energy efficiency technologies, a possibility starkly illustrated by last week's almost €5 billion (nearly $7 billion) writedown by RWE, the German utility, as it reported its first loss – of €2.8 billion ($3.9 billion) – since the company was formed almost sixty years ago.

The company's chief executive Peter Terium said that the writedowns reflect the fact that its fossil fuel assets just aren't going to earn what the company believed they would. He admitted that RWE had pursued the wrong strategy, focusing too much on its coal and gas assets and not enough on renewables.

"In the coming years, our power plants will earn even less than feared. We had to account for that in our annual results," Terium told investors, adding that the rise of renewable energy technologies such as wind and solar is "unstoppable" and the company made mistakes by getting into renewable energy too late.

http://www.forbes.com/sites/mikescott/2014/02/27/we-are-not-alone-climate-change-laws-span-the-world/

The fact that so many countries are taking action also removes one of the key barriers to agreement in the past, which was the view that tackling climate change would put companies and national economies at a competitive disadvantage.

Increasingly, the reverse is being seen to be true – that laws to tackle climate change are leading to greater resource and energy efficiency, cleaner, lower-carbon growth and improved energy security.

With most of the 66 countries covered in the study being developing nations, climate-related laws can bring other benefits including increased ability to cope with disasters, new jobs and better public health.

http://www.abc.net.au/lateline/content/2014/s3973194.htm

Monash letters reveal secretive attitude over fossil fuel investments – Lateline - Australian Broadcasting Corporation - Broadcast: 27/03/2014

KERRY BREWSTER: Monash won't reveal to Lateline where it invests its money but if it follows a similar pattern to other funds then about 50 per cent of its 400 million will be in carbon-intensive stocks like oil, gas and coal with only about two per cent in low-carbon assets.
JOHN HEWSON: How do they defend running that sort of risk? Let's assume that tomorrow there is a catastrophic - series of catastrophic climate events which dramatically affects the value of some of their investments, the share prices collapse.
You know people say 'oh it can't happen', I heard that all the way throughout 2007 when funds I was associated with were getting out of the stock market thinking well the market's going down 50 per cent - everyone's telling us they couldn't.
All the asset managers were telling us 'oh no the market's not going to go down.'
At some point you cannot go on defending the indefensible. At some point you are going to have to say whoops there, is a risk here.

DAVID KAROLY: It is critically important that Monash University, like all universities, walk the walk as well as just talking the talk and yet Monash University is being seen to do only the things that are easy.
KERRY BREWSTER: Some of the world's largest asset owners, including AXA group, Calpers and ASL are working with John Hewson's asset owners disclosure project which is ranking the top 1,000 funds on how they're responding to climate change. He is urging them to move some of their combined $80 trillion out of fossil fuels and into low-carbon alternatives.
JOHN HEWSON: Well, the exposure of these institutions to climate risk dwarfs anything we've seen in the subprime crisis.

BEN CALDECOTT, OXFORD UNIVERSITY: There has been a confluence of new risks coming together, all of which are related to the environment. You can take value destruction above and beyond what we've seen before.
KERRY BREWSTER: As director of Oxford's Stranded Assets program, Ben Caldicott is telling audiences that demand for coal will peak as early as 2016.
BEN CALDECOTT: All these other things make expanding coal output a pretty bad idea and a risky strategy and then you add in the climate change dimensions and it just becomes ridiculous really.

End – MQRA – Mining Lease Notification and Objection Initiate – Reed – 28.3.14

SUBMISSION No: 75
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April 2014

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QLD

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House Standing Committee on the Environment

Inquiry into streamlining environmental regulation, 'green tape', and one stop shops

Terms of Reference

The Committee will inquire into and report on the impact of 'green tape' and issues related to environmental regulation and deregulation. The inquiry will have particular regard to:

- ☐ jurisdictional arrangements, regulatory requirements and the potential for deregulation;
- ☐ the balance between regulatory burdens and environmental benefits;
- ☐ areas for improved efficiency and effectiveness of the regulatory framework; and
- ☐ legislation governing environmental regulation, and the potential for deregulation.

Dear Committee Secretary, I would like to make a submission to this inquiry.

The present environmental regulation system desperately needs reform and must be based on independent balanced advice rather than ideology, electioneering or industry agendas.

The experience that we have had in Collinsville with the coal mining industry has been very poor over the last 40 years or more. The advent of open cut mining here in the 1960's has resulted in a great increase in environmental impacts.

Our family had a bad experience in the 1970's when a CHPP was discharging water into Corduroy Creek which ran into Pelican Creek where we pump the water for our farm. The

high acidity rusted out our pumps, pipes and tanks. There seems to have been heavy metal contamination of the aquifer. We were never compensated for that loss.

In 2005 a proposal came to Collinsville for the QCoal Sonoma Coal Project. I studied the EIS and was concerned that the mine would be coming too close to Coral Creek but promises were made to protect the creek and its water with a buffer zone and baseline monitoring. I am now ashamed to admit that I was afraid to make any submissions to the Sonoma Coal Project EIS because I thought it would be seen as an objection to a coal mine that would create sorely needed jobs.

We have been on a very steep learning curve over the last 3 years and have become alarmed about how poorly the environmental assessment processes work at a State and Federal Government level. There is a very serious problem with industry capture and an imbalance in power between mining companies and small landholders and the community in Queensland. It is becoming increasing evident that there are also political problems with the recent NSW ICAC hearings and QLD media reports exposing serious accountability and transparency failures.

Our great concern is that any changes that puts more responsibility into the hands of companies that have demonstrated a willingness to use the imbalance in power to their advantage and to manipulate and downplay their impacts at a cost to other stakeholders, could make a poor situation far worse.

It should not need to be said that environmental impacts can be extremely serious with consequence that can last forever. Given that the economy is a subsystem of the ecosystem and biodiversity and land and water quality are foundations of ecosystem health, environmental regulation is of critical importance.

Our experience here over the last 3 years dealing with the proposal to divert and mine Coral Creek by Sonoma coal mine has been extremely financially and personally exhausting. I have spent all of my and my father's farm finance and life savings trying to have the mining of the creek we believe is a critically important water source for our farm and home, properly assessed.

We received expert scientific advice that there was a risk of failure of the Coral Creek diversion which would threaten the supply and quality of the water that constitutes the most reliable source for our farm. We also received legal advice that the baseline studies were so inadequate that it would be impossible to gain compensation or for the government to prosecute the mining company and seek rectification in the advent of a failure of the diversion.

We felt we had no option than to improve the conditions and baseline studies applying to the diversion of Coral Creek for our benefit and for others threatened by inappropriate waterway diversions.

I would like to refer to communications with the Queensland Government about the failure we experienced with the environmental regulation processes.

Appendix 1- Email letter to the Minister for Environment, Minister for Natural Resources, and Minister for Mining and the Premier on the 20th January 2012.
Request for a peer review of the hydraulic assessment of Coral Creek Sonoma, Collinsville on ML 10326

4. Need for a Study of the Impacts of Mining of Coral Creek on the Local Hydrogeology and Hydroecology on an EPBC and NCA-listed Vulnerable Threatened Species.

Coral and Pelican Creeks have many rock bars running across them and some appear to be of igneous and others possibly metamorphic geology. They appear to act like terraces to contain water and that may be why the *Eucalyptus raveretiana, an EPBC and NCA listed vulnerable threatened species,* does so well there.

Eucalyptus raveretiana grows on the banks and bed for a far greater distance up Coral Creek than Pelican Creek along the riparian areas.

The mining of Coral Creek would affect some of those rock bars and potentially the hydrogeology of Coral Creek. That may in turn affect available water volumes, groundwater levels in the riparian areas, and duration of flows to maintain the *Eucalyptus raveretiana* which is highly likely to be a groundwater-dependent phreatic species.

7. The Community lacks Funds to Argue Their Position in the Land Court

We understand that to be able to fully argue our case for this peer review we would need to go before the Land Court as a level 2 or 3 and could therefore be liable for court costs. Because of our financial position we would not have the resources to take that risk and therefore will not be able to properly represent the issues for ourselves, other landholders, stakeholders and future generations.

We therefore see these matters need to be addressed by DERM as a matter of Natural Justice as we did not create this situation.

8. Need for a Risk Assessment on Downstream impacts on Agriculture and Environmental Values

Coral Creek is a major waterway constituting 50% of Collinsville's natural water and its diversion will affect all of the water for those downstream of its junction with Pelican Creek including conservation values in the nationally -listed Birralee Pelican Creek Wetland Aggregation.

Some of Collinsville & Scottville's best agricultural land relies on Pelican Creek below the Coral Creek junction.

We need a risk assessment to show that the risks to long-term water quality will be negligible.

Appendix 2- 21st September 2012 - **Letter to Qld Government -** EMAIL TRANSMISSION

Dear Premier and Ministers, I am sending this email that I started writing in May now because of my serious concern about regulation relating to the environment and mining. The experience that I have had over the last 2 years has led me the conclusion that there is a great degree of failure of the approval and regulation system that will have extremely serious and very long term consequences and therefore call for some sort of urgent inquiry or review of its effectiveness.

Page 4: At the time of talking to one consultant the Federal Government was discussing green tape reduction and we discussed it. He believed that the problem was not an excess of green tape but a lack of effectiveness and loopholes in that regulation. He thought the reason that some proposals were taking an extended time to get approval was because the mining companies were taking advantage of the process and trying to get approvals for works that should not have been proposed in the first place. (I have also heard similar things from a number of others recently.)

We have also spoken to academics with experience in this field and have again had disturbing analysis of the situation with the process of consultants writing submissions for mining companies.

It has been suggested by a number of senior lecturers that there are many shortcomings in the approvals process and the situation puts the mining companies in a much stronger position than those that may be threatened by their proposals.

Therefore given the overwhelming imbalance in the resources available between the mining industry and the community and landholders, the strength of the Government regulating authority is of critical importance.

From my experience with the DERM during this case of the Coral Creek diversion proposal there is reason for concern that the regulating authority is understaffed and needs more resources.

I understand that there is a high turnover of staff and mining companies are paying more than twice as much for science graduates. (Since I wrote this in May your Government has announced that the staff relating to mining regulation is to be reduced, this concerns me greatly.)

So therefore given the great potential for very long term damage from mining to environment and water issues the effective regulation of this industry is of critical importance.

Page 6: The decision of the Land Court case handed down on the 19.9.12 was made without the benefit of my expert witness reports as I was left with little option but to withdraw from level 3 to level 2 after an unfavourable ruling on a preliminary decision. Although Member Isdale found the preliminary question was in fact a valid question, I would have been required to pursue the matter to full hearing, to have it determined. This was in the face of continuous bullying tactics from QCoal that I was delaying the case, and threatening a claim for costs against me up to $3.7million.

The objection I originally made to the EA Amendment was not referred to a solicitor as at the time I like many others believed that the Government regulating authority and its duty of care should resolve the issues equitably. This decision proved to be *penny wise and pound foolish* as there were legal inadequacies in my objection document.

My attempts to self-represent when the EA objection progressed to the Land Court proved too difficult and I was very grateful to receive the assistance of the Environmental Defenders Office of NQ with the case. Even with their assistance the costs of Barristers, expert witnesses and other expenses, the costs have depleted the financial reserves of my farm operation significantly.

Because of the very strong case that my expert reports present for very significant damage to Coral Creek and the water quality for our farm and those downstream from its diversion and mining and the cessation of State funding to the EDONQ and EDOQld, I am now in the position of needing to use much of my superannuation to continue the case.

I have no alternative to this action as I intend to continue to work this farm and protect its environs as my Father did throughout his life. I will have to live with the consequences of the diversion of Coral Creek for the rest of my life and would rather live in poverty than regret.

There is little doubt that biodiversity is the foundation of the resilience of the ecosystem and our economy is a subsystem of the ecosystem. Policy decisions do not always take this into account and is leading to diminishing natural capital and environmental health for future generations.

The short term financial gain from the high risk components of the coal mining occurring in this area will be at the expense of our long term primary production and economic viability.

Appendix 3- 23rd May 2013 – **Letter to Qld Government** - EMAIL TRANSMISSION

Page 4: These comments relate to vegetation management also and the past loss of critically important vegetation communities is likely to have resulted in the loss of the local variation in species which is considered to be as important as the loss of an entire species.

The fragmentation and reduction in community size of remnant populations can make them vulnerable to genetic weakness, weed infestation and disease.

I have made observations here that defy prevalent folklore about trees and grass. Corridors of trees have been planting on our property and grazed yet the grass under the trees is lusher than in the open and after frost or hot dry weather, is green rather than dry. I have spoken to old time graziers and they tell me that trees get their moisture from a different place than grass.
The implications for soil erosion is critically important as leaf, twig and branch fall from trees prevail while grass disintegrates quickly in drought. The other critical issue is loss of tree cover results in a reduction of rainwater infiltration and ground water recharge. Isotopic analysis shows that the transpiration cycles is a significant source of rain and dew especially in inland areas.

I have observed some very troubling activity on neighbouring properties over the years. Recently a contractor dozed a track beside the fences and in the process pushed mature

healthy trees like Brigalow and Leichardt Bean which are nitrogen fixers, are fire retardant and are very drought tolerant and were away from the fence lines.

Also in the process large trees in a major creek were dozed including the Nationally listed Eucalyptus raveretiana. Large Paperbarks and Sheoaks were also dozed into the running water. I contacted the landholder to get the phone number of the contractor to alert them to the breach of the law that had inadvertently happened. Unfortunately my approach was not greeted with cooperation despite the activity being upstream of my water pump and farm.

Land use and vegetation issues are of critical importance and I believe strong education and regulation are imperative as failure can have very serious and long term consequences. Also there are a lot of inexperienced landholders and operators that can make serious mistakes.

Page 6: Another issue that relates to land clearing and again is of the utmost concern to me as it was to my father is environmental weeds. From my observation the problem seems to be escalating and the loss of native vegetation and increased clearing and earthworks exacerbates colonisation because of reduced competition and the increase in vectors.

I have noticed that some landholders use heavy machinery to clear species like Lantana, Chinee Apple and Rubber Vine when a small amount of herbicide on the basal trunk or cut stump is all that is required. The downside of using dozers to clear weeds is obviously soil erosion but also from observation the weeds comes back from seeds and roots and grow more vigorously because of the reduction of moderation from native vegetation. The weed problem is often exacerbated and many areas that have been cleared over the last 50 years are often now completely weed infested.

This recent report makes some very important points: http://www.abc.net.au/news/2013-05-17/predictions-australia-will-be-hardest-hit-by-climate-change/4695718
Ian Dunlop is a former senior Executive of Royal Dutch Shell and a former chair of the Australian Coal Association.
"We're one of the driest continents on the earth and the effects on Australia will be more severe than elsewhere."
Mr Dunlop says climate change will also have a negative impact on Australia's agricultural industry.
"The much longer term problems of the sustainability of things like agriculture because if we keep on going where we're going large parts of the country are either going to be moving back into deserts or alternatively they'll end up subject to extreme flooding and conditions that aren't particularly conducive to agriculture anyway," he said.

As I have been working on this letter I hear that the vegetation management legislation changes have been passed in Parliament. I regret not working on this before now because I am very concerned that a lot of irreplaceable natural capital will be lost with very serious consequences.

There are presently many land use problems, unsustainable practices and inefficiencies that should be rectified before more land is made vulnerable to further damage.

Page 7: I have immense faith in our farmers and graziers and know their love of the land but I also know how stubborn and how many views there are about the way things work.

Unfortunately not everyone does understand exactly how the complexity of the ecosystem works and scientific knowledge is constantly being updated and analysis refined.

I have come to meet many scientists and environmentalists over the years and I find that they are not immune to cherry picking information and engaging in motivated reasoning and wishful thinking, but they are usually open to scrutiny and new evidence and knowledge.

One very experienced fellow said to me some time back that the problem with the environmental crisis is that it is slow moving and people pass away with the knowledge of what we have lost and that our environment is dying by a thousand cuts and as it gets weaker it will be more vulnerable to what could become the final cuts. I hope for the sake of future generations that we are not committing slow motion huri-kuri.

It is admirable to show trust but foolish to fail to verify. Management of impacts on our common environment is a Government responsibility. Failure can have extremely serious consequences.

Appendix 4 - MQRA (Modernising Qld Resource Acts) Program Team
Department of Natural Resources and Mines- **Mining Lease Notification and Objection Initiative – Discussion Paper submission** - 28th March 2014

When the Environmental Impact Statement (EIS) came out in 2006 for the Sonoma Coal Project, I had a look at the documents at the library and was impressed with the detail and thought that in this day and age the government and mining companies would have far higher standards than the 1970's and would not allow environmental damage. There were explicit promises made to protect Coral Creek with a buffer zone and monitoring of ground and surface water.

It was with shock and disbelief when in 2010 a public notice appeared proposing the diversion of Coral Creek to mine the coal underneath. My first reaction was that this proposal would put our water supply and quality at risk and result in a scar on the landscape as Coral Creek and this area is known to be very demanding on vegetation and liable to bank erosion.

I had little expertise in hydrology and tried to gain financial assistance from other landholders downstream to engage an expert but there was little interest in financing something that was considered the government's responsibility.

In the process of consulting others in the community I learned that another landholder affected by another mine had had a very expensive experience of trying and failing to get compensation for the loss of their orchard and water quality.

We decided to do our best to interpret the water licence application documents and received assistance from some conservation groups who had technical expertise and experience with submissions. It became evident that our local knowledge was valid and we underwent a steep learning curve.

From my objection of 15.4.11 to the Water Licence, *to Interfere with the flow of water in Coral Creek by changing the course of flow*, the document: Coral Creek Water Licence

Application: 517907 - ***Responses to Request for Information*** from Sonoma Mine Management Pty Ltd. Dated 6.1.11 - ***Geotechnical Design***
It states that the diversion channel will be excavated into a variety of geological strata which dip downwards in a southerly direction towards the pit and that the cobble layer which is mostly colluvium but also contains sandy gravels and gravelly sands in some areas has a seepage potential between the channel and the pit. It also says that the underlying rock layer generally consists of sandstones and siltstones, with varying degrees of fracturing that could also, in some areas, pose seepage potential between the channel and the pit. It goes on to say that a clay layer [no depth is specified] covered with geotextile and rip-rap and one metre of topsoil into which trees are to be planted will minimise the potential of seepage to the pit. The same technique is to be used to seal the sand layer over the rock of the original creek bed.

We also discovered that the Sonoma mine was going to leave a 90ha void to a depth of 145m behind when it finished mining and relinquished the mining lease. No wonder we had fears that the supply of water to our farm would be threatened. There are also water holes in Coral Creek near its junction with Pelican Creek that have never been known to dry up even in the most severe droughts, being the closest natural surface water to Collinsville with another 12 km to the Bowen River waterholes.

The problem of hazardous voids that concentrate salts and heavy metals and sterilise productive ground has only become evident to us while working on the documents concerned with the Coral Creek diversion. When I enquired with a DERM officer about the leaving of voids I was told that because there was little public opposition they were not able to require them to be rehabilitated because the mine proponent would challenge the requirement.

I find many people, even mine workers and regional councillors have no idea that the voids will be left behind saving the mining company rehabilitation costs but costing the public and future generations. I have certainly become very proactive about raising the issue in EIS, mining leases (ML) and environmental authorities (EA) when they come up for public comment and approval as I feel it is a civic duty to give assistance to the regulators to uphold and improve standards and outcomes in my region. The Drake Coal Project EIS process took weeks of work for me and despite a great deal of community concern received only 2 public submissions. Fortunately the local council and a number of government departments made submissions that concurred with our concerns based on local knowledge and substantial improvements were made to the mine design. This illustrates the importance of local knowledge.

Page 3: It is known that the problem of cumulative impacts is increasingly being understood and attention given to it. In the case of the EIS for the Drake Coal Project the regulating authorities have drawn attention to the failure of the proponent to properly consider cumulative impacts and a lack of vigour in the EIS.

In the case of the diversion and mining of Coral Creek, expert reports conservatively estimate the sediment erosion from the diversion to be 100,000 tonnes and the latest determinations of costs for Reef Rescue type measures to reduce sediment by farmers or graziers and the federal government, at $200 per tonne resulting in a cost of $20million.

So for the diversion of Coral Creek with royalties and taxation calculated on today's coal prices, the benefit to the public is likely to be negative considering the loss of amenity, heritage, natural habitat and risks to water quality and supply.

I see in the summary of the discussion paper *that if all the recommendations are implemented there will be on average an estimated saving to industry of approximately $6.0 million per year*. Frankly I think it is madness to be upturning a complex and critically important regulation system for such a marginal saving when one mistake could cost a very great deal more than the entire saving and could do incalculable harm to the reputation of the state and industry.

When you consider the case of the proposed diversion and mining of Coral Creek that was not necessary for the viability of the mine and has alienated much of the local community and to date has cost landholders over $250,000 and public interest (in-kind) contributions of over $500,000, the value of good decision making at the outset is illustrated.

I would suggest that some of the staff cut from the Queensland government mining assessments be reinstated and the quality of approvals is increased as I understand that many inside the industry, academia and the community believe that the process needs very significant improvement.

It seems that the drive and ideology behind the changes proposed are largely based on maximising production rather than optimising development. It is expected that most mining companies would try to maximise production but if the government who are responsible for regulation loose the balance between resource production and environmental and community health management there is a risk of conflict of interest and moral hazard.

It also is looking increasingly like coal is in terminal decline because of the development of advanced energy systems and the changes to the world energy structures. Therefore fast tracking new mines at a time of declining markets will result in a glut and a loss of viability for existing mines at a time when communities depend on those mines and will need time to diversify their economic base and work on transition and adaptation.

Also there are large scale liability issues from the existing mines including hazardous voids and spoil heaps, inadequately rehabilitated watercourse diversions, coal seam and spontaneous combustion spoil heap fires, all contributing to a loss of water and air quality. If the existing mines become unviable before commitments are made to make good and upgrade environmental bonds, it is possible that the mining company liabilities will become a public and government responsibility. One estimate of Queensland's total liability for derelict mines is $1 billion.

Letter to Editor- Bowen Independent-published 9.5.14

I would like to make some comments about the diversion and mining of Coral Creek Collinsville and the ABC 730 report of April 29th, 2014. It is hard to get all the facts across about a complex issue in an 8 minute TV segment.

I did not invite the ABC to do the report; they were following up on the recent Land Court Water Licence case. I said I did not have a personal issue with any individuals at the Sonoma mine but with the succession of governments that have allowed a business and regulatory environment to develop that is resulting in unacceptable proposals and a failure to properly assess them.

I wanted to acknowledge the contribution that the Sonoma mine makes to the community and the QCoal - RFDS dental bus that was sorely needed and appreciated. The program producers could not get a statement from QCoal Sonoma but did broadcast a statement from the Queensland Resources Council.

There was an inaccuracy in the report that i would like to correct. I said that the farm has been in my family for almost 100 years but between 1946 and 1962 the Kelly, Wilshire and Iker families owned the property.

It is of great concern to me that over the last 3 years of dealing with the Coral Creek diversion proposal, I have observed the standards of assessment and regulation of mining operations deteriorate when it is already at a low standard.

When the Environmental Impact Statement (EIS) came out for the Drake coal project last year it became evident to locals that there were unacceptable aspects to the design with regards to public and environmental safety with the position of a co-disposal dam too close to the Bowen River and pits in flood zones. Some major changes were made to the design thankfully. Yet from what I understand there has subsequently been a weakening of the EIS assessment process to leave responsibility for design to the mines and compliance with standards to the government.

In late March the Queensland government released a discussion paper for public comment on a proposal to restrict objections to Mining Leases and Environmental Authorities to the direct landholders and the local Councils. Local knowledge is of critical importance as mine design is often carried out remotely by fly in fly out consultants. In the case of Coral Creek all of the feasibility and baseline studies have failed to work out what is common knowledge locally, that it has a more reliable aquifer and spring feed than Pelican Creek. Unfortunately the Whitsunday Regional Council was unaware of the discussion paper and it was too late when staff was made aware of it, to run a submission past a council meeting. Fortunately the Local Government Association made a submission.

The problems that already exist because of the imbalance in power between mining companies and the community and small landholders are serious. The diversion and mining of Coral Creek case illustrates that. It is almost impossible to engage an engineering consultant to work on a case to oppose a proposal by a mining company and the prohibitive legal costs make it very difficult to deal with the complex issues involved.

The consequences of bad decisions for high impact developments should be taken very seriously as cumulative impacts are escalating. I would suggest our governments increase the staffing and expertise of our regulators as it is much more cost effective to decline an inappropriate proposal than deal with its failure.

I hope my submission is of benefit for your extremely important inquiry.

Yours Sincerely, Garry Reed

8th March 2013 EMAIL TRANSMISSION

Garry Arthur Reed

Senate Committee Inquiry into the Impacts of Air Quality on Health

Secretary Senate Standing Committees on Community Affairs,
PO Box 6100
Parliament House Canberra
ACT 2600.

https://senate.aph.gov.au/submissions/pages/index.aspx
email: community.affairs.sen@aph.gov.au

Health impacts of air pollution
Senate Community Affairs Committee

Chair: Senator Rachael Siewert

The Committee's terms of reference are to examine the impacts on health of air quality in Australia, including:
(a) particulate matter, its sources and effects;
(b) those populations most at risk and the causes that put those populations at risk;
(c) the standards, monitoring and regulation of air quality at all levels of government; and
(d) any other related matters.

Points to consider for the submission:
(1) Planning processes
(2) Heath effects
(3) Air monitoring
(4.1) Other matters: personal and community anxieties
(4.2) Dust

Introduction

Collinsville is located at the north of the Bowen Coal Basin, 84 km inland by road from Bowen on the northern section of the Whitsundays in Central Queensland.

The establishment of the State-owned Bowen Consolidated Mines in 1919 led to the establishment of the settlement of Moongunyah, the local indigenous word for coal; although by 1921, local politician Charles Collins managed to have the town renamed to Collinsville.

Mount Coolon Road, Collinsville Old Town, the southern entrance.

Collinsville has a history of coal mining since 1912 with underground mines from 1919 until open cut mining took over from the 1980's.

Seven men were killed in a mine accident in Collinsville in October 1954, highlighting the need for better safety equipment. Around forty miners were working underground at the time.
A Collinsville Miners Memorial Day is held on the 13th of October each year.
A quote from last years memorial day brochure: *We gather here today and every year on the 13th day of October united in grief, to pay tribute and honour all of our miners that have fallen in the winning of coal here in Collinsville; 26 men and 2 Pit Ponies... Whilst today's ceremony is a solemn occasion, it is an opportunity for today's miners to heed "The Real Cost of Coal."*

The Collinsville open cut pits have had problems with spontaneous combustion fires in the spoil heaps and possibly some coal seams. Last year there were reports of appropriately 80 spoil heap fires and some incidents lead to the closing of the operation for several days. Remediation works have been put in place and a Air Quality Testing Group formed including the State Government regulation authority and the local coal mine operators; Xstrata, Qcoal, Sonoma Mine Management and rail operator QR National/Aurizon. It has been confirmed that monitoring of PM 2.5 will not occur. (see below, Collinsville open cut, 18.7.12 – 11am)

Pelican Creek via Scottville looking to the Collinsville Coal Blake open cut with spoil heap fire smoke visible, a haze can be seen above the fires with a much clearer horizon away to the south west. 4.7.08 - 3pm

http://www.townsvillebulletin.com.au/article/2012/03/17/314881_news.html

Miners hit by deadly gases

JANE ARMITSTEAD | March 17th, 2012

AN investigation has been launched to determine how a deadly cocktail of gases cut down an entire crew at a North Queensland coal mine.

Fourteen miners from the Collinsville Coal Mine were rushed to hospital late Thursday and about 50 were reportedly evacuated at 3am Friday before it was closed.

The miners were believed to have suffered gas poisoning after exposure to sulphur dioxide and carbon monoxide, among a cocktail of other deadly gases.

They reportedly struggled to breathe, began vomiting, suffered from severe nausea and lost vision due to stinging and irritated eyes.

The mining union yesterday said the mine should have been shut down long ago as more than 30 people had been rushed to hospital with gas-related issues, including a woman who was airlifted to Rockhampton and placed in an induced coma, narrowly escaping death, in the past two months.

A miner on shift who asked to remain anonymous said panic shot through the site after an entire crew "went down" from gas exposure.

"A whole crew went down, even a young inexperienced girl who shouldn't have been in the area in the first place," he said.

"The risks have been there for months, we have had enough, what does it take for them to do something before people get killed."

Personal Experience

My Grandfather Frederick Reed died at the Collinsville mine in 1932 and was the third miner to die in the coal mines here. At the time my Father, Ronald was 10 years old and my Uncle, Andrew was 16 years old. I grew up on the family farm 4 km out of Scottville that is 3 km from Collinsville. My Father, Ron and my Uncle Andy were very hard working but careful and risk averse. I was destined to be safety conscious and proactive about hazards, good design and governance, and system

failures.

Personal experience can be a powerful motivator and a boiler explosion that put a school friend on the critical list in a saline bath in Townsville hospital at the beginning of my electrician apprenticeship at the local Collinsville Power Station had a profound effect on me.

There is another experience more removed from direct experience but is also seared in my mind. I almost got a job on a gas rig in the North Sea off Aberdeen in Scotland in 1985. About two and a half years later on the 6th July 1988 the Piper Alpha disaster happened, killing 167 men.

The Cullen Inquiry made 106 recommendations for changes to North Sea safety procedures, all of which were accepted by industry

Most significant of these recommendations was that the responsibility for enforcing safety in the North Sea should be moved from the Department of Energy to the Health and Safety Executive, as having both production and safety overseen by the same agency was a conflict of interest.

It should be common sense that conflict of interest can arise regardless of how many assurances are made, so true independence and separation of powers must exist between the Government, regulating authorities, monitoring and testing organisations & companies and project proponents.

It is also obvious that there is a great imbalance in power between the community and large companies here. This community is very dependent on jobs from coal mines giving them a great advantage and they have far greater financial resources and industry lobby groups & PR consultants that leaves the local authorities, community groups and landholders overwhelmed.

I believe from local experience and reports from others that there are serious shortcomings in the processes that are supposed to protect community and environmental health.
A report from ABC News - 17.10.10 gives reason for serious concern.

http://www.abc.net.au/news/2010-09-17/testers-fabricating-air-pollution-reports/2263742

A former employee of an Australian air testing company alleges data is being fabricated and fraudulently provided to regulatory bodies and is going unchecked by the government.

The scientist says he and colleagues were pressured to cut corners...

The man says he has obtained copies of reports that support his claims since leaving the company.

And he says he believes the fraudulent behaviour is going undetected and could be widespread within the industry.

He alleges the National Association of Testing Authorities (NATA) and the Department of Environment and Resource Management are not sufficiently regulating compliance to standards.

"The Environmental Protection Agency is requesting that industry provide them with reports by NATA-accredited bodies that detail the levels of air emissions that they have," he said.

"But when these reports are submitted they are taken at face value and they're not being properly scrutinised by either NATA or the EPA. So there is nothing to show that these are being done properly, and I have evidence to show that they haven't been done properly if they were to be checked."

He says the effects of non-compliance could be detrimental for the public.

"If we don't have accurate figures on what is being emitted into the air, in Gladstone for example, we have no way of knowing if levels are being exceeded past safe community levels - and the air could have high levels of lead, high levels of dioxins, of carcinogens, or poisons into the atmosphere which could then cause sickness."

The scientist also says that due to non-compliance going unchecked, councils make uninformed decisions about industry expansions.

And he says similar discrepancies in air testing could be occurring in the coal seam gas industry.

"If they got the incorrect information about the amount of pollutants that are being put into the atmosphere, they are unable to accurately determine whether to go ahead with expansions, because they don't have a correct baseline to know what the air pollution levels are at any one time."

He says during his time at the company he saw large companies go from struggling to pass compliance tests, to easily passing environmental standards.

"NATA needs to start doing their job properly," he said.

"Unfortunately they're not an independent body because they are paid for by the stack testing companies themselves ... so there is no independence there.

"But ideally we should look more towards the American model, where the environmental protection agency have their own sampling officers who are fully experienced in stack testing and actually will perform surprise visits to stack testing companies when they're on site, are able to audit reports, and have a requirement that raw data is included in the stack testing reports so that anyone can have a look and ensure that things are being done to the standard.

"At the moment there are no requirements that you include your raw data in Australia. And every testing company should have that data. It should be no problem for them to include it in any report that they submit, to show that things were done to the standard." (end of excerpts)

I believe the situation has the potential to get even worse in Queensland as the EIS process is making changes to the way it operates, it seems as a cost cutting exercise and a way of speeding up approvals. This comes on top of major staff cuts in the departments.

http://www.ehp.qld.gov.au/management/planning-guidelines/policies/regulatory-strategy.html

A Case Study

After the Sonoma Coal Mine was proposed in 1996 for a site on Sonoma Station 5km upstream on Coral Creek from our farm, I did not make a objection as there were explicit promises to protect the major waterway with a buffer zone.

Unfortunately within 2 years a proposal was made to divert Coral Creek to mine the coal underneath. The coal deposit represents 1.4% of the of the Sonoma mine total Run of Mine (ROM) and as a percentage of the new mines in process locally by the parent company Qcoal, represents about 0.14% of ROM. The local community was as outraged as I was and has resulted in a necessity to devote all my time and resources into opposing the diversion as my common sense told me and subsequently expert reports, that the proposal was very high risk and threatened our farm's water supply and those downstream, as well as the survival of the threatened Black Ironbox/Creek Coolabah (Eucalyptus raveretiana).

So far I have spent two and a half years and $75,000 on this case. The cost would have been much higher without the help of the EDO. Unfortunately the new state government withdrew all its funding to the Queensland and North Qld Environmental Defenders Office (EDOQLD & EDONQ).

http://www.brisbanetimes.com.au/queensland/groups-consider-legal-action-against-government-cutbacks-20120705-21jv0.html

The EDO's north Queensland office, which questioned the proposed Hay Port coal loading facility and over-development of north Queensland ports, has lost $100,000 – about 50 per cent – of its funding.

EDO North Queensland management committee president John Seccull said he would have accepted general cuts across the 30 community legal aid areas because of budget cuts.

"Reducing the funding to community legal services across the board, I would have accepted that as a legitimate consequence of funding cutbacks," he said.

Mr Seccull said there was a lot of election rhetoric of cutting "green-tape."

"And in my view this is a consequence of that," he said.

"It will mean that we can no longer operate effectively as a community legal centre." (end excerpts)

The case is continuing and the costs are likely to pass the $100,000 that was saved by the Queensland government and will impact on my farming operation's future very significantly. The health and loss of income costs to myself and those helping me are great also.

The experience has been a great wakeup call and has motivated me to contribute to the regulation process as I understand how critically important it is. What has become obvious to me is that many companies will exploit every opportunity to maximise their profit if they are allowed to, and that this is actually an obligation to their owners and shareholders.

Therefore government and community organisations have a critical role to balance the power imbalance as the stakes are enormous.

Recent Illustration

I have made submissions to the Environmental Impact Statement (EIS) for the Qcoal Drake Coal Project which is a coal mine directly south of the Qcoal Sonoma Mine and Qcoal Cows Coal Mine and beside the Qcoal Jax Mine. The Drake Coal mine would be as close to our farm as the Sonoma mine and has the potential to significantly increase the existing dust and noise problems.

Drake Coal Project Environmental Impact Statement (EIS) – June 2012,
Draft Supplementary EIS (DSEIS) – November 2012,
Supplementary EIS (SEIS) – March 2013.

Refer to Appendix B for complete EIS submission relating to the air quality issues.

SEIS Comment: I have just noticed this reference in the EIS Air Quality Assessment- Appendix K.
For the year 2008/2009, hourly meteorological data from the on-site Sonoma Automatic Weather Station (AWS)2, which was located some 7 km north of the Project site, was used to develop a meteorological file for a full year. This data included raw data on temperature, wind speed and direction and sigmatheta (standard deviation of wind direction).
2 An on-site inspection of the AWS indicated that the instrument was installed and is operated by the same NATA registered laboratory that performs the dust deposition monitoring. However, it is noted that the site location does not conform to the siting guidelines of the Australian Standard AS 2923-1987 *Ambient Air – Guide for measurement of horizontal wind for air quality applications*. In particular, the 10 m mast does not have the necessary horizontal clearance of '10-times the height of nearby obstacles'. This seems to be reflected in the measured annual average wind speed being 2.35 m/s which is significantly lower than the Parsons Brinckerhoff (Report 2136452-RPT001-B_Iss1) prognostic-modelled annual average of 4.3 m/s. Since this is the best available measured data for the site, and with the best exposure being in the direction of the prevailing winds from the east, these data from the AWS were used in this report.

I have also noticed that there is an inaccuracy in this Air Quality Assessment regards the distance of the site from the coast, it states 150km but is in fact less than 75km.

EIS Submission. ***4.4 Climate Change***

As well as a decrease in annual rainfall, an increase in daily precipitation intensity (rain per rain-day) and the number of dry days is predicted. The future precipitation regime will have longer dry spells interrupted by heavier precipitation events. Changes to extreme events would have the potential to increase erosion rates and flood frequency, with implications for river flow, water quality, and the design standards of infrastructure.

Drought occurrence is projected to increase over most of Australia (CSIRO, 2007). (CSIRO (2007). Climate Change in Australia, Technical Report, developed by Commonwealth Scientific and Industrial Research Organisation and the Bureau of Meteorology in partnership with the Australian Greenhouse Office, Canberra.)

Models have predicted a range in rainfall changes from an annual increase of 17% to a decrease of 35% by 2070. The 'best estimate' of projected rainfall change shows a decrease under all emissions scenarios (DCC, 2009). (Department of Climate Change (2009). Climate Change Risks to Australia's Coast, Commonwealth of Australia, Canberra.)

These predictions are bad news for our country, vegetation and degraded and rehabilitating land for the very long term. The elephant in the room is how this mine will indirectly contribute to climate change and the wisdom of facilitating industry processes that in themselves contain sacrifices of land quality that will prevail indefinitely.

DSEIS Response from proponent.

Noted. Climate change impacts have been discussed in Chapter 4 of the EIS Report. Consequences of climate change that were considered include: increased temperatures, flooding from intense rainfall, reduction in rainwater availability, erosion, damage from cyclonic conditions and bushfires. The Proponent will take all necessary measures outlined in the EM Plan and PMLUP to mitigate and manage the impacts of the mine operations on the existing environment values which could ultimately leverage impacts on climate change.

SEIS Comment. I regret not asking the proponent what they meant by this statement. As I read it again I am left with the feeling I get from a lot of the responses, of issues being explained away and leaving one feeling confused or overwhelmed in many cases. I am not left with a feeling of confidence and satisfaction but uncertainty, frustration and deep concern.

EIS Submission.

4.4.5 Cyclones

Under three different studies the number of severe tropical cyclones is projected to increase by 56% by 2050 (Walsh et al., 2004) (Walsh KJE, Nguyen KC and McGregor JL (2004). Finer resolution regional climate model simulations of the impact of climate change on tropical cyclones near Australia, Climate Dynamic, 22:1,www.springerlink.com/contect/brmpmturdqvxh3vv.) , 22% by 2050 (Leslie et al., 2007) (Leslie LM, Karoly DJ, Leplastrier M and Buckley BW (2007). Variability of Tropical Cyclones over the Southwest Pacific Ocean using High Resolution Climate Model, Meteorology and Physic 97 (Special Issue on Tropical Cyclones), ftp.gfdl.noaa.gov.au/qld-regional-profiles.) and 140% by 2070 (Abbs et al., 2006).(Abbs D, Aryal S, Campbell E, McGregor J, Nguyen K, Palmer M, Rafter A, Watterson I and Bates B (2006). Projections of Extreme Rainfall and Cyclones: Final Report to the Australia Greenhouse Office, CSIRO Marine and Atmospheric Research, Canberaa, www.cmar.csiro.au/eprint/ open/abbsdj_2006b.pdf.)

These results are of great concern because of the presence on the site of residual voids liable to overflow and spoil heaps that may be unstable over time.

> The soils of non-alluvial soil substrates naturally occur on level to very gently undulating slopes. When they are placed at any significant angle, they are prone to erosion by rain and wind and the resultant material is transported into waterways and sensitive receiving environments. Because of the uncertainties of climate change the problem may not arise for some time or could dramatically exacerbate existing problems.

SEIS Proponent document:
Comment GR 41
The serious questions that I have raised and the reference material I have presented here and also the comments and material presented by the Q-MCG 34 were not answered by the response: PM2.5 was modelled and assessed and found to have lesser impact than PM10. In fact the complete lack of response to the extremely serious issues raised about the effects of dust on the community and the resultant health implications and potential loss of life is derisory and could be seen as showing contempt for our community.

The Draft EA - MIN100942709 for Cows Coal Mine immediately to the south of Sonoma Coal Mine and to the north of the proposed Drake mine has called for PM2.5 monitoring. It should be understood by the proponent that the DERM and now the EHP require monitoring of PM2.5 on new coal mines. It shows bad faith and disrespect for the Collinsville community by QCoal Drake to attempt to roll back best practice environmental standards. **(I have confirmed that the final Cows Coal EA , signed 5 June 2012 requires PM2.5 monitoring.)**

My research has found that 11 years ago, Australian governments resolved to adopt a standard for fine particle pollution (PM2.5). During that time the World Health Organisation has issued recommended guidelines and many developed nations have now adopted those standards.

Response from proponent
This submission is new material that was received after the submission period ended.
The Air Quality Assessment (Appendix K of the EIS) provides detailed information on impacts and mitigation measures associated with the Project. As described in this assessment, PM2.5 was modelled and assessed and found to have lesser impact than PM10. Dust monitoring will be in accordance with the environmental authority.

8.2 High Level Mitigation Measures

- Application of the high level mitigation measures are expected to reduce dust emissions by 40%, that their application will result in compliance to the EPP (Air)/NEPM (Air) objectives/goals;
- The Project is predicted to comply with the assessment criteria EPP (Air)/NEPM (Air) objectives/goals for PM_{10} at the public-restricted mining lease boundary, for preparation and operations over the 26 year life of the mine with the addition of high level mitigation;
- As the most problematic constituent PM_{10} is now compliant for both the preparation and operations over the 26 year life of the mine, it is then fair to assume that $PM_{2.5}$ and TSP would also be compliant at the site boundary with their appropriate criteria with the addition of high level mitigation; and
- The Project is predicted to easily comply with all relevant EPP (Air)/NEPM (Air) air quality objectives and goals at all sensitive receptors identified and at Collinsville for preparation and operations over the 26 year life of the mine with the addition of high level mitigation.

SEIS recommendation – PM2.5 must be measured in this, the 13th year of the 21st Century under a democratic developed first world government.

How can the proponent be so sure that they will comply with PM2.5 modelling if they are not actually monitoring PM2.5? *Expected to, the Project is predicted to comply, it is then fair to assume and, the Project is predicted to easily comply,* are not good enough, why is there so much reluctance to agree to monitor PM2.5, it's not rocket science.

EIS submission.
***11.11 Discussion on High Level Mitigation Results** (see above)*

This prediction seems to defy common sense as i would expect PM2.5 particles which are lighter I presume than PM10, to travel further by wind.

Coal s Assault on Human Health - A Report From Physicians For Social Responsibility
By Alan H. Lockwood, MD FAAN Kristen Welker-Hood, ScD MSN RN Molly Rauch, MPH Barbara Gottlieb - November 2009
By convention, and for purposes of monitoring air to evaluate compliance with air quality standards, the PMs of greatest concern are those with a diameter of 2.5 um or less (PM2.5). These small particles are the most likely to penetrate deeply into the lungs, reach the alveoli, and initiate the pathophysiological sequences leading to acute and chronic manifestations of cardiovascular heart disease (CHD).

Medical Journal of Australia 19.10.11 The mining and burning of coal: effects on health and the environment. William Castleden, David Shearman, George Crisp and Philip Finch.
Coalmining poses a significant threat to the integrity of aquifers, which may be hydrologically connected to other groundwater-dependent ecosystems including farm dams, bores and rivers. Water from coal mines must be disposed of and waste material is often held within the surface lease of a mine, introducing a risk of contamination of human food sources. Pollution of the environment can also occur through windblown dust during transportation, where coal is washed and at export ports.
Australia's international obligations under the agreement reached at the United Nations Conference on Environment and Development (UNCED June 1992) give EPAs permission to use the precautionary principle—that an action should not be taken if the consequences are uncertain and likely to be dangerous to the public or the environment—in their assessments. This is rarely, if ever, invoked in the case of approving new coalmines. Health impact statements for proposed mines are not requested by state governments, so the EPAs have, unwittingly, become responsible for the protection of significant aspects of public health.
The time has come for Environmental Protection Agencies to take the precautionary principle into account during their deliberations on new coalmining applications.

Epstein PR, Buonocore JJ, Eckerle K, et al. **Full cost accounting for the life cycle of coal.**
Ann NY Acad Sci 2011; 1219: 73-98.
Epstein and colleagues recently reported an analysis of the health and environmental costs of coal in the US and concluded that the damage caused by coal should double or triple the costs of coal-generated electricity.

Australian Air Quality Group. Particles. AAQG: Armidale, 25 Apr 2010. http://aaqg.3sc.net/air-pollution-and-health/particles (accessed Aug 2011).
The smallest particles, particulate matter (PM) 2.5, are the most damaging.

Relations Between Health Indicators and Residential Proximity to Coal Mining in West Virginia
Michael Hendryx, PhD and Melissa M. Ahern, PhD April 2008
As coal production increased, health status worsened, and rates of cardiopulmonary disease, lung disease, cardiovascular disease, diabetes, and kidney disease increased . Within larger disease categories, specific types of disease associated with coal production included chronic obstructive pulmonary disease (COPD), black lung disease, and hypertension.

British Trade Unions Congress (TUC) General Secretary Brendan Barber said on 2.9.11:
'Because disease and death caused by the various types of dust can take many years to develop, both employers and regulators take them far less seriously than deaths caused by injury, yet they are just as tragic for both the workers and their families.'
http://www.tuc.org.uk/workplace/tuc-19972-f0.cfm

Appendix K
3.3.3 Particulate Matter – In-Air Concentration
There are no existing data available for the average concentrations of PM 10 and PM 2.5 within the Sonoma project area. The PB assessment assumed a background PM10 concentration of 16.8 µg/m3, based on the Mackay (1999) data provided by the EPA....

It is unfortunate that there is not more data available for dust from the Sonoma Coal mine as it is close to Collinsville and Scottville and it has been known for some time that coal dust and especially PM2.5

particles present serious health issues.

Response from proponent

Sonoma operations measure dust fallout at several locations and PM10 at Collinsville Airport. This data gathering is part of the environmental management of the site with reporting to government regulator. Any problem with elevated levels requires intervention via the dust management system – this is as proposed in the technical report of Appendix K of the EIS Report.

SEIS recommendation – PM2.5 must be measured in this, the 13th year of the 21st Century under a democratic developed first world government (surely).

The evidence of averse health impacts from the dust and pollution from coal mining operations is growing and given that this project proposal is upwind of the Collinsville and Scottville communities and there are long standing rumours of a cancer and respiratory disease cluster, epidemiological research that would be expected in future will require as high a quality of monitoring as possible.

Here are some more recent reports that are relevant to this coal mine proposal:

http://www.cancer.org/Cancer/news/world-health-organization-says-diesel-exhaust-causes-cancer
Article date: June 15, 2012 A group of experts from the World Health Organization (WHO) has classified diesel engine exhaust as a carcinogen – a substance that causes cancer. The International Agency for Research on Cancer (IARC), which is part of the WHO, based its decision on what it calls "sufficient evidence" that exposure to diesel exhaust causes lung cancer and "limited evidence" that it increases the risk of bladder cancer. The new classification moves diesel fuel from the category of "probably carcinogenic" to "carcinogenic."

http://www.iarc.fr/en/media-centre/pr/2012/pdfs/pr213_E.pdf

Lyon, France, June 12, 2012 -- After a week-long meeting of international experts, the International Agency for Research on Cancer (IARC), which is part of the World Health Organization (WHO), today classified diesel engine exhaust as **carcinogenic to humans (Group 1)**, based on sufficient evidence that exposure is associated with an increased risk for lung cancer.

http://mines.industry.qld.gov.au/safety-and-health/683.htm
There is a wealth of information on the Qld Government website about the hazards from blasting yet there are no references at all in the EIS Appendix K Air Quality Assessment.

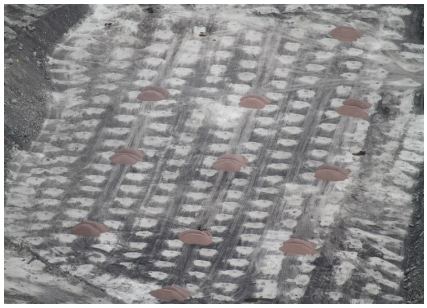
I had an experience at a Qcoal Sonoma road block about 1 km from the Collinsville Old Town and beside an industrial depot and residence on 12.10.12 from 4pm. The window of my utility was open when i took these photographs. The cloud of dust came straight over our vehicles and the dust burnt my eyes and I experienced burning and discomfort for more than 2 weeks. The cloud could be seen drifting over the town after it passed over us. I have subsequently been informed that this gas and dust could have damaged my lungs.

Blasting on Sonoma Mine approximately 2km from this road block on Bowen Developmental Road.


Bowen Developmental Road approximately 1 km south of Collinsville.

Sonoma Coal Mine on Coral Creek

Beside Bowen Developmental Rd.



Shot firing/Blasting preparation.

Sonoma Coal Mine uses diesel machinery.

The Sonoma Coal Mine CHPP beside the road.

There are other concerns about this EIS Air Quality Assessment. On page 14 it states: Note that the Project site and surrounding area have little to no intervening topographical features that would affect dispersion patterns, and is also not unduly influenced by coastal effects (such as sea and land breezes) due to being located 150 km inland from the coast. Anyone that has been to Collinsville would know that it is a 84km drive and less than 75km as the crow flies from the coast.

DSEIS:
2.3.2.9 Noise & Dust / Habitat Protection
Comment GR 25 - EIS submission.
In conclusion I would like to point out that at the time of the EIS for the Sonoma Coal Project I choose not to make any objection to the mine as the local community was suffering a depressed economy and needed more job creating industry. I now regret this as do many people in this area as issues with noise and dust has proved to be considerable and myself and others have spent the last 2 years trying to protect the habitat and water of Coral Creek that is threatened by its clearing, mining and diversion despite promises in the EIS of its protection.

Response
Noted, the Proponent is taking all design measures and working to state approved guidelines and standards to minimise the impacts of the mine on the receiving environment.

SEIS Comment: It is hoped that the project proponent will not use its strength of financial, legal, political and technical consultant power to overturn or minimise the standards and exploit the weaknesses and inadequacies in the legislation and guidelines that protect environmental and public health.

The dust modelling and results used are inadequate and there are shortcomings and faults in the assessment reports. Collinsville and rural properties will be sure to suffer a great increase in dust. The Sonoma mine has resulted in significant levels of dust in Collinsville so along with Jax mine there is a more than 10 times increase in mining activity proposed that will still be well within our dust spread zone.
I think there is a definite case to scale the mine down and bring the CHPP and co-disposal dam further back from the Bowen River and install a safety levee to eliminate the risk from a collapse of the dam and to remove the pits from areas subject to flooding from the River and the 12mile Gully. There should also be an upgrade in dust suppression as the water trucks only wet the roads yet a major source of dust is the excavator and truck buckets and stockpile loaders. It would not be difficult to use water sprays and skirts, and given the serious health effects from coal dust, would be cost effective with full cost accounting.
Also there is an issue with the amount and quality of diesel used in the mines and the coal trains that will increase in number.
There should also be baseline and monitoring studies done on the health of residents of Collinsville to determine it's relationship with dust levels and particle analysis.

EIS Submission.
Again Collinsville is in an uncertain position with a politicised and polarised debate around the environmental issues with the Carbon Tax, Abbot Point, the Collinsville Power Station and the Great Barrier Reef.
As a result of this atmosphere of fear and confusion people become reluctant to speak out publicly but from my observations become more angry and dis-empowered.
Involving the local community in the EIS process is crucial to the utilisation of local knowledge and the goodwill of the community towards the operation of the project as well as scrutiny and verification of standards of performance. The following is an example of new information coming to light:

Australian Broadcasting Corporation – 730 - Broadcast: 25/02/2013 Reporter: Peter McCutcheon
A World War Two plane wreck, and unofficial war grave, could force a rethink on coal port expansion plans in North Queensland.

PETER MCCUTCHEON, REPORTER: Anne Mecklem has spent a lifetime exploring underwater. But there's one deep-sea discovery that she rates as her finest.

ANNE MECKLEM, AUSSIE REEF DIVE: It's just one of those things that, you know, you hear about it and it's, again, history. You know, history and also sad history too…

PETER MCCUTCHEON: Dive operators Anne Mecklem and her husband Brian documented for the first time the location of a World War II plane wreck. It's a remarkable piece of history that has been part of local folklore since the 1960s when fishermen would complain about getting their nets snagged.

PETER MCCUTCHEON: This is the entire rear section of a Catalina flying boat, a long-distance patrol aircraft that crashed into the seas off Bowen in North Queensland in 1943, killing 14 people. Using a depth sounder and local fishing maps, Anne and Brian Mecklem dived 40 metres to record what had been hidden for nearly 70 years…

PETER MCCUTCHEON: So it's not surprising the discovery of what remains of the Catalina made front-page news in the local newspaper two years ago. But the story didn't spread much beyond Bowen.
ANNE MECKLEM: We would've thought really that it had been reported to the proper authorities and put in - that it would be on the shipwreck, the historical shipwreck database.
PETER MCCUTCHEON: But of course it hadn't. All it was was a local story.
ANNE MECKLEM: Yes, that's right.
PETER MCCUTCHEON: It's only this year that locals felt a need to push for wider acknowledgement of the Catalina discovery because of the rapid expansion of coal mining with proposals to dredge around the nearby Point Abbott terminal.

The North Queensland Bulk Ports Corporation wants to dispose of up to three million cubic metres of dredged material offshore, and according to official documents, this could possibly mean the silt would bury the site of the Catalina wreck.
BOB HOSE, BOWEN RSL: We want to protect the integrity of the crash site so we don't want any of that plumes of silt or anything going into that site. ...
... It's probably, unofficial, a war grave. The bodies were never recovered as far as I know.(end quote)

It should not need to be said that mining operations present one of the highest environmental impacts of any industry. The open cut coal mining industry is also in the position of having a large footprint that is escalating at the time when it's future is limited because of the development of alternatives and the recognition of it's broader impacts.
It is therefore critical that the future of alternative industries to coal mining are not damaged by poor design or maximising resource recovery when there will be a large reserve in excess of the expected demand.
The pace of change, technological development, understanding of ecosystem services and advances in governance accountability would be expected to result in a much better standard of development for us and future generations.

The following text was not include in my comments on the DSEIS. I believe these comments on the political climate are important as we do not exist in a vacuum.
From page 8 – Draft Supplementary EIS - 26th November 2012
There is also another issue that is not helpful to due process for the EIS. A political narrative has been widely publicised locally for some time now, that suggests that a green party campaign with a anti-development agenda underlies environmental concerns with mining and water quality issues.

Some of the language used could be considered vilification and it appears there is a strategy to stigmatise and marginalise people that speak out about environmental issues and concerns.

SEIS:

Comment GR 44 – DSEIS submission.
This community has a strong opinion that the EIS process is a waste of time and regulation is not effective (not my opinion) and that local knowledge is not considered and decisions are made by people that have never been to see the country, creeks and rivers for themselves (I agree with this from my experience).

Response from proponent
This submission is new material that was received after the submission period ended.
Noted.

SEIS Comment. There seems to be a very cynical attitude towards Government Regulation and the EIS process in the community as I have related. Many of the people who I have spoken to from inside the mining industry and outside landholders have had experiences that continue to amaze me. The following article covers some of the issues:

http://www.abc.net.au/environment/articles/2013/03/06/3703819.htm
Do environmental assessments protect the environment?
Bianca Nogrady ABC Environment 6 Mar 2013
Andrew Macintosh - Associate Director of the Australian National University's Centre for Climate Law and Policy - says EIAs are as much about public consultation as they are about improving environmental outcomes. On that question, he feels the EIA process also leaves a lot to be desired.
"The problem is that public participation sounds nice in theory and a lot of people support it in theory, but in practice it isn't working," Macintosh says.
To begin with, the EIA reports, which are required to be made available for public comment before a decision is made on a project, are often inaccessible.
"The public gets 30 days to make comment on an EIA that can be up to 5,000 pages long, which is completely unrealistic," he says. "A lot of them are standardised documents, and they just basically fill in the gaps, so the reader is often faced with hundreds, sometimes thousands, of pages of gumpf."
He suggests regulating the size of the documents and ensuring succinct and accessible summaries of the most important points of the report....
"When people have actually looked at how accurate these assessments are, they have found a significant gap between the predicted impacts and actual impacts. The reports have predicted that x was going to happen, when in fact, the impact was y," he says.
"When you think about it, the inaccuracy in predictions is not that startling. The contractors have to make assessments about difficult-to-predict variables with little information and compressed timeframes.
"For example, species and ecological community assessments are often conducted from one site visit. If it's a herbaceous species and you walk across the site and it's not the right time of year, you aren't going to see it."
Another concern is the fact the consultants are paid by the proponents. "So you have that inherent problem everybody knows, particularly researchers, that when you get money from somebody it tends to influence what you say," says Macintosh.
However, Morrison-Saunders says a 'user-pays' system is the best way to go, as it places the responsibility on the proponents, rather than the consultant or regulator.
"If you make the regulator responsible, they can prescribe all sorts of management measures that proponents have to do, which seems fine. But then what happens when the management measures are done exactly according to the book, and they don't work?" he asks.

"If it's the mining company who is responsible for the environmental performance and it's the managing director of the mining company who could theoretically be jailed or fined $1 million if they have a pollution incident or they don't do the right thing, then they have to employ appropriate consultants." (**SEIS Comment:** I see a problem in Queensland with this approach as the fines for failure to comply with EAs and environmental regulation are completely inadequate. A case in 2010 of a pit water spill into Coral Creek from Sonoma mine because of an unauthorised discharge into a stormwater channel that had failed to be inspected for 3 consecutive quarterly inspections, and because the mine had been given a warning 2 months before after a DERM inspection had found a co-disposal dam overtopping, received a fine of $2000, See PIN.000555. **(see att. Appendix A)**
I have also been told by operation managers and staff of other mines in the Bowen Basin that they often are instructed to discharge into creeks as the fines and chance of being caught are so low.)
While the current EIA process has come in for its fair share of criticism, Dr Morrison-Saunders believes it succeeds in striking a balance between competing interests.
"There's an art to impact assessments - and that's the art of striking this balance between enough scientific information to make an informed decision and put in place a robust management system, and bowing to the pressures of politics and short-term economic gains.
"What tends to happen is everyone grizzles and moans and the good things of the EIA process are quietly ignored: good things about how projects are redesigned or how public comments are taken on board and people's concerns are actually woven into the redesigning projects or management in a different way."

Barry 06 Mar 2013 10:56:44am
The EIA process as it currently operates in most states is an absurdity. EIA's do achieve what they are designed to achieve - that is, to facilitate the progress of the proponent's project. The environmental validity of EIA's is completely compromised from the outset by state regulations which allow the proponent to hire his own consultant to do the job for him.
Clearly, this is a lucrative business for the environmental consultancy industry. Many major environmental consultancies are subsidiaries of large companies that also do construction, engineering and mining. In other words they are part of the development industry. These are examples of Caesar appealing to Caesar.
We have many instances of EIA's being simply desktop studies, with little or no ground truthing of sites. We have many cases of on ground work being carried out by staff poorly qualified to do the work. Many site studies are 'snapshot' surveys where a site is visited by a consultant for a very short time, often at the wrong time of day, with little hope of really understanding the biodiversity of the site - the main objective being to tick off the boxes. We have examples of consultants leaving out critical information that might otherwise jeopardise the project. After all, if you want ongoing business in the industry, you don't upset those who pay you.
A better model might be for governments to establish a list of independent, accredited environmental consultancies, and have an independent board which appoints them to do the work on projects. Proponents simply pay a fee up front for the cost of the work but don't compromise the outcome by being directly involved in hiring their preferred consultant.(end quotes)

I agree with a lot (but not all) of these comments as from my experience there seems to be a very serious problem with industry capture as I could not find a consultant to work on a case to oppose a proposal by a mining company to divert a creek that we depend on for our farms water supply and is critically important to the survival of a NCA listed species. I contacted most of the consultants operating in Queensland and found they were conflicted because of involvement with the proponent or considered the case to not be in their corporate interest after a risk analysis.

SEIS: Comment GR 45
Another thing that is also having an impact on the political climate is resistance to new technology associated with energy efficiency and renewable energy and the science of climate change because of fear that there may be a resultant reduction in employment. There are many reports that show high employment levels and other technological and quality of life spin-offs from these new industries and technologies.

Response
This submission is new material that was received after the submission period ended.
Noted.

SEIS Comment. I am very concerned about what I have seen for quite a while now with some industry think tank lobby groups spreading disinformation and muddying the waters as a way of weakening scrutiny and opposition, reducing project costs and maximising returns. I am not suggesting that the proponent in this case is engaged in that activity but they are benefiting from it.

Many people are misinformed and confused, and not able to make well informed decisions.
The great risk with allowing distortions of the decision making process is that the less than optimum options are taken which could prove to be very expensive as economies with more transparent and ethical governance will be on the more sustainable path.

There is also a great disadvantage for the community and industries that have a much longer term perspective and are not receiving a windfall profit from extracting a natural resource that the industry is not paying the full cost of, because we have less financial ability in the short-term to pay for teams of consultants, solicitors and public relations personal.

A foundation of democracy and good governance is government measures that balance the power of dominant self interested players with the less powerful in the community. The dangers of allowing distortions in the decision making process are written in history, have been very costly and we continue to live with the consequences as will future generations.

From my knowledge of power generation there are inherent limitations to the energy efficiency of fossil fuel technologies and even with coking/metallurgical coal, solar and renewable alternatives would be expected to dominate investment in the not too distant future. So that makes it very important that infrastructure is able to meet the higher standards and advanced alternatives that are inevitable.

And the renewable alternatives will be dependant on good water and land quality and healthy communities so the existing and proposed mines should be maintaining high standards of design and rehabilitation. It could be expected that the industries that will be in a declining position will be crying poor and making demands for standards to be cut to remain viable. I hope we do not fall for this as this will result in a loss for developing industry viability and disadvantage for our future generations.

There are some fast moving changes coming in the business and technology of energy and resource use around the world, and there is no way that Australia can remain isolated from that reality. Communities such as ours that depend heavily on coal mining will face challenges but there are enough other existing and new industries that will secure the area's future for the very long term. Because of the finite nature of coal mining it is extremely important that the foundations of the other local industries are not undermined.

The process of design and approval for mining projects has some failings that are becoming more

evident like the degree of degradation of valuable land and water resources as well as the cumulative impacts locally and further afield.
The international issue of global warming/climate change is a major factor that is very threatening world wide and is predicted to affect Australia more adversely than most other countries. There is a natural resistance to accepting what looks like a disadvantage for us and a lot of misinterpreted information is circulating as well as misinformation spread to serve vested interests.
For example there is a view that the world is facing a new iceage and a warming will be to our benefit. The following article explains the misunderstanding that has occurred.

http://www.bbc.co.uk/news/science-environment-16439807
BBC News 9.1.12
In the journal *Nature Geoscience*, they write that the next Ice Age would begin within 1,500 years - but emissions have been so high that it will not.
"At current levels of CO2, even if emissions stopped now we'd probably have a long interglacial duration determined by whatever long-term processes could kick in and bring [atmospheric] CO2 down," said Luke Skinner from Cambridge University.
Dr Skinner's group - which also included scientists from University College London, the University of Florida and Norway's Bergen University - calculates that the atmospheric concentration of CO2 would have to fall below about 240 parts per million (ppm) before the glaciation could begin.
The current level is around 390ppm.
Other research groups have shown that even if emissions were shut off instantly, concentrations would remain elevated for at least 1,000 years, with enough heat stored in the oceans potentially to cause significant melting of polar ice and sea level rise.
Groups opposed to limiting greenhouse gas emissions are already citing the study as a reason for embracing humankind's CO2 emissions.
"It's an interesting philosophical discussion - 'would we better off in a warm [interglacial-type] world rather than a glaciation?' and probably we would," he said.
"But it's missing the point, because where we're going is not maintaining our currently warm climate but heating it much further, and adding CO2 to a warm climate is very different from adding it to a cold climate.
"The rate of change with CO2 is basically unprecedented, and there are huge consequences if we can't cope with that." (end excerpts)

I received a youtube clip the other day that is going around, it goes through 5 environmental disasters it says never happened, one of them, acid rain, is something I have knowledge of. When travelling in West Germany in 1996, I visited a coal fired power station near Munich that was the first to retrofit a desulfurisation plant to reduce sulphur dioxide (SO2) emissions and acid rain. I was aware that acid rain had resulted in the death of all life in lakes in Scandinavia and the eroding of heritage buildings across Europe but I was not aware of the seriousness of the human health effects. I wanted to get some details and found this research paper:
http://www2.vwl.uni-mannheim.de/fileadmin/user_upload/pigorsch/pdf/luechinger.pdf
Air Pollution and Infant Mortality:
A Natural Experiment from Power Plant Desulfurization
Simon Luechinger* University of Lucerne and KOF Swiss Economic Institute, ETH Zurich
August 04, 2010
The paper estimates the effect of SO2 pollution on infant mortality in Germany, 1985-2003. I exploit the natural experiment created by the mandated desulfurization at power plants, with wind directions dividing countries into treatment and control groups. **See page 29 of the paper, graph directly relating infant death reductions to the reduction in SO2 pollution in Germany.**
Desulfurisation is now the norm in Europe and is being fitted to plants in China now that they are

experiencing an environmental disaster and their smog is even reaching the west coast of the United States.
A feedback comment made on the youtube video sums it up, that the problems were not as serious as threatened because people got up and done something about the problems and found alternatives.
At present there also seems to be a political strategy to deny or at least postpone the changes necessary but this will put us behind the eight ball and continue the process that is degrading our natural capital at a time when it's value is being recognised and we stand to gain by retaining as much of it as possible.
There could be an argument for trying to exploit our natural resources at the expense of our natural capital (while its value is not accounted for) while we can, but the serious downside is that we will be in a weaker position for ever after if we take the short sighted path. Natural capital has the potential to sustain us indefinitely if we manage it properly.

Economic Imperatives
The problems evident in the approval and regulation processes are great and the long term consequences very serious. The economic implications of making decisions based on poor quality information biased towards the status quo at a time of rapid advances in the technologies of ecosystem analysis and industrial production are also very serious. We risk wasting limited resources on dinosaur technologies and building expensive white elephants.

The present economic orthodoxy, that considers social, health and environmental costs as externalities is now obviously unsustainable and the change to real Triple Bottom Line/True Cost Accounting is likely to occur soon and be internationally adopted very quickly. Nations and States that are not prepared for this inevitable and imminent eventuality will be left at a great disadvantage.

There are growing doubts about the inherent biases and vested interests that influence the interpretation of information of variable quality and growing complexity. The quality of advice from Government Bureaus in the United States as well as in Australian and other democratic countries is being questioned as it is often proving to be seriously inadequate. As the world population continues to grow and the environment continues to degrade, the quality and precision of decisions becomes a great deal more important. Changes in world political power becoming more concentrated in corporate hands and countries that have limited effective democracy growing in influence gives reason for concern but a strengthening of governance and transparency standards in International relations would be expected to progress as the stakes grow higher. Rigorous truly independent assessments should become more of a imperative and commonplace.
Here are some articles from respected sources that illustrate the diversity of views in currency:

Too Much Luck - The Mining Boom and Australia's Future by Paul Cleary Blackinc Books 2011
Our state and federal politicians have become so bedazzled by the prospect of even greater mineral riches that they are eagerly encouraging a resources rush while neglecting long-term ecological and financial consequences.
Australia needs to reform its regulation of the mining industry, in particular by embracing greater cooperation between state and federal governments than our 1901 Constitution provides for.
Without such reforms, a handful of multinational companies will continue to profit enormously from resources that by rights belong to all Australians. Under our current system, those most directly affected by mining projects-local communities, regional towns, Indigenous land-owners-often benefit very little.
Relying on resource commodities to pay your way in the world thus makes countries more vulnerable to global prices and supply resources. As Warren Buffett has said, there ain't anything special about the stuff-it has no unique 'franchise'- and that's why the world's most successful investor avoids the sector. Coal and iron ore are nothing like a Great Barrier Reef or Kakadu holiday experience, which are unique in the world and

which European and Asian tourists are willing to pay very good money for. They are nothing like our grain, beef or dairy exports, which benefit in global markets from our reputation for a healthy food production chain. They are nothing like the education services that were earning Australia close to $20 billion a year until recently. And nor are they anything like the medical products made by CSL, Cocklear or the emerging adult stem cell company Mesoblast. These products are either unique or have brand value that is difficult or impossible to copy and which has therefore secured them a place in the global economy.
But while commodity prices are high, the boom will play havoc with these other exporters, who will see their foreign currency earnings slashed when they convert them to Australian dollars.
The Minerals Council of Australia (MCA), which is funded mainly by the big miners, has strongly denied that the mining boom is having a negative impact on industries such as tourism.

http://dea.org.au/news/article/coal-curse-the-black-side-of-the-subsidised-resources-boom
Doctors for the Environment – Coal curse: the black side of the subsidised resources boom. 8.7.12
The Reserve Bank has argued that, while the importance of the resources boom has provided a positive impetus for the Australian economy, our over-reliance on minerals is a "resource curse" that looms ominously over our economic future.
In a resource curse, high levels of investment and support for the resource sector undermine the viability of other industries that provide more enduring employment opportunities and are more ecologically sustainable. But Australia's resource curse has an even blacker side, because it is based on an insidious myth about the real economic costs of coal.
Burning coal is the primary source of Australia's apparently "cheap" energy. Paradoxically, while coal generates a lot of royalties for State governments and is the nation's second largest export earner, the industry contributes only around 1.8 per cent to GDP. This is compared to other industries such as financial and insurance services (9.6%), retail and wholesale trade (8.6%), construction (7.7%) and health care and social services (6%). It is a relatively insignificant employer, even where mining is concentrated. In the Hunter it employs only 6% of the region's workforce.
These economic positives: export and royalty income, energy supply, and a small contribution to GDP and employment, have to be weighed against some very high costs. These are usually invisible in the public debate about the coal resource.
The whole mining industry receives a subsidy in the form of a tax rebate on the diesel that fuels the trucks and machinery. This $2 billion a year subsidy amounts to $87 annual contribution from every Australian.
Governments provide many high-energy users like miners with cheap electricity. For example, while household and small business electricity prices in NSW are rising at around 15% per year, wholesale prices paid by industry have not risen for 12 years. NSW residents subsidise the price of coal to power stations as well as pay higher electricity prices
We don't just bear the cost of coal through the subsidies our taxes fund. There are other costs. The Newcastle-Hunter region provides a good example of the darkest side of the coal curse. Productive rural industries have thrived for two hundred years in the Hunter Valley, including viticulture, horse breeding and mixed farming. These industries, essential to food supply and a balanced, mixed and ecologically-sustainable economy are being displaced as mining extends its reach.
Waterways and land are blighted with saline discharge from mines, coal dust and power station fallout, damaging crops and stock as well as eradicating native species. Villages, farms and heritage properties have disappeared while punishing shift work schedules and a commuter workforce threaten the fabric of family life and community organisations.
The health costs of coal mining and burning are severe, leading some experts to brand coal "the new tobacco". The Australian Academy of Technological Sciences and Engineering (ATSE, 2009) estimated the total healthcare bill in Australia from coal-fired power station pollution to be $2.6 billion a year.
On a global scale, coal is the leading source of greenhouse gas emissions and thus the main industrial source of climate change. The burning of coal for electricity has grown faster than any other source of greenhouse gas emissions, and accounts for more than half of world emissions from stationary sources.
Though the costs to Australian and global society are huge, with such generous government subsidies, it is not surprising that production of coal-fired power shows no signs of abating, and likewise the continued growth of coal mining and coal exports. The coal curse has descended on Australia, and without urgent action we can only look forward to a mounting burden of illness, environmental degradation, economic dislocation, social disintegration and a warming planet.

The National Strategy for Ecologically Sustainable Development (COAG 1992) (ESD) principles. *The key objectives of the ESD as outlined in the Strategy are:*

- *"To enhance individual and community well - being and welfare by following a path of economic development that safeguards the welfare of future generations;*
- *To provide for equity within and between generations; and*
- *To protect biological diversity and maintain essential ecological processes and life – supporting systems".*

The principles presented here are very admirable but there are serious questions about the balance between these principles and the maximisation of short term production and profit that is evident in most resource extraction proposals. **It would seem that the ESD protocol is only given lip service from most levels of State and Federal Government judging by recent decisions. The underlying principle that our economy is a subsystem of the ecosystem seems to have been forgotten or is being ignored.**
The Rio+20 Conference on Sustainable Development last year shows how much is happening worldwide and how disciplines that have been in the background would be expected to continue to emerge after the wakeup call of the GFC.

CONCLUSIONS OF THE UNITED STATES FINANCIAL CRISIS INQUIRY COMMISSION

Financial institutions and credit rating agencies embraced mathematical models as reliable predictors of risks, replacing judgement in too many instances. Too often, risk management became risk justification.
http://fcic-static.law.stanford.edu/cdn_media/fcic- reports/fcic_final_report_conclusions.pdf

http://www.guardian.co.uk/environment/2010/feb/18/worlds-top-firms-environmental-damage
The cost of pollution and other damage to the natural environment caused by the world's biggest companies would wipe out more than one-third of their profits if they were held financially accountable, a major unpublished study for the United Nations has found.
The report comes amid growing concern that no one is made to pay for most of the use, loss and damage of the environment, which is reaching crisis proportions in the form of pollution and the rapid loss of freshwater, fisheries and fertile soils.

From:**Australian Government response to the report of the independent review of the Environmental Protection & Biodiversity Conservation (EPBC) Act. June 2011**
International reports have confirmed the value of biodiversity and in particular ecosystem services. For example, the recently released United Nations Environment Program report, Dead planet, living planet: Biodiversity and ecosystem restoration for sustainable development , notes that ecosystems deliver essential services worth between US$21 trillion and US$72 trillion a year, which is comparable with the 2008 World Gross National Income of US$58 trillion. At the same time, recent international findings continue to confirm that global biodiversity is in significant and ongoing decline. To tackle the challenge of biodiversity decline we must change how we manage the natural environment. This shift is important if we are to maintain healthy and resilient life-supporting ecosystem functions and biodiversity, particularly in the face of the impacts of climate change on natural ecosystems.

http://www.ecoeco.org/content/
Ecological economics exists because a hundred years of disciplinary specialization in scientific inquiry has left us unable to understand or to manage the interactions between the human and environmental components of our world. While none would dispute the insights that disciplinary specialization has brought, many now recognize that it has also turned out to be our Achilles heel. In an interconnected evolving world, reductionist science has pushed out the envelope of knowledge in many different directions, but it has left us bereft of ideas as to how to formulate and solve problems that stem from the interactions between humans and the natural world. How is human behaviour connected to changes in hydrological, nutrient or carbon cycles? What are the feedbacks between the social and natural systems, and how do these influence the services we get from ecosystems? Ecological economics as a field attempts to answer questions such as these.

Conclusion
Collinsville has a proud history in mining and community solidarity and social cohesion but it is facing great challenges with the critically important issues of personal, community and environmental health.

It is argued that the reporting of the issues we have are largely a result of exaggeration for political or financial purposes but for those of us on the coalface the reality is hard to downplay, dismiss or ignore.

The cost to families and communities from a loss of environmental and personal health is incalculable and cannot be traded off in a zero sum game of winners and losers.

We must aim for zero harm in the workplace and in the community.

Post Script
This submission has been written in the spirit of the mountains of impact statements, expert reports, scientific papers, government acts, affidavits and books and articles that I have had to read over the last two and a half years.

Many people are coming to the same conclusion, that the democratic and bureaucratic process of Government is not infallible and depends on people of good faith contributing to the governance process and being vigilant and speaking out when the process fails or is corrupted.

"Democracy is the worst form of government, except for all those other forms that have been tried from time to time." (from a House of Commons speech by Winston Churchill on Nov. 11, 1947)

The advantage of democracy is its responsiveness to the common sense of people and the check that it makes on the power of narrow political or corporate interests but democracy is vulnerable and needs our respect and care.

“The twentieth century has been characterized by three developments of great political importance: the growth of democracy, the growth of corporate power, and the growth of corporate propaganda as a means of protecting corporate power against democracy.”

Alex Carey, *Taking the Risk out of Democracy: Propaganda in the US and Australia*

I apologise for any mistakes, inaccuracies, bad grammar and potentially selective presentation of information in my submission. (I am very aware of selection bias and cherry-picking of information presented as impartial and see evidence of this from quarters that you expect to be more careful and ethical, which causes me great concern. As a layman I present this submission from a personal perspective and welcome academic analysis of the content and material that I do not claim to be completely impartial as these issues are experienced very close to home.)

I am very grateful to the Senate of the Parliament of Australia for the opportunity to contribute to this Senate Committee Inquiry.

Yours Sincerely, Garry A Reed

21st May 2015 EMAIL TRANSMISSION

Committee Secretary
House of Representatives Standing Committee on the Environment
PO Box 6021
Parliament House
Canberra ACT 2600

environment.reps@aph.gov.au

Garry Reed

Register of Environmental Organisations

Dear Committee Secretary, please accept this submission to your inquiry into the administration, transparency and effectiveness of the Register of Environmental Organisations under the *Income Tax Assessment Act 1997*.

Term of Reference: The House of Representatives Standing Committee on the Environment will inquire into and report on the administration and transparency of the Register of Environmental Organisations (the Register) and its effectiveness in supporting communities to take practical action to improve the environment.

The Inquiry will have particular regard to:

- the definition of 'environmental organisation' under the *Income Tax Assessment Act 1997*, including under Subdivision 30-E;
- the requirements to be met by an organisation to be listed on the Register and maintain its listing;
- activities undertaken by organisations currently listed on the Register and the extent to which these activities involve on-ground environmental works;
- reporting requirements for organisations to disclose donations and activities funded by donations;
- the administration of the Register and potential efficiency improvements;
- compliance arrangements and the measures available to the Department of the Environment and the Australian Taxation Office to investigate breaches of the Act and Ministerial Guidelines by listed organisations; and
- relevant governance arrangements in international jurisdictions, and exploring methods to adopt best practice in Australia.

I support an inquiry into *the administration and transparency of the Register of Environmental Organisations* but I also believe it is critically important for balance to inquire into industry organisation registration as they have an enormous advantage over community organisations and landowners/leaseholders.

It concerns me that this inquiry is pre-empting an outcome as it states in the terms of reference, to inquire into *the effectiveness in supporting communities to take practical action to improve the environment.* As someone that has been involved in community groups and as a landowner attempting to represent ones interests against powerful industries and businesses, it can be incredibly difficult to match their financial and organisational resources.

It is understandable the businesses and industries would use what is legally available to them to maintain and promote their interests and protect their investments, inventories and resource reserves. This situation though presents a great challenge to our society when old established industries coupled to redundant damaging technologies are threatened by newer more efficient and more desirable technologies. The organisations that uphold the community and public interest are critically important under these circumstances.

I would suggest that *practical action to improve the environment* is almost fruitless when the political and financial power is so out of balance in our country. The need for an open and fair system of decision making so that the best technology, quality standards and outcomes for the broader community are achieved should be obvious.

The history of development in Australia to date has some tragic aspects that have squandered natural and social capital and lost great opportunities leaving us in a much more impoverished position than we could have been. I will follow with some references and comments that illustrate my claims.

In 1995 Australia with the help of the Energy Research & Development Corporation (ERDC) was leading the world in solar voltaics and developed the evacuated tube solar hot water system. One of the reports from ERDC (Report No: ERDC 243 – Hot Dry Rocks Feasibility Study – December 1994) states *Large amounts of energy held in Hot Dry Rocks [HDR] lying beneath Australia's continental crust could equal several thousand years of Australia's total energy consumption.* The ERDC was abolished after the election of the Howard/Costello Government in 1996/97.

It is also painfully evident that the prejudice shown for coal mining by successive federal and state governments has caused serious long term losses that will be far greater than the short term benefits.

The weakening of the Renewable Energy Target (RET) as a means of helping the conventional power generators at a time of pressure to transition to renewable energy is not doing anyone any favours as it is extending the life of highly polluting power plants with escalating fuel costs to the detriment of higher technologies with lower operating costs and pollution. The international progress of renewable energy and energy storage and efficiency makes postponement very damaging to our competitiveness and leaves Australia with an extremely costly environmental and health legacy.

There has been a political narrative running for decades that demonizes the Green Party and environmental groups. It seems there is a campaign on foot to discredit and devalue those that are promoting environmental interests.

A speech in the Senate by Liberal Senator for Queensland George Brandis on the 28th

October 2003 is on the Hansard record. Senator Brandis said there were similarities between the methods employed by contemporary Green politics and the methods and values of the Nazis. ABC RN's "*Earthbeat*" 8.11.03 - interviewed the author of a book the Senator referred to as going all the way to explaining the modus operandi of the Greens with Senator Bob Brown's unauthorised question to President Bush the week before. Raymond Dominick, the author of "*The Environmental Movement in Germany: Prophets and Pioneers,1871-1971*, when asked about how his book was used said "*he was a little distressed to see that the point I thought I had made was misconstrued, in fact I think it was twisted almost into its opposite"*. He went on to say," *for the Greens, racist conservation is not part of their world view at all, I see the Greens as descendants of those parts of the conservation movement that were not tainted by Nazism, which is exactly the opposite of the argument that Senator Brandis was making"*.

Recently the MP for Dawson George Christensen has been expressing extremely inflammatory and outlying views on climate and the environment.

http://www.smh.com.au/federal-politics/political-news/nationals-mp-george-christensen-calls-green-activists-terrorists-20140925-10lt5a.html

Nationals MP George Christensen calls Green activists 'terrorists'

Date - September 25, 2014 - Latika Bourke - National political reporter

One of Prime Minister Tony Abbott's MPs has lashed green groups, including Greenpeace, as "terrorists" and in a bizarre speech to Parliament has declared radical green groups as the greatest terror threat to North Queensland.

Nationals MP George Christensen is fighting activists whom he calls "gutless green grubs" opposed to the expansion of the Abbot Point coal terminal in his electorate. In his speech to Parliament, the outspoken MP said "the greatest terrorism threat in North Queensland, I'm sad to say, comes from the extreme green movement".

Labor's justice spokesman David Feeney rounded on the MP, calling him an "idiot" and demanded he apologise for his "infantile, outrageous and insensitive" comments made after last week's anti-terrorism raids and this week's fatal shooting of a "known terror suspect".

http://mediamatters.org/blog/2014/07/07/climate-denial-goes-vegas/199974

July 7, 2014 - ALEXANDER ZAITCHIK

Climate Denial Goes Vegas - The Heartland Institute hits the Strip with some much-needed comedic relief

Today, Chicago's Heartland Institute, the kings of unintentional climate-comedy, will hit the Vegas strip with a three-day show at Mandalay Bay Resort and Casino, featuring a chorus line's worth of hilarious climate rejectionists. The line-up will collectively perform the

energy-policy equivalent of a Henny Youngman routine: "Take my planet capable of supporting civilization. *Please!*"

The think tank that flacked for Big Tobacco against the science of lung cancer will perform off the same playbook to flack for Big Carbon against the science of greenhouse gases. Tickets to see these self-styled climate researchers and political operatives -- almost none of whom are climate or earth systems scientists and nearly all of them funded at one- or two-degrees remove by oil and coal interests -- run $129, including meals.

https://archive.is/Wg8q1 - **58 Experts Who Do Not Believe Global Warming is a Crisis.**

George Christensen was one of the expert speakers at this Heartland Institute's *9th International Conference on Climate Change* yet he only has an undergraduate degree in journalism.

From my experience with environment groups like the Mackay Conservation Group (MCG) the qualifications and standards of performance from staff has been very high and the assistance invaluable.

Our community and my family received critically important assistance when we were faced with a threat to the local major waterway – Coral Creek in 2010. We attempted to find an engineering consultant to make reports for submissions to the state and federal government assessment processes. We found that it is almost impossible to find a consultant that is prepared to work on a case that is opposing a proposal from a mining company, if you could afford the costs that run to $80,000.

In our case we did find some academics to make reports to take the case to the Land Court but unfortunately ran out of money after spending $275,000 and were unable to afford an appeal as the state and federal governments had defunded the public interest EDO's (Environmental Defenders Office).

Our case illustrates the critical importance of public interest environmental organisations.
(See attached – Appendix-1- Senate Inquiry - Certain Aspects of Queensland Government Administration - Submission 113 – page 7/8)
In the case of the diversion and mining of Coral Creek, expert reports conservatively estimate the sediment erosion from the diversion to be 100,000 tonnes and the latest determinations of costs for Reef Rescue type measures to reduce sediment by farmers or graziers and the federal government, at $200 per tonne resulting in a cost of $20million.

So for the diversion of Coral Creek with royalties and taxation calculated on today's coal prices, the benefit to the public is likely (guaranteed) *to be negative considering the loss of amenity, heritage, natural habitat and risks to water quality and supply.*

When you consider the case of the proposed diversion and mining of Coral Creek that was not necessary for the viability of the mine and has alienated much of the local community and to date has cost landholders over $250,000 and public interest contributions over $500,000, the value of good decision making at the outset is illustrated.

The process of working on submissions and studying reports connected with the Coral Creek case has made us very proactive about scrutiny of local developments. The problem of hazardous voids that concentrate salts and heavy metals and sterilise productive ground has only become evident to us while working on the documents concerned with the Coral Creek diversion. When I enquired with a DERM (Dept of Resource Mgt) officer about the leaving of voids I was told that because there was little public opposition they were not able to require mines to rehabilitate because the proponent would challenge the requirement. This also illustrates the need for public interest scrutiny and assistance for communities.

The Modernising Queensland Resource Acts (MQRA) program gave us great concern in March 2014. **(See Ap-1 page 8)** *It seems that the drive and ideology behind the changes proposed are largely based on maximising production rather than optimising development. It is expected that most mining companies would try to maximise production but if the governments who are responsible for regulation loose the balance between resource production and environmental and community health management there is a risk of conflict of interest and moral hazard.*

It also is looking increasingly like coal is in terminal decline because of the development of advanced energy systems and the changes to the world energy structures. (http://www.environomics.org/environomics/econSustain.pdf - Economics and Sustainability: Conflict or Convergence? - ***Maximizing income does not maximize well-being***)

Therefore fast tracking new mines at a time of declining markets will result in a glut and a loss of viability for existing mines at a time when communities depend on those mines and will need time to diversify their economic base and work on transition and adaptation.

Also there are large scale liability issues from the existing mines including hazardous voids and spoil heaps, inadequately rehabilitated watercourse diversions, coal seam and spontaneous combustion spoil heap fires, all contributing to a loss of water and air quality. If the existing mines become unviable before commitments are made to make good and upgrade environmental bonds, it is possible that the mining company liabilities will become a public and government responsibility.

In 2011 an application was made for Jax coal mine on the Bowen River near Collinsville. **(See Ap-1 page 7 & 16)** I go into some detail about the way the objections were not upheld because of a lack of resources and assistance to the MCG, the Whitsunday Regional Council (WRC) and my group of objectors. I have copied the 15 relevant points made in the Land Court decision.

In 2012 the MCG, the IESC (Independent Expert Scientific Committee), Government Departments and I also contributed to the assessment process for the Drake coal mine and I detail the long complicated process that resulted in major improvements to the plans because of serious design faults. **(See Ap-1 page 6 – 16)**

In April 2014 I made a submission to the **Inquiry into streamlining environmental regulation, 'green tape', and one stop shops. (See Ap-1 page 22 – 31)** I wrote the following that is very applicable to this inquiry. *Our great concern is that any changes that puts more responsibility into the hands of companies that have demonstrated a willingness to use the imbalance in power to their advantage and to manipulate and downplay their impacts at a cost to other stakeholders, could make a poor situation far worse.*

It should not need to be said that environmental impacts can be extremely serious with consequence that can last forever. Given that the economy is a subsystem of the ecosystem and biodiversity and land and water quality are foundations of ecosystem health, environmental regulation is of critical importance.

Our experience here over the last 3 years dealing with the proposal to divert and mine Coral Creek by Sonoma coal mine has been extremely financially and personally exhausting. I have spent all of my and my father's farm finance and life savings trying to have the mining of the creek we believe is a critically important water source for our farm and home, properly assessed.

We received expert scientific advice that there was a risk of failure of the Coral Creek diversion which would threaten the supply and quality of the water that constitutes the most reliable source for our farm. We also received legal advice that the baseline studies were so inadequate that it would be impossible to gain compensation or for the government to prosecute the mining company and seek rectification in the advent of a failure of the diversion.

We felt we had no option than to improve the conditions and baseline studies applying to the diversion of Coral Creek for our benefit and for others threatened by inappropriate waterway diversions.

I included a letter to the Qld Government in September 2012 about the issues relating to the Coral Creek mining and diversion proposal. **(See Ap-1 page 25)** *We have also spoken to academics with experience in this field and have again had disturbing analysis of the situation with the process of consultants writing submissions for mining companies.*

It has been suggested by a number of senior lecturers that there are many shortcomings in the approvals process and the situation puts the mining companies in a much stronger position than those that may be threatened by their proposals.

Therefore given the overwhelming imbalance in the resources available between the mining industry and the community and landholders, the strength of the Government regulating authority is of critical importance.

From my experience with the DERM during this case of the Coral Creek diversion proposal there is reason for concern that the regulating authority is understaffed and needs more resources.

My attempts to self-represent when the EA objection progressed to the Land Court proved too difficult and I was very grateful to receive the assistance of the Environmental Defenders Office of NQ with the case. Even with their assistance the costs of Barristers, expert witnesses and other expenses, the costs have depleted the financial reserves of my farm operation significantly.

Because of the very strong case that my expert reports present for very significant damage to

Coral Creek and the water quality for our farm and those downstream from its diversion and mining and the cessation of State funding to the EDONQ and EDOQld, I am now in the position of needing to use much of my savings to continue the case.

I have no alternative to this action as I intend to continue to work this farm and protect its environs as my Father did throughout his life. I will have to live with the consequences of the diversion of Coral Creek for the rest of my life and would rather live in poverty than regret.

There is little doubt that biodiversity is the foundation of the resilience of the ecosystem and our economy is a subsystem of the ecosystem. Policy decisions do not always take this into account and is leading to diminishing natural capital and environmental health for future generations.

The short term financial gain from the high risk components of the coal mining occurring in this area will be at the expense of our long term primary production and economic viability.

I also made a submission to the Senate Committee Inquiry into the Impacts of Air Quality on Health in March 2013. **(See Ap-1 pages 32- 52)** I refer to the defunding of the EDO by the Qld Gov. *The case is continuing and the costs are likely to pass the $100,000 that was saved by the Queensland government and will impact on my farming operation's future very significantly. The health and loss of income costs to us and those helping us are great also.*

The experience has been a great wakeup call and has motivated me to contribute to the regulation process as I understand how critically important it is. What has become obvious to me is that many companies will exploit every opportunity to maximise their profit if they are allowed to, and that this is actually an obligation to their owners and shareholders.

Therefore government and community organisations have a critical role to balance the power imbalance as the stakes are enormous.

One of my expert reports on the Coral Creek diversion drew attention to a very concerning problem that is being allowed across Queensland and from what I understand most of Australia.

*Drake EIS Submission - **4.4 Climate Change***
As well as a decrease in annual rainfall, an increase in daily precipitation intensity (rain per rain-day) and the number of dry days is predicted. The future precipitation regime will have longer dry spells interrupted by heavier precipitation events. Changes to extreme events would have the potential to increase erosion rates and flood frequency, with implications for river flow, water quality, and the design standards of infrastructure.
Drought occurrence is projected to increase over most of Australia (CSIRO, 2007). Climate Change in Australia, Technical Report, developed by Commonwealth Scientific and Industrial Research Organisation and the Bureau of Meteorology in partnership with the Australian Greenhouse Office, Canberra.)
Models have predicted a range in rainfall changes from an annual increase of 17% to a decrease of 35% by 2070. The 'best estimate' of projected rainfall change shows a decrease

under all emissions scenarios (DCC, 2009). (Department of Climate Change (2009). Climate Change Risks to Australia's Coast, Commonwealth of Australia, Canberra.)

*Drake EIS Submission - **4.4.5 Cyclones***
Under three different studies the number of severe tropical cyclones is projected to increase by 56% by 2050, 22% by 2050 and 140% by 2070.

These results are of great concern because of the presence on the site of residual voids liable to overflow and spoil heaps that may be unstable over time.

The soils of non-alluvial soil substrates naturally occur on level to very gently undulating slopes. When they are placed at any significant angle, they are prone to erosion by rain and wind and the resultant material is transported into waterways and sensitive receiving environments. Because of the uncertainties of climate change the problem may not arise for some time or could dramatically exacerbate existing problems.

I also refer to the QCoal Cows mine Environmental Authority requirement to monitor fine particle pollution PM2.5 yet wound back the condition in the Drake mine EIS**. (See Ap-1 page 39)** *The Draft EA - MIN100942709 for Cows Coal Mine immediately to the south of Sonoma Coal Mine and to the north of the proposed Drake mine has called for PM2.5 monitoring. It should be understood by the proponent that the DERM and now the EHP require monitoring of PM2.5 on new coal mines. It shows bad faith and disrespect for the Collinsville community by QCoal Drake to attempt to roll back best practice environmental standards. (I have confirmed that the final Cows Coal EA, signed 5 June 2012 requires PM2.5 monitoring.)*

SEIS recommendation – PM2.5 must be measured in this, the 13th year of the 21st Century under a democratic developed first world government.

How can the proponent be so sure that they will comply with PM2.5 modelling if they are not actually monitoring PM2.5? Expected to, the Project is predicted to comply, it is then fair to assume and, the Project is predicted to easily comply, are not good enough, why is there so much reluctance to agree to monitor PM2.5, it's not rocket science.

Also in this submission I detail how the community can be reluctant to speak out and make submission to the assessment processes of projects that have serious consequences for them. I also refer to a case in Bowen where a World War Two unofficial sea war grave site could have been damaged because of inadequate assessment by the proponent and only came to light after scrutiny by locals.

(See Ap-1 page 43) *It is hoped that the project proponent will not use its strength of financial, legal, political and technical consultant power to overturn or minimise the standards and exploit the weaknesses and inadequacies in the legislation and guidelines that protect environmental and public health.*

As a result of an atmosphere of fear and confusion people become reluctant to speak out publicly but from my observations become more angry and dis-empowered.

Involving the local community in the EIS process is crucial to the utilisation of local knowledge and the goodwill of the community towards the operation of the project as well as

scrutiny and verification of standards of performance. The following is an example of new information coming to light:

Dive operators Anne Mecklem and her husband Brian documented for the first time the location of a World War II plane wreck. It's a remarkable piece of history that has been part of local folklore since the 1960s when fishermen would complain about getting their nets snagged. This is the entire rear section of a Catalina flying boat, a long-distance patrol aircraft that crashed into the seas off Bowen in North Queensland in 1943, killing 14 people. Using a depth sounder and local fishing maps, Anne and Brian Mecklem dived 40 metres to record what had been hidden for nearly 70 years…

So it's not surprising the discovery of what remains of the Catalina made front-page news in the local newspaper two years ago. But the story didn't spread much beyond Bowen.
ANNE MECKLEM: We would've thought really that it had been reported to the proper authorities and put in - that it would be on the shipwreck, the historical shipwreck database.

I concluded this submission with some quotes that are very relevant to this inquiry.

Many people are coming to the same conclusion, that the democratic and bureaucratic process of Government is not infallible and depends on people of good faith contributing to the governance process and being vigilant and speaking out when the process fails or is corrupted.

"Democracy is the worst form of government, except for all those other forms that have been tried from time to time." (from a House of Commons speech by Winston Churchill on Nov. 11, 1947)

The advantage of democracy is its responsiveness to the common sense of people and the check that it makes on the power of narrow political or corporate interests but democracy is vulnerable and needs our respect and care.

"The twentieth century has been characterized by three developments of great political importance: the growth of democracy, the growth of corporate power, and the growth of corporate propaganda as a means of protecting corporate power against democracy."
Alex Carey, *Taking the Risk out of Democracy: Propaganda in the US and Australia*

There is a contention coming from some quarters that environmental groups are involved in some sort of conspiracy to close down the fossil fuel industry. From my reading of the issues over the last 50 years, the need to raise standards of mining operations and improve technology is desperately needed. I shared an experience from my travels in Europe that is very illuminating. **(See Ap-1 page 48)**

When travelling in West Germany in 1986, I visited a coal fired power station near Munich that was the first to retrofit a desulfurization plant to reduce sulphur dioxide (SO2) emissions and acid rain. I was aware that acid rain had resulted in the death of all life in lakes in Scandinavia and the eroding of heritage buildings across Europe but I was not aware of the seriousness of the human health effects. I wanted to get some details and found this research paper: http://www.precaution.org/lib/luechinger_air_poll_and_infant_mortality.140601.pdf

Air pollution and infant mortality: A natural experiment from Power plant desulfurization – Simon Luechinger ∗ University of Lucerne and KOF Swiss Economic Institute, ETH Zurich, Switzerland – Available online 24 June 2014

The paper estimates the effect of SO2 pollution on infant mortality in Germany, 1985-2003. It exploits the natural experiment created by the mandated desulfurization at power plants, with wind directions dividing countries into treatment and control groups. **See page 2 of the online pdf, a graph directly relating infant death reductions to the reduction in SO2 pollution in Germany.**

Desulphurisation is now the norm in Europe and is being fitted to plants in China now that they are experiencing an environmental disaster and their smog is even reaching the west coast of the United States.

Incredibly a coal fired power station has only recently been approved in Queensland without Flue Gas Desulphurisation (FGD) by the Coordinator General as part of the Galilee Basin State Development Area process.

The standard procedure now in Queensland is for coal and gas proposals to be of State Significance and then come under the Coordinator General's Department and it seems because of pressure to sign off on proposals, conditions are left without adequate certainty with further work pending. **(See Ap-1 page 4)**

I relate my experience of suffering major financial constraint after the Newman Government stopped all funding to the EDONQ. There are also details of the failure and lack of rigor with environmental assessments, winding back of environmental standards and the critical importance of local knowledge that is now threatened.

My comments on the MQRA (Modernising Qld Resource Acts program) Mining Lease Notification and Objection Discussion Paper. March 2014 - This submission and subsequent confidential submissions to the Parliamentary Inquiry into the Mineral and Energy Resources Act reform seems to have been in vain as my concerns and experiences were not reflected in the final Act. The following recommendation from the NSW ICAC would have saved a lot of us a lot of time and money if it had been applied to Coral Creek Collinsville.

http://www.icac.nsw.gov.au/
ICAC (Independent Commission Against Corruption – NSW) list of corruption prevention recommendations in relation to operations Jasper and Acacia - Wednesday 28 October 2013

Recommendation 8 - That the assessment panel provides a triple bottom line assessment of the environmental, social and economic factors of allocating an EL (Exploration Lease) and reports its findings to the steering group.

The issues I raised about voids in the submission are of serious concern and yet are only now being tagged for future work after approving a major project as in the Byerwen CG report: **Byerwen Coal project: Coordinator-General's evaluation report on the environmental impact statement – July 2014**

5.1.6 Open-cut mine pit voids

I consider there is a need to understand the best environmental, economic and social outcomes achievable with regards to mine pit management and the long-term implications of creating pit lakes and permanent residual voids in the Bowen Basin. I consider it is appropriate for DEHP or DNRM as lead agency to undertake investigations into the consequences of establishing a deep linear void trending parallel to many subsurface structural lineaments, including faults, across the entire Bowen Basin. Initially the research should determine the current location, number, area and depth of both operational mine pits and residual voids post mine closure as this information is not currently available for analysis. An approach to pit management and backfilling of future mine proposals could then be developed based on the known combined voids in the Bowen Basin and their economic impact on land use.

This quote relating to Carbon Dioxide emissions highlights the need for the community and government to put pressure on industry to keep up with world environmental standards.

http://www.abc.net.au/lateline/content/2013/s3787338.htm
Australian Broadcasting Corporation - Broadcast: 21/06/2013 - Reporter: Kerry Brewster
A billion dollar coal industry fund, which was supposed to drive development of 'clean coal' technology, has changed its purpose allowing it instead to promote coal use here and overseas.
KERRY BREWSTER: The former chair of the Australian Coal Association Ian Dunlop is surprised Coal 21's funds may be diverted.
IAN DUNLOP, FORMER CHAIRMAN, AUSTRALIAN COAL ASSOCIATION: The Coal 21 fund is very specific research and development fund particularly to get carbon capture and storage up and working and to get other clean coal technologies. The money that is being spent is really minor compared with the total, I think it's a billion dollars overall. We spent around $200 million at this point in time. That that's taken place over the last seven years or so, or slightly more probably and I think that is just recognition that there is no serious intent to take this forward. If you look at the climate problem, it is a global emergency.
KERRY BREWSTER: The Climate Commission has warned that up to 80 per cent of the world's fossil fuels have to stay in the ground to avoid dangerous warming. Its prediction is backed by numerous scientific organisations and the international energy agency, which says that under a business as usual scenario temperatures may rise six degrees this century. The coal and gas executive for decades Ian Dunlop says Australia must phase out coal.
IAN DUNLOP: They knew three decades ago that the constraint on carbon emissions was going to constrain the coal industry at some point and that point has now come. They need to stop pretending this is a minor problem, they can keep going the way they have done in the 20th century, get real about taking serious action and accept what their leaders now have to do is start the intelligence phase out of coal.
KERRY BREWSTER: The Coal Association rejects the notion.
NIKKI WILLIAMS: We are a $60 billion sector for this country. And employ 180,000 people directly and indirectly. And there are 1.2 million people in Australia at this time who work in energy intensive business and whatever the fate of the manufacturing sector which is looking not wonderful at this point in time, the fact is the manufacturing sector relies on coal. So the notion that coal can be switched off or should be switched off is not one that we clearly support if you talk about it from a vested interest point of view. But it is clearly not in the interests of Australians if they are unaware of that fact.

KERRY BREWSTER: The Climate Institute fears the industry will simply put profits before the planet.
JOHN CONNOR, CEO, THE CLIMATE INSTITUTE: We are at the brink now and seeing investors starting to wake up to this concept of unbearable carbon. I think that what we are seeing and what I fear seeing is just a dash to exploit a dash for cash on fossil fuels. That is just radically irresponsible and it's very disappointing to see the industry's fund being opened up to other uses and very disappointing to see the people like the Minerals Council start to attack as extremists those who even raise this notion of a carbon budget. (End transcript)

There does not seem to be any doubt that CO2 emissions are going to continue to be under increasing pressure. The following article referring to ocean acidification is alarming; it's by Lisa Gershwin who used to work on Box Jellyfish in Townsville before she lost her funding. She is now working for CSIRO Ocean Research in Hobart and has just published a book called *Stung*.

The Science Show-27.7.13-The rise of slime: jellyfish and algae thrive in new oceanic conditions *Over-fishing, pollution and increased greenhouse gases dissolving in from the atmosphere are changing ocean water chemistry and applying combined pressure on ocean ecology.* http://www.abc.net.au/radionational/programs/scienceshow/the-rise-of-slime3a-jellyfish-and-algae-thrive-in-new-oceanic-/4838478

Triple Bottom Line Accounting (TBL) should be mandatory around the world by now but unfortunately seems to have been sidelined yet its adoption is inevitable sooner or later.

The inaugural conference of the Australia & New Zealand Society for Ecological Economics (ANZSEE) was held in Coffs Harbour in 1995. http://anzsee.org/

A foundation principle of ecological economics is the economy is a subsystem of the ecosystem and economic decisions need to take the full and true costs and benefits into account.

The factoring in of all costs and the long term liabilities when decisions are made about alternative technologies and development options should be a no-brainer as very costly mistakes with far greater long term loses than short term benefits can be made. Internationally governments and agencies are implementing much more holistic economic analysis and protocols. The following references illustrate that.

Stanford Report, July 24, 2014 - **Stanford study shows how to power California with wind, water and sun** - *New research outlines the path to a possible future for California in which renewable energy creates a healthier environment, generates jobs and stabilizes energy prices.*

"I think the most interesting finding is that the plan will reduce social costs related to air pollution and climate change by about $150 billion per year in 2050, and that these savings will pay for all new energy generation in only seven years," said study co-author Mark

Delucchi of the University of California, Davis.
http://news.stanford.edu/news/2014/july/clean-energy-california-072414.html

Previous analysis in the International Energy Agency - IEA's *World Energy Outlook Special Report: Redrawing the Energy-Climate Map* has shown that the global decarbonisation challenge will not only require greater investment in clean energy technologies, but that existing "locked in" high-emissions infrastructure must also be addressed, which is unlikely to occur without policy intervention. Using the example of coal-fired power generation, *Energy, Climate Change and Environment* assesses a number of policies to "unlock" these assets, e.g. through early retirement, retrofits and conversions, that are being implemented or under consideration in Europe, Australia, China, Canada and the United States, and what more could be done.
http://www.iea.org/newsroomandevents/news/2014/december/a-detailed-look-at-policies-and-measures-to-decarbonise-the-energy-sector.html

https://theconversation.com/99-999-certainty-humans-are-driving-global-warming-new-study-29911

Philip Kokic - Senior Statistician at CSIRO, Mark Howden - Research Scientist, Agriculture Flagship at CSIRO, Steven Crimp - Senior Research Scientist at CSIRO – 4.9.14

99.999% certainty humans are driving global warming: new study

The 2013 Intergovernmental Panel on Climate Change Fifth Assessment Report provided an expert consensus that: It is *extremely likely* [defined as 95-100% certainty] that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic [human-caused] increase in greenhouse gas concentrations and other anthropogenic forcings together.

Good risk management is all about identifying the most likely causes of a problem, and then acting to reduce those risks. Some of the projected impacts of climate change can be avoided, reduced or delayed by effective reduction in global net greenhouse gas emissions and by effective adaptation to the changing climate.

Ignoring the problem is no longer an option. If we are thinking about action to respond to climate change or doing nothing, with a probability exceeding 99.999% that the warming we are seeing *is* human-induced, we certainly shouldn't be taking the chance of doing nothing.

CSIRO says climate change and poor planning could cost Australia over $1 trillion
Jake Sturmer -10.12.14 - As the planet tracks towards its hottest ever year the CSIRO is warning the damage caused by extreme weather could cost Australia more than a trillion dollars. http://www.abc.net.au/am/content/2014/s4145650.htm

The following reports put forward arguments that I think are painfully true: **The renewable energy boom is coming, but Australians are too gutless to lead the way** – 11.12.14 - Julian Cribb - *Government after government of technological illiterates is holding us back from being true champions of renewable energy. Problem is, we elected them to do just that.*

In the Olympics of energy, Australia just won two gold medals. Martin Green at the University of NSW announced his team had cracked a world-beating 40.4 per cent efficiency in solar cells, and a solar racing car designed by the university's engineering students set a new world record of 107km/h over 500 kilometres.

Yet here we are, undisputed world front-runners in solar efficiency, poised to abandon or water down our own target for renewable energy. And, as builders of the world's finest solar-racing machine, dismantling our car industry.

There is a global boom in renewable energy coming down, and sun-drenched, wind-rich, tide-girt, hot-rocking, algae-pulsing Australia is doing all it can to miss it.

http://www.canberratimes.com.au/comment/the-renewable-energy-boom-is-coming-but-australians-are-too-gutless-to-lead-the-way-20141210-122ikf.html

No going back - 5 May 2015 - John Mathews - Professor of Strategic Management, Macquarie Graduate School of Management at Macquarie University

What about Australia and the sorry state of affairs in which the Abbott government can see nothing beyond coal exports and does everything it can to halt the transition to renewables? Tesla's announcement has just shifted the ground beneath their feet.

No longer can anyone in Australia claim that renewables would be "nice" if only they came with storage. Now they do.

A smart government in Australia would be looking to ride this wave and promote Australian renewable technology as a source of wealth for the country in a post-fossil fuel era.

Finally we would be able to move beyond the fruitless debates in Australia over whether to have a carbon tax or not, and move to the more immediate and practical issue of promoting renewable industry and technology.
https://theconversation.com/the-tesla-battery-heralds-the-beginning-of-the-end-for-fossil-fuels-41197

Clean energy switch possible by 2030, at fossil fuel prices - August 24, 2013
Switching Australia to 100 per cent renewable power within decades could end up costing the same as continuing to use fossil fuels, a federal government study suggests.

Modelling by the **Australian Energy Market Operator (AEMO)** shows sourcing 100 per cent of power from solar, wind and other clean sources would be technically viable by 2030,

albeit with the cost ranging from $219 billion to $252 billion. But a "community summary" quietly published this month has rekindled debate by saying a massive renewable expansion would be no more expensive than expanding conventional energy.
http://www.smh.com.au/national/clean-energy-switch-possible-by-2030-at-fossil-fuel-prices-20130823-2sgyc.html

There are enormous subsidies to the use of fossil fuels but they are mainly being borne by the community through health costs, loss of amenity, land, water and air quality and future generations because of legacy issues like voids- spoil heaps- damaged waterways and aquifers and elevated CO2 – global warming- ocean and freshwater acidification etc.

The Hawke/Keating government were introducing full cost accounting and ecological economics; the DEST- department for the environment supported the inaugural conference of Australia & NZ Society for Ecological Economics - ANZSEE in 1995 but it was buried by the Howard/Costello government. A decision making process that does not consider all of the costs and benefits is likely to make serious mistakes which is exactly what has happened. Australia was leading the world in renewable energy in 1995 and now the resources boom that was given preference has led to a great deal of wasted investment and infrastructure and lost opportunities.

The Ratch/Transfield Collinsville Power Station had received $2.5m of funding from the Australian Renewable Energy Agency (ARENA) for a feasibility study into conversion from coal to hybrid solar thermal/gas in 2013/2014. http://arena.gov.au/project/feasibility-study-into-conversion-of-collinsville-power-station-from-coal-to-hybrid-solar-thermalgas/

An interview on ABC Radio National Science Show -10.5.14 by Robin Williams with Paul Meredith - Professor of Physics - University of Queensland - Director UQ Solar, discusses our Collinsville Power Station: *How should we optimise the combination of the gas-fired boiler and the solar field to get the maximum value out of the plant in terms of selling electricity back on to the national interest to market? And these are really interesting questions, both from a fundamental perspective, the thermodynamics of running a gas boiler, for example, with a solar thermal field is very interesting indeed, and then of course the techno-economics of making this a valuable proposition. And so they are coming to the end of that feasibility study. I can't tell you what the outcome of that feasibility study is…I think it's a very viable proposition. Look, ultimately Australia is playing catch-up, I'm not going to hide that fact, we are playing catch-up with our European cousins. We are playing catch-up with the United States. We are now even playing catch-up with China in many ways in rolling out and deploying renewable energy, not just solar but renewable energy in general.*
http://www.abc.net.au/radionational/programs/scienceshow/australia-playing-catch-up-with-europe2c-us-and-china-in-deplo/5443108

Unfortunately it seems the uncertainty about the Renewable Energy Target (RET) and probably the predicted increase in the cost of gas has seen the project canned. The following report from 15.12.14 gives another example of this problem for us: **Burdekin Hydro Project Not Happening: Company Blames Government** – *The government's flip-flopping Renewable Energy Targets have been blamed for Meridian Energy's decision not to proceed*

with the Burdekin Hydro Power Generation project in Northern Queensland. Meridian Energy announced late last Friday that the company would not proceed with the project due to destabilising revisions to Australian energy policy sought by the Federal Government.
http://www.qmeb.com.au/news/burdekin-hydro-project-happening-company-blames-government/

The Collinsville and Scottville community is being affected by dust and smoke from the nearby mines after a succession of poor environmental regulation decisions. The political fashion for green tape reduction seems likely to have been another poison chalice going by the following report.

The OECD found the strictness of environmental policies has "increased significantly" in all the countries over the past two decades. But that increased stringency has not harmed productivity growth or productivity levels. In fact, new green regulations "may translate into a permanent increase in productivity levels in some industries."

How can this be? One possible explanation is that the new regulations have pushed firms to operate more efficiently than would otherwise have been case – the green tape has encouraged innovation and investment that has allowed firms to do things better. The improvements triggered by stricter environmental rules have more than offset the costs.

http://www.smh.com.au/comment/oecd-says-green-tape-is-not-damaging-the-economy-20150131-132a98.html

Conclusion: There have been extremely serious mistakes made in the environmental design, approval and regulation processes in our history and the consequences of a continuation of this poor performance and regulation failure is potentially catastrophic. Any changes to environmental group registration must not further disadvantage them anymore than they are already disadvantaged because of the enormous imbalance in power and resources between industry and the community.

Because of the critical importance of public participation in the government environmental regulation processes, measures should be taken that support and assist groups that are representing public interests.

Thank you for the opportunity to contribute to this inquiry.

Yours sincerely, Garry Reed

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When this study was originally developed by the Department of the Environment, Sport and Territories, it was hoped that sufficient data would be available to enable preparation of a study report which would be largely figures showing the extent of financial and environmental subsidies to natural resource use, in a number of areas.

However, as the study was progressed by the consultants, in consultation with the Department, it became clear that there were many conceptual as well as practical difficulties in getting the data which is the aim of the study. The report therefore developed as more of a discussion document and less as a catalogue of hard figures.

Nevertheless the Department considers that the report makes a valuable contribution to information about subsidies to natural resource use, as regards both the discussion of issues involved in such measurement, and the partial but indicative figures that have been estimated.

Contents

List of tables

Executive summary

1. This report sets out the findings of a study which examined financial and environmental subsidies to a range of Australian resource activities. Financial subsidies include non-recovery of public management costs, favourable tax treatment, direct contributions and lower than normal rates of return. Environmental subsidies cover the non-payment of environmental disruption costs by the entities causing the disruptions; in economic terms the disrupting activities give rise to environmental externalities. Resource activities examined in the study are energy production and use, water, waste water, solid waste disposal, extraction from forests, agricultural chemicals, natural attractions and extraction from fisheries. A summary of the financial and environmental subsidies considered in the study is presented in Table ES1.
2. Financial subsidies tend to decrease costs and increase activity levels of entities. Environmental subsidies decrease costs for activities that cause environmental disruption and therefore also encourage higher activity levels than might be socially optimal. If financial subsidies are associated with environmental subsidies environmental disruption will tend to be magnified.
3. Removal of financial and environmental subsidies from resource activities is constrained by other policy concerns, for example competitiveness, but if achieved would tend to improve fiscal as well as environmental performance. The improvement of the fiscal performance of governments could be achieved, for example through increased revenues from charges for services and environmental damages and through reduction of treatment and control expenditures by governments.
4. In each of the resource areas studied detailed data on financial and environmental subsidies proved very difficult to obtain. This is especially the case for environmental subsidy data as in many cases market valuation of environmental externalities is lacking; also those valuations that are available are generally contentious because of the estimation approaches used. Where estimates were made of subsidy values, lack of precise data dictated that order of magnitude value ranges be estimated. Valuation of subsidies affecting the environment is a relatively new field of quantitative economic analysis and much more work remains to be done on the valuation and analysis of these subsidies, how they might be removed and what the impact of their removal would be.

   In future, it may be appropriate for government entities to identify and quantify subsidies affecting the use or degradation of environmental resources. This may become an important issue in the context of the national agenda for microeconomic reform.

5. The analysis of financial and environmental subsidies in the resource activities reviewed indicated that subsidies are being partially removed in these areas as governments are demanding a wider and more stringent application of the user- and polluter-pays principles. But the application of these principles is very variable in both the financial and environmental subsidy areas.

6. In the financial subsidies area a very important issue is the payment of user charges, access fees and extraction levies by direct users of community owned resources. Although some analytical and policy development work has been done on this issue in Australia, particularly in the energy field, it is apparent that few efforts have been made to develop a coherent policy framework.

7. A related issue is the apportionment of the cost of public agencies for resource management activities. The trend is to higher cost recovery through the more extensive use of levies and charges on the specific resource industries involved. It appears,however, that more critical analysis of the cost apportionment is required, particularly of claimed benefits to the community at large, that is, the public goods aspects of the agencies' functions.

8. The environmental impact of subsidy removal was not quantified although an indication of the outcomes is given. This is an area in which further work is needed. Partial or full subsidy removal by the use of financial instruments might not achieve environmental objectives, therefore necessitating consideration of other policy instruments including regulation and information programs.

9. A summary of the results of the subsidy analysis in each resource area is provided in Table ES2. Briefly the summary indicates that substantial financial subsidies remain, particularly in the water sector, and that environmental subsidies are probably significant in all sectors but quantification of them is seriously deficient.

   The subsidy estimates provided in Table ES2 provide order of magnitude indications of the subsidies judged to be amenable to quantification from available sources. As discussed in the main body of the report the estimates and the data they are drawn from vary considerably in accuracy.

10. In this study it is estimated that government payments and revenue foregone, through financial subsidies to the use of natural resources, totalled at least $5.7 billion in 1993–94, equal to 4.4 per cent of the total revenue of Australian governments. Environmental subsidies, for those areas covered by the study, and where quantified estimates were possible, amounted to at least $8 billion, equal to a further 6 per cent of total government revenue.

11. In total the subsidies for which quantified estimates have been made amount to $13.7–14.8 billion. These amounts are significant both in relation to GDP (3.2 to 3.5 per cent) and to the total of the budget deficits of the federal and State governments (about 77–83 per cent). It should be noted, however, that a significant proportion of any increase in revenues might be required to control and repair environmental damage, and raising the revenues will have varying effects on the activities from which they are raised.

12. These totals overestimate the revenue which could be recouped from removal of financial subsidies and imposition of the environmental charges which have been estimated, if only because the imposition of charges would reduce the level of exploitation of natural resources. However, it should be emphasised that lack of data prevented quantification of many

environmental subsidies, and the figures presented here should be regarded as a low rather than a high estimate of the total.

13. More detailed studies of the subsidies in each resource activity would provide more robust estimates and improved understanding of the subsidies involved. Priority areas for further study would be the water, waste water, solid wastes, energy/transport and agricultural input activities, the valuation of water and air quality, bio-diversity impacts and the opportunity costs of forestry operations. Also of priority for further analysis is the evaluation of policy instruments to remove subsidies including an assessment of the financial, economic and environmental impact of the instruments.

14. A further priority for further study is the international dimension of the subsidies. This examination would cover both international environmental problems, e.g. the enhanced greenhouse effect, and the impact on the economy and the environment of subsidy removal in each area. Removal of subsidies on internationally traded resources and inputs into traded goods, for example water inputs to agricultural products, is often constrained because of competitiveness concerns. International negotiation and cooperation will be needed to remove many of these constraints.

15. A strength of this study is the insights it provides on the financial and environmental subsidies in the resource activities examined; a weakness is that, given the wide scope of the study and the resources available, it was not possible to examine and analyse the eight resource activities in detail. This points to a need for systematic and comprehensive reporting by public management agencies on subsidies to the use of natural resources.

Table ES1: Summary of subsidies, removal policy instruments

Resource sector/use	Financial subsidies	Environmental subsidies	Subsidy removal instruments
1. Energy production and consumption Fossil fuels – coal – natural gas – oil	Direct subsidies, low access fees, tax treatment, public agency costs.	Atmospheric emissions (CO2, SOx, NOx, CH4, particulates); also land and water impacts of these activities.[1]	Removal of financial subsidies (competitive neutrality, recovery of public agency costs, etc.), improved pricing (user charges) and imposition of environmental charges (externality pricing, levies). Regulation (standards, tradable quota instruments).
Renewable energy	Direct subsidies, tax treatment, public agency costs.	Water flows (hydro), atmospheric emissions (biomass), noise (wind), aesthetics (solar).	Competitive neutrality policies, environmental charges. (Note that subsidies may be appropriate for renewable energy industry development.)
Electricity	Returns to capital, tax treatment.	Transmission impacts (aesthetics, electro magnetic fields).	Competitive neutrality policies, environmental charges, regulation.
Energy use	Direct subsidies, public agency costs.	Atmospheric emission and other by-product impacts.	Competitive neutrality policies, environmental charges, regulation.
Road transport	Road use costs and charges (excises, etc.).	Atmospheric emission (NOx, VOCs, CO2, CO, particulates, etc.) and other by-product impacts.[2] Flora and fauna impacts. Noise.Run-off.	Competitive neutrality policies, improved pricing, environmental charges, regulation.

Notes: 1, 2
CO2 = carbon dioxide, SOx = oxides of sulphur, NOx = oxides of nitrogen,CH4 = methane, CO= carbon monoxide, VOCs = volatile organic compounds.

Resource sector/use	Financial subsidies	Environmental subsidies	Subsidy removal instruments
2. Water – catchment (water supply, hydro); distribution (pipelines, pumping facilities, etc.)	Returns to capital; capital and recurrent subsidies; taxation; public agency costs. Charges not related to use, non-recovery of some costs.	Flora and fauna effects, reduced flow effects, cold flow effects from dams, greenhouse impacts (methane); land disturbance. Effects of irrigation over-use. Competitive neutrality policies, e.g.	commercial pricing, normal rates of return; regulation; environmental charges. See Waste water below.
3. Waste water treatment and disposal (Covers waterborne effluents in all sectors: untreated drainage, sewerage systems and other treatment plants) – treatment – ultimate disposal	Returns to capital, tax treatment public agency costs, direct subsidies.	Water quality impacts of liquid wastes disposal into streams etc.on humans, animals, fish, plants, tourism activities, etc.	Competitive neutrality policies, environmental charges, regulation. Nutrient rich waters could be usefully disposed of, e.g. onto land for agricultural and forestry purposes.
4. Solid waste disposal (By recycling, land fill, incineration, stockpile, illegal dumping)	Below normal rates of return, taxation, public agency costs.	Leaching from landfill sites into streams/ oceans; litter, odours, greenhouse and other atmospheric emissions (CO2,CH4, etc.), particulates (dust, etc.) from landfill and incineration.	Competitive neutrality policies, regulation, improved pricing, environmental charges.

Resource sector/use	Financial subsidies	Environmental subsidies	Subsidy removal instruments
5. Extraction of forest products (Covers forestry operations, not forest product plants such as pulp mills)	Access fees/royalties, public agency costs.	Soil erosion; flora and fauna effects and reduction in bio-diversity; aesthetics; greenhouse impacts; and water catchment impacts (reduction in water production, siltation and effects of turbidity); loss of tourism and other economic potential.	Competitive neutrality policies,restructured access fees, regulation, environmental charges.
6. Agricultural chemicals – fertilisers, pesticides, herbicides, fungicides.	Direct subsidies, public agency costs, tax treatment.	Stream (e.g. blue-green algae) and ocean (e.g. Great Barrier Reef) water quality degradation affecting downstream and ocean water users (effects on incomes, health, overall utility); fauna and flora bio-diversity effects; human health effects from application methods. Impacts are associated with effects of other farm practices (land-clearing, over stocking, and tillage). Competitive neutrality	policies, regulation, environmental charges. Promotion of alternative pest control and fertilisation methods and optimal use of pesticides and fertilisers. Sustainable agriculture (Landcare, etc.) programs.
7. Use of natural attractions for recreation and tourism	Low/no user charges, public agency costs.	Biodiversity (fauna and flora) impacts, degradation of areas.	Higher access charges,regulation, environmental charges.
8. Extraction from public fisheries (Covers fishing operations but not on-shore fish processing plants)	Access fees/tax treatment, public agency costs.	Intergenerational externalities (unsustainable stocks); effects of fishing activities on non-target species (by-catch) and other wildlife.	Competitive neutrality policies, restructured access charges, licensing regulation, environmental charges.

Table ES2: Summary of subsidies to the resource activities studied

Activity element	Financial subsidies ($ millions, 1994)	Environmental subsidies ($ million, 1994)	Subsidy removal instruments	Fiscal implications ($ millions, 1994)
1. Energy				
– Production: primary sources (fossil fuels, renewables) and electricity	$0.795 billion	Not estimated for coal,oil, gas, renewables due to data gaps. $2.505 billion (electricity) $1.371 billion (non- electricity greenhouse)	Pricing to include externalities,removal of subsidies, tradable permits.	Effect depends on: – level of government considered – impact on revenue base (e.g. industry profits).
– End-use (transport fuels/roads, other uses)	$1.200 billion	$200 million to $1.320 billion.	Removal of subsidies, externality pricing. Direct road pricing in urban areas. Regulation. Information (e.g. labelling) programs.	Could be substantial for State and Federal Governments.
Total	$1.995 billion for production and use (see Table 8). Further revenue foregone of $1.17 billion would be added if the Diesel Fuel Rebate Scheme were treated as a subsidy.	$4.076–$5.196 billion (see Table 8).	—	$6.071–$7.191 billion.
2. Water	Low returns on capital and inappropriate pricing structures,particularly in rural areas. $3.322 billion (see Table 11).	Not estimated. Water over-use contributing to salinity and other problems, e.g.in Murray–Darling Basin.	Raise prices/charges and change revenue/price structures.	Changes to water system charges would reduce State budget expenditures on water departments/ agencies. $3.332 billion.

Activity element	Financial subsidies ($ millions, 1994)	Environmental subsidies ($ million, 1994)	Subsidy removal instruments	Fiscal implications ($ millions, 1994)
3. Waste water	Difficult to separate out from water authority finances, hence forms part of water subsidies.	Substantial costs involved in reducing waste water impacts on all aspects of water quality. $3.500 billion (see Table 14).	Raising charges and prices and change structures. Tradable Regulation. Waste agreements. Tradable permits.	See water above; higher prices/charges would provide morecontrol/restoration funds to treatment and other agencies. $3.500 billion.
4. Solid waste disposal	$70 million (see Table 15).	$140 million (see Table 15).	Raise charges to: – waste producers and – waste disposers. Regulation of waste production and disposal. Tradable waste permits.	Could raise government (mainly local) revenues by over $100 million on present disposal patterns and practices. $210 million.
5. Extraction of forest products	$100 million (see Table 16).	Not estimated.	User charges based on real resource cost estimates,including damage and/or restoration (reforestation, etc.) costs. Regulation of forest use.	Removal of high conservation value areas would result in reduction of revenues, but could be offset by higher use charges elsewhere and revenues from non-timber activities.

Activity element	Financial subsidies ($ millions, 1994)	Environmental subsidies ($ million, 1994)	Subsidy removal instruments	Fiscal implications ($ millions, 1994)
6. Natural attractions	Low on no user fees; management costs substantial. $160 million (see Table 19).	Very difficult to value damage caused by direct users. —	Higher direct user fees (access, activities) but exclusion costs may be high. Regulation of use.	Increased revenue — mainly to State governments, but also to Commonwealth and tribal owners; amount depends on public goods considerations. $160 million.
7. Agricultural chemicals	$515 million is allocated to the agricultural sector under the diesel fuel rebate scheme (DFRS) of which $40 million might be attributed to agricultural chemical application. This estimate is contentious and not included in the total as the primary rationale for the DFRS is the non-use of road by off-road vehicle activities.	Not estimated	Internalise subsidies. Regulate use. Transferable chemical use quotas. Introduce chemical use charges to reflect use damage.	

Activity element	Financial subsidies ($ millions, 1994)	Environmental subsidies ($ million, 1994)	Subsidy removal instruments	Fiscal implications ($ millions, 1994)
8. Extraction from public fisheries	Extraction/access fees appear low on basis of management costs and potential returns to fishing operations, i.e. both management and pricing can be improved. $85 million (see Table 27).	Sustainability a major issue but adequate technical knowledge lacking; improved control/ management costs to enhance sustainability estimated. Impacts of by-catch, fishing operations. $30 million (see Table 27).	Higher access/extraction fees, auction of access/extraction licences. Tradable permits Environmental charges Regulation of access and use.	Fisheries sector revenue collections by government could be substantially increased. $120 million.
TOTAL subsidies estimated from all activities studied where quantified estimates have been made	**$5.732 billion.**	**$7.746–$8.866 billion.**		**$13.478–$14.598 billion.** **3.1–3.5% of GDP.**

1. Introduction

1.1 Study scope

As a result of increasing population and economic activity, human impacts on the environment are increasing. Financial and environmental subsidies may promote environmental impacts. The purpose of this report is to identify and quantify these subsidies as they relate to a selection of economic activities.

1.1.1 Definitions

Economic processes generally involve the combination of inputs to produce valued outputs. These outputs may be valued either as further inputs to production or as goods or services which can be directly consumed.

Environmental resource inputs refer to naturally-occuring stocks and flows. Stocks of minerals, fish, old-growth forests and similar assets may be permanently depleted or destroyed through their incorporation into production processes. Again flows of renewable natural resources may be incorporated into products, or (more commonly) may be adversely affected by the process of production. In both cases a cost is incurred, in that destroyed stocks are no longer available for future generations, and flows are not available for other purposes.

In commercial production, the owners of inputs are paid from the proceeds of sale of the outputs. If revenues from sales fail to cover costs, the productive entity makes a loss, which if sustained will normally entail closure of the productive entity.

Many, but not all, environmental inputs are public property, which means that payments for their use are due to governments as representatives of the public. It has been usual for governments to impose charges for access to minerals and forests, and sometimes for water, but rarely for air. It has been unusual for charges for using natural resources to cover all financial and environmental costs.

As the term is used here, a financial subsidy arises when a government deliberately adds to the revenue or relaxes the financial performance criteria of a productive entity to enable it to sell its outputs at less than the real costs incurred in producing those outputs. The subsidy may be disguised, for example as provision of capital at less than market rates, or the purchase of part of the output at greater than cost. In this paper these subsidies are termed ‘financial subsidies’.

Financial subsidies may be provided through the failure of government-owned entities to achieve normal rates of return, direct subsidies, rebates, etc., special tax allowances, and the non-recovery of public agency costs for services provided to resource industries, for example by not being required to earn normal rates of return,or to recover some costs of their operations.

Governments may also subsidise production by not enforcing payment for costs imposed on

other parties by producing entities. In economic terms these costs are termed external costs and where they impact on the environment are known as environmental externalities. In this paper such subsidies are termed 'environmental subsidies' since they are costs which are not reflected in prices. Environmental subsidies may be removed by imposing charges for use of the resource, or alternatively by negotiation, regulation or information programs to reduce environmental impacts.

When production is organised within the public sector and is wholly paid for out of taxes, it is not generally regarded as subsidised. Thus it is rarely claimed that the defence or police forces are subsidised. A further condition for a subsidy to be identified, therefore, is that the output must be at least potentially saleable. This means that individual purchasers must be identifiable, and the output must be denominated in units on which a sale price can be placed.

An output is sold at a price if the following conditions apply:

1. The output is divided into units.
2. Units are saleable; they may be appropriated by individuals.
3. Purchasers are charged according to the number of units they appropriate. The more the units, the greater the total payment.
4. Purchasers have the option of varying the number of units they appropriate, provided they make the requisite payments.
5. The amount charged per unit is related to the cost of producing that unit.

Revenues gained under these conditions are termed user charges; revenue which is raised to defray the cost of particular government services but which does not meet these conditions can be termed a 'hypothecated levy', that is, revenues from it are hypothecated to production of specific services. Water and sewerage rates charged in property values are such a levy.

These conditions are the minimum required to present purchasers with financial incentives to minimise costs. They are not sufficient to guarantee the attainment of economically efficient or optimal levels of production, but at least make a contribution in that direction.

Debate often takes place as to whether particular items of revenue are a user charge. An example might be a compulsory municipal garbage charge, which fails to meet conditions 3 and 4 above. Imposts which meet several but not all of the conditions can be termed 'quasi-user charges'.

This report identifies a number of economic activities which involve significant inputs of environmental resources, and where the resultant outputs are considered potentially saleable. Financial and environmental subsidies are then assessed using the above definitions. By definition, there is no subsidy if revenue from user charges covers all input costs, including external natural resource costs. Where environmental costs are incurred, this requires that there be a revenue flow to the government proportional to environmental costs, in addition to the revenue required to meet other input costs.

Where either a financial or environmental subsidy is incurred, but either quasi user charges or hypothecated levies are applied which fully cover the costs of production, it will be pointed out that the resource using activity is subsidised from these sources rather than from general taxation. This is significant, in that there is likely to be less public objection to moving from a hypothecated levy or quasi user charge to a genuine user charge than there would be when user charges are imposed for goods or services which have hitherto been financed from tax revenue or from uncompensated environmental subsidies.

The study provides aggregate estimates of subsidies. Where one group of customers or clients of an activity such as water distribution pay less than another group for the same service a cross-subsidy is said to be paid. Cross-

subsidy situations are frequently found among resource activities. The estimation the cross-subsidies was not required in the study brief but the presence of cross-subsidies is noted, for example in the electricity and water sectors.

1.1.2 Significance of subsidies

Financial or environmental subsidies may allow producers to operate at relatively low price levels or to fail to minimise other types of cost. Subsidies tend to encourage relatively high production levels and low operational efficiency. In economic terms significant resource misallocation could occur in the subsidised and related activities.

The interplay of financial and environmental subsidies often magnifies environmental disruption as both sets of subsidies tend to encourage higher output levels of environmentally disruptive activities. A priori there is a clear case for removing financial subsidies and for imposing charges for environmental costs so as to place these activities on a basis more related to their real financial and environmental costs of production. In an imperfect (second, third, etc. best) world this a *priori* conclusion needs to be thoroughly checked as application of these principles only to more obviously subsidised activities could result in further misallocation of resources.

In many of the areas under study there is often a view that governments have "community service obligations"to provide low cost and ready access to natural resources and services based on these resources. Similarly, it is often argued that subsidy removal would seriously affect some groups such as farmers and forestry workers. This traditional view is now being critically assessed in many areas because of increasing evidence (analytical and observed) that this policy stance leads to misallocation of resources. The misallocation of resources results from the resource user charges being below the real cost of using the resource. That is, appropriate price signals are lacking. Where deemed necessary, community service and other perceived obligations can be met through offsetting measures such as income tax adjustments for low income earners, targetted concessions and structural adjustment programs. Subsidies to resource use are a blunt and ineffective instrument for meeting social objectives.

No economic system can be made to function in a theoretically optimal manner even if agreement could be reached on how optimality could be defined. Various pressures on the political milieu overseeing the system prevent optimality being achieved. However, a careful analysis of each situation can lead to decisions which improve resource allocation.

The resource activities analysed in the study are:

- energy production and use (in the industrial, residential, road transport,and commercial sectors);
- catchment, distribution and use of water;
- waste water treatment and disposal;
- solid waste disposal;
- extraction of forest products;
- use of natural attractions for recreation and tourism;
- use of chemicals (fertilisers, pesticides, etc.) in agriculture; and
- extraction from publicly managed fisheries.

The main resource activity not covered in the study is mining (except coal); this activity was not included because of the work already done on this activity and because the complexity of mining issues would require a substantial addition to the scope of the study. For similar reasons agriculture was not comprehensively examined.

This type of study is in keeping with the goal, core objectives and guiding principles of the National Strategy for Ecologically Sustainable Development 1992 and the consensus reached in the Inter-governmental Agreement on the

Environment (IGAE) to which the Commonwealth, State/Territory and local governments are party. Pricing, regulation and information programs to address subsidies to the use of natural resources are likely to become important in the context of the national agenda for micro-economic reform.

1.2 Study approach

The first step in the study was a review of available literature on financial and environmental subsidies to the resource uses listed above.

From the literature review, NIEIR's knowledge of these activities, and from detailed analysis of these resource uses, the financial and environmental subsidies associated with each resource use were identified. A summary of the subsidies identified is included in Table ES1 in the executive summary of the report.

Estimates of the values of the subsidies were then identified and developed using the approaches set out below.

(i) Financial subsidies. Estimates were developed, where feasible, of financial subsidies to economic entities engaged in activities affecting the depletion and/or degradation of natural resources. Activity subsidies arising from the non-recovery of public agency costs from resource activity entities were estimated from a review of budget documents and departmental reports. Cost estimates included a normal business rate of return on capital investments and resource information and management costs. Revenue from user charges was offset against costs, and if revenue failed to achieve a normal rate of return a subsidy was inferred.

The financial subsidy estimates developed should be regarded as broad indicators of the value of financial subsidies and not precise magnitudes, primarily because most of the data is extracted from publications which were not designed to measure financial subsidies to environmentally depleting and degrading activities.

A special comment is required on the estimates which relied on federal and State government budget papers and departmental reports. In view of factors such as:

(i) the immense amount of information presented in budget papers and reports;

(ii) management and programs are often shared by agencies;

(iii) federal-state financial arrangements are complex; and

(iv) data is not formatted to highlight financial subsidies to environmental degrading activities,

it is not possible to state that all financial subsidies have been identified.

These factors tend to lead to underestimation of the value of financial subsidies. On the other hand, the possibility of double counting the value of financial subsidies is ever present in the Australian federal system. This arises because of the over lapping sources of finance and responsibilities in the different tiers of governments. Here, in developing financial estimates considerable effort was expended in reviewing budget papers and departmental reports to ensure double counting was eliminated but some probably remains.

The different approaches adopted by various State governments in presenting information on government expenditure in budget papers were also recognised as a limitation on expenditure estimates. While most areas of expenditure identified in budget papers cover all funding sources this does not occur in all States or every area of expenditure. There is also the possibility of some double counting within the States' own expenditure estimates. A further problem is that departmental corporate overheads are seldom allocated to specific activities. With the general improvement in the quality of State Budget Papers and departmental reports over the past decade

this measurement problem is unlikely to be of great significance. Nevertheless, it should be recognised that the limitations placed by the States on their own estimates of expenditure are relevant when evaluating the reliability of the estimates of the value of subsidies to environmental depletion and degradation included in this report.

Despite all the difficulties, it is believed that the estimates of financial subsidies in this report provide a reasonable approximation of the magnitude of subsidies. Further refinement of these estimates would require detailed analysis of budget papers and departmental/agency annual reports in all States, consultative research with all State Governments and considerable resources. In future public management agencies could systematically report on subsidies to the use of natural resources.

(ii) Environmental subsidies. Available Australian and overseas studies were critically reviewed to:

- assess their methodologies;
- assess the applicability of their findings to this study; and
- extract suitable data from them.

Data from these studies were, where necessary and feasible, supplemented by NIEIR estimates for data deficiencies. Details of the environmental subsidy estimates, and the caveats associated with them, are provided in each resource activity chapter. The use of budget and other government agency data for the estimation of environmental subsidies is subject to similar limitations as those described above for financial subsidies.

The identification of subsidies was often a complex exercise as several activities and their environmental effects are often interrelated, for example the use of fertilisers and irrigation water, and overall farm practices. It was often difficult to estimate the values of the financial and environmental subsidies associated with each activity due to data gaps and uncertainties. Those subsidies that were not amenable to even order of magnitude estimates due to lack of data etc. were delineated along with comments on the estimation problems.

Alternative policy instruments to remove financial and environmental subsidies were listed and briefly discussed in each of the resource activity areas.[1] A fuller review and assessment was not required in the study terms of reference.

Finally, on the basis of the subsidy estimates,estimates were made, wherever possible, of the revenue implications of removing the subsidies.

The revenue implications of removing particular financial and environmental subsidies can be estimated from the values determined for them, subject to all the above caveats. A further problem arises, however, because charging the cost to users of the activities under examination will change market demands for them and thus impact on the revenue base. The net revenue estimates are based on a ceteris paribus assumption, i.e. that the present pattern of production and consumption prevails. This assumption provides a reasonable picture of short term revenue impacts and points the way to estimation of the longer term impacts. Beyond this, a further study could estimate the expenditure which might be required to address environmental disruption.

Difficulties were encountered in deciding on an analysis period for the study. Firm fiscal data for resource entities is often

1. A comprehensive study of environmental policy instruments has been undertaken for DEST. See James, D., *Using economic instruments for meeting environmental objectives: Australia's experience*, Environmental Economics Research paper No. 1,DEST, 1993. Another discussion, focusing on greenhouse issues,is found in *Policy Instruments for Responses to Environmental Concerns*, NIEIR, for the Electricity Supply Association of Australia,March 1994.

only available for periods prior to 1993–94; on the other hand, as indicated above, subsidy situations have changed (and continue to change) significantly since the early 1990s. Therefore, using early 1990s data can significantly mis-represent the current and likely future subsidy situation for each resource activity. On considering the conceptual and data problems, the approach taken was to use the most recent data available and, where necessary, extrapolate available 1990s data to 1994–95 and use this year as the analysis period for the study. Estimates of financial and environmental subsidies are expressed in 1994 dollars.

Revenues from removal of financial subsidies would mainly depend on the extent to which public agency costs were recovered, the rate of return sought and the tax situation of the entities involved. For environmental subsidies revenues would mainly depend on the charges levied and the extent to which resource users and polluters reduced their emissions, etc. when charges were imposed and/or regulations tightened.

1.3 Conceptual issues

1.3.1 Introduction

Recently there has been considerable work on financial subsidies to resource activities, particularly in the energy and water industries. In Australia these studies include those undertaken by the Industry Commission and a number of other agencies and groups. Internationally, the OECD Environment Directorate is undertaking work to assess the environmental consequences of government support to the energy sector.

For both financial and environmental subsidies to the activities covered under the current study, quantitative estimates of subsidies are sparse and by no means comprehensive. This appears to be true of both Australia and other countries. Among the activities most work has been and is being undertaken on energy sector activities, mainly because of the importance of energy activities on greenhouse gas (GHG) emissions and the more apparent environmental impacts, for example air pollution from transport, of these activities in urban areas.

1.3.2 Costs for the assessment of financial subsidies

Subsidies, as defined above, arise when costs of production are not fully covered by user charges. In this section we expand on the definition of costs. Valuation approaches are discussed in Section 1.3.4 of this chapter.

Financial subsidies were defined above as arising when user charges do not cover the costs of production of a good or service, apart from the costs of environmental inputs. Input costs other than environmental costs are generally treated as having first claim on user charges; i.e. it is common for a business entity in either the public or private sector to cover its financial costs but not to cover its environmental costs, and so receive no financial subsidies but extensive environmental subsidies.

The most important of the financial costs for consideration in this study are discussed below.

Capital costs

Failure to achieve normal rates of return represents a major source of financial subsidies to several resource activities in Australia,particularly in the water sector. A normal rate of return may be defined as the opportunity cost of capital use in the community. It is the minimum rate of return on investment required to adequately cover opportunities foregone from alternative investments.

For public sector activities a normal rate of return should reflect the cost to the community of using public assets. This cost may be assessed in several ways.

1. It is arguable that the rate of return should reflect the current long term bond rate, since this is the marginal cost of public funds. A problem with this approach is that long term bond rates have been subject to considerable fluctuation. From a normal level of around 2 per cent a year in the early part of this century, the ten year bond rate averaged around 5 per cent in the 1960s; rose from 7 to 10 per cent during the 1970s and reached 13.3 per cent in 1989–90, from which height it fell to 7.3 per cent in 1993–94, recently recovering to 8.8 per cent.
2. Given that the assets of government businesses are likely to rise in value with inflation, it is arguable that the true cost of capital to such businesses is the long term bond rate adjusted for inflation. Real long term bond rates fluctuate both with the nominal rate and the inflation rate, but over the first half of the twentieth century and into the 1960s they averaged around 1 per cent. They were negative for a number of years during the 1970s, but rebounded to unprecedented heights during the 1980s, and for the period 1989–94 averaged 6.6 per cent.
3. Some would further argue that productive activities are risky, and should bear a rate of return greater than the long term real bond rate. Reflecting this view, a rate of 8 per cent has been adopted as a benchmark in the present study.
4. An alternative would be to set the rate of return with respect to private sector activities. The question then is which private sector rate of return should be considered. Though rates of return in corporate business average above the long term bond rate, the aggregate returns of the Australian corporate sector had to be adjusted downwards by 20 billion dollars due to business failures in the early part of this decade. Again, returns in small business to which there is ease of entry notoriously fail to yield any surplus over financing costs. However, the choice of 8 per cent is reasonably defensible from this point of view, at current rates of return.
5. A different perspective is that derived from calculations of the rate at which non-renewable resources should be depleted. At current rates of interest it makes very little sense to defer exploitation of non-renewable resources, since postponed benefits count for very little the further they are postponed and the higher the discount rate. Those who wish to emphasise provision for the future accordingly wish to use much lower discount rates. If low rates should be used in calculations of the rate of exploitation of non-renewable resources, it is arguable that they should also be extended to other environmental assessments.
6. Finally, as already pointed out, real interest rates are currently at very high levels, by historical standards. It has been argued that these high rates reflect the stress at present being placed on monetary policy as an instrument of economic control, and are likely to be temporary in nature. If this is the case, it is arguable that public sector returns should continue to be judged by historically normal long term interest rates plus a risk margin. This yields a rate of 3 or 4 per cent.

Points 5 and 6 above provide caveats to the choice of 8 per cent as the cost of capital for purposes of calculating subsidisation. In general, where capital returns are in question in this report, the achieved rate will be reported. Readers who prefer a rate lower than 8 per cent may use this information to adjust the reported financial subsidies downwards if they choose.

In both the financial and environmental subsidy areas there are important intergenerational considerations. Removal of resource use subsidies would contribute to the lowering of government debt and/or enable higher expenditure on priority areas including those with long term benefits. These changes would tend to

increase benefits to future generations, as would moves towards the sustainability of economic activities. In dealing with inter-generational and other future value issues it is necessary to consider what discount rate should be applied to these values.

Discount rates link the future value of money to the present by specifying at what rate the value of a future dollar should be reduced. Or, put another way, the discount rate is the amount by which a unit of monetary value available in a future year is discounted or reduced for comparison with present economic values.

As discussed in section 1.3.2 above, for some public policy purposes, such as a choice among alternative development investment projects from a limited budget, high real discount rates may be appropriate. However, such rates quickly turn future values into negligible amounts. Discounting at 10 per cent, $100 received 200 years in the future is worth only $5.3 x 10-7 today (i.e. a small fraction of a cent); about $0.005 discounting at 5 per cent; and about $2 if the discount rate is 2 per cent. Although some greater valuation of the present over the future is appropriate, the extreme trade-offs suggested by the 5 per cent and 10 per cent rates seem implausible. Some analysts such as Mishan[1] suggest that, for inter-generational analysis, there should be no discounting at all because the unborn generation might value extra income just as highly as the present generation. Similarly, Sen[2] has argued that environmental degradation may "oppress" the future generation even if it is wealthier.

Tax concessions

Financial subsidies to enterprises in both the public and private sectors can be disguised in the form of tax concessions. However, detailed analysis of tax treatment of the resource activities is beyond the scope of the study and discussion is limited to areas where tax subsidies may arise, e.g. in electricity. With microeconomic reform the major utilities, for example in the electricity industry, now pay or make provision for "surrogate" corporate tax.

Public management costs

The apportionment of the cost of public agencies for resource management activities remains an important issue. The trend is to the more extensive use of levies and charges for the services provided by the agencies to the specific resource industries involved. It appears, however, that more critical analysis of the benefit and cost apportionment is required, particularly of claimed benefits to the community at large, that is, the public goods aspects of the agencies' functions. Costs of these public goods aspects should be raised from consolidated revenues rather than being raised from industry levies, charges, etc. An arbitrary allocation of public agency costs could be made; for example 50 per cent to direct resource users and 50 per cent to public goods (indirect user) functions of the agencies. However, such an allocation of costs may under- or over-estimate each agency function and each situation requires specific analyses. Ultimately policy makers must decide on the appropriate allocation of costs in each case; to attempt to do so is beyond the scope of this study.

User charges

An important resource use issue is that even where costs are fully recovered and normal returns to capital achieved, this may be by means of hypothecated levies rather than a system of cost-related user charges which give appropriate price signals to users of the resource. Thus, in the water and solid waste sectors, cost recovery has historically been through municipal property taxes and water rates, which are unrelated to actual resource or service use. Similarly, in the road sector it is

1 Mishan, E.J., *Cost-Benefit Analysis: An Informal Intro - duction*, Allen and Unwin,London, U.K., 1975.

2 Sen,A.K., *Approaches to the choice of discount rates for social benefit-cost analysis*, in Lind. R. (Ed.),Discounting for Finite Risk in Energy Policy, Resources for the Future, Washington, D.C., USA,1982.

often claimed that costs are recovered, more or less, through various taxes (such as sales tax on vehicles and fuel excises) which are to some degree related to road use. However, as will be discussed below, the relationship of these charges to the costs occasioned by each road user is tenuous, and in respect of the financial costs of road provision they do not meet the definition of a user charge set out above.

The requirement that user charges be cost-related involves analysis of the costs of service provision. Sometimes this analysis reveals a cost structure which demands a two-part tariff, as for example in electricity. A fixed charge covers the cost of providing access to the service while a variable charge based on use of the service (e.g. kWh or kilolitres of water used) is also imposed. Charges of this type meet the test of cost-relatedness in a way that flat-rate compulsory charges, such as garbage charges levied at a flat rate per household, do not.

Charging and pricing systems are changing towards user charges, particularly in the water sector but only very slowly in the road sector.

1.3.3 Valuation of environmental subsidies

Environmental subsidies were defined above as arising when the costs of environmental impacts are not recovered from the entity disrupting the environment. Where the environmental effects of the polluting entity are abated (fully or partly) by the affected entities and/or government agencies there is in effect a financial subsidy to the polluting entity paid (in market values) by the community at large. Where the environmental damage is not abated the damage cost is not paid in explicit dollar terms but is borne by the community at large in terms not explicitly priced, for example in health effects or loss of biodiversity. Alternative methods for valuation of environmental subsidies is a major issue and is discussed in Section 1.3.4 below.

Environmental costs may be offset by user charges which compensate the public purse for the deterioration of public resources. Such funds may be applied to mitigate the environmental damage, but a public choice may be made to accept the environmental cost and use the revenue elsewhere.

Where the disrupting entities can be identified negotiation or regulation may be used to resolve the subsidy issue. Where clear identification is not possible with current techniques or where for other reasons the entities are not required to control the damages, the costs of these damages are borne by the community at large or particular segments of the community.

Some environmental disruption is mitigated by public agencies and private firms that have not caused the disruption. The environmental costs mitigated are internalised by the economic system but, as indicated above, represent subsidies to the entities causing the disruption.

Where mitigation of the environmental disruption is not undertaken (e.g. reduction of algal blooms in streams), damages are incurred by particular groups (e.g. affected water users) or the community at large (e.g. biodiversity reduction) because the disruption and its ensuing damages have not been mitigated. In these situations environmental subsidies have not as yet been internalised by the economic system though they may have economic effects such as increased health costs. This group of environmental subsidies which are not directly priced by the economic system presents particularly difficult valuation problems.

Some externality studies have included the costs of rising unemployment from economic decisions. These costs, we consider, are not true environmental costs but are costs associated with the distributional or transitional impact of economic decisions. This study considers only externalities arising from the utilisation of environmental resources as inputs.

Environmental subsidies or externalities may be estimated by reference to valuation studies

using several approaches. The strengths and weaknesses of these approaches and examples of their use in this study are briefly summarised below. More comprehensive and throrough discussion of these techniques and of the issues surrounding the valuation of environmental externalities and resources is found in Pearce, D., Markandya, A., and Barbier, E.B., *Blueprint for a Green Economy* Earthscan, London, 1989, Chapter 2 and also in *Techniques to Value Environmental Resources: An Introductory Handbook*, Department of Sport and Territories, Department of Finance and the Resource Assessment Commission, 1995.

(a) Direct damage costing

In principle this is the soundest approach as it attempts to directly measure the resource cost of negative externalities. That is, it is based on valuing damages caused by external effects. The main problem with this approach is the frequent lack of accurate information on damage costs. The damage caused may have no market value, for example reduction in biodiversity. Also, the damage may be of such a magnitude that it affects market prices of goods and services associated with the external effect, and it is often difficult to separate out the impact of the external effect on market prices.

Further, it may be difficult or incorrect to extrapolate from one damage situation, e.g. in a particular location, to a larger geographic entity.

One approach to the damage cost evaluation problem is to attempt evaluation of the loss in economic activity which the subsidy or externality causes, i.e. evaluation of the opportunities foregone.

The problems of directly measuring the damage cost of negative externalities have led to the use of the other valuation approaches briefly discussed below.

An example of the use of direct damage costing in this study is the damage caused by forestry operations to yields of water. Detailed damage costs have been prepared for particular Victorian catchments. In this case the problem with these (and several other) estimates is that of extrapolating them to the whole of Australia.

(b) Control costing

Because of difficulties with quantifying the impacts of external effects it is sometimes suggested that another approach might be to estimate the cost of mitigating the external effect. However, as control costs are generally unrelated to damage costs, they cannot be seen as providing shadow prices for damage costs. On the other hand, as control will remove or reduce damage cost, control costs give an indication of what society has to pay to prevent or reduce the damage. Where society has given an indication, even of a general nature, that it is willing to pay the cost of avoiding or controlling an environmental problem, the control cost approach provides a minimum figure for the damage cost which society perceives.

The use of control costs is generally based on controlling the external effect to some standard level. This level may be considered too high (reduction of an emission below the damage concern point) or too low (control to a level which leaves emissions causing damage of concern). Standards are generally set by consultation between the affected parties, experts and the regulating body. It must be recognised that standards, even those set by consensus, involve value judgments. A further problem with control costs is that available data may be based on control approaches which may be expensive compared with other control options.

In this study estimates of costs to control environmental disruption by waste water systems in the Sydney region are used to estimate the waste water externality for the whole of Australia. Here it is judged that extrapolation was reasonable because the Sydney region is a substantial portion of the Australian whole. This

extrapolation has its limitations, however, because it is very difficult to judge how other regions' waste water problems and the costs of controlling them compare with those in the high population concentration Sydney area.

(c) Contingent valuation

Surveys on the willingness-to-pay (WTP) for reduction of damage or to accept compensation (WTAC) for damage caused by an external effect have been suggested as contingent valuation approaches to external effects. These approaches requires those surveyed to value contingencies and are dependent on persons being willing and able to value non-marketed goods and services.

The main problem with these approaches is that people surveyed may strategise in their response rather than give a real appraisal of their willingness to pay. Thus they may overstate their willingness to pay because they feel it very unlikely they will ever have to pay for the damage; understatement may result from a feeling that they may be a prime target for payment. Further, respondents may not be able to isolate the effect they are being asked to evaluate from other related effects.

In this study estimates of the difference between willingness to pay for entry to natural attractions and the fees actually charged are used to estimate financial subsidies to direct users of these areas.

(d) Hedonic pricing

This approach is based on the concept that the satisfaction derived from the purchase of goods with many similar but some dissimilar attributes will show up as price differences caused by the dissimilarities.

In the environmental field the hedonic pricing approach has been used to value external effects, particularly as they affect property values. For example, the price difference between a house next to a power line and a house of similar size, age, condition, etc. might be used to value the external effects associated with the power line.

But many attributes affect the price of fairly similar goods and services, and it is generally very difficult to separate out/collect sufficient data to enable reasonably accurate separation of the impact on prices of each attribute difference.

Although the hedonic approach is not used in this study, a reference is made to its possible use in valuing odour externalities from sewerage treatment plants.

(e) Other approaches

Where data from the above valuation approaches is not directly available attempts are made to estimate environmental subsidy costs from secondary data sources, for example from data on production impacts, and from extrapolation of limited control cost data to the total activity population. In the study where no satisfactory costing approach was possible the effects are noted but not valued.

A recent report[1] on techniques to value environmental resources examined a range of valuation approaches and how they might be applied. In covering the broad approaches discussed above, the report used a more detailed classification system. Resource valuation issues and estimates are also the subject of a recent Australian Bureau of Statistics (ABS) paper[2] which focusses, however, on commercial (market) value of resources.

(f) Valuation example 96 liquid wastes

The problems of evaluating environmental external effect may be illustrated by reference to the liquid wastes treatment. The drainage of liquid wastes from sewerage plants and other sources into streams causes serious reductions in stream water quality around Australia. These water quality reductions affect wildlife and humans. Odours from sewerage plants may also cause reductions in property values and business and aesthetic damage.

The valuation of the external effects on wildlife might be carried out by attempting to value the damage to wildlife (fish,crustaceans, birds) associated with the streams. This damage cost approach would be difficult as the species affected are, in the main, not marketed.

For humans damage to health might be valued by reference to impacts on longevity and earning power; this raises difficult issues of relating specific water borne toxicants to health and the valuation of health impacts.

The possibilities of preventing wastes entering drainage systems, of treatment of wastes entering the drainage system and of other stream clean-up techniques suggests that a control cost approach might be used. As many waste sources are dispersed and are not readily identified they are therefore difficult to quantify. In this situation prevention costing would be incomplete or inaccurate. Also, as many drainage points are dispersed comprehensive treatment is often impossible; and in estimating treatment costs post-treatment water standards must be specified. These standards depend on what damage is to be prevented which leads us back to the damage cost and assessment problems.

A contingent analysis approach could be attempted by asking a carefully designed sample of persons what they would be prepared to pay for preventing the damage caused by the liquid wastes entering the streams or what amount they would be prepared to accept for the damages caused. This sample cost estimate could then be extrapolated to the whole population. Problems with this approach include: the exact nature of the damage is often difficult to specify in a survey, sampled persons may not understand the damage implications and sampled persons may over-estimate or underestimate the damage depending on whether they think charges or compensation would be based on their valuations.

Application of the hedonic approach would attempt to value similar properties affected and unaffected by the liquid waste disposal effects. For example, odours from sewerage plants contribute to property devaluation and perhaps the forced relocation of some activities. The contribution of the externality (e.g. odours) to property values and relocation decision is, however, difficult to determine.

This example illustrates the problems of externality valuation which apply, to varying degrees, to all the resource activities under study. Overall control cost estimates are more readily developed for most activities but some damage, contingency and hedonic analysis costings are available. It must be reiterated, however, that control costs do not provide an estimate of societal valuation of environmental resources. In all cases substantial caveats apply to the values developed because of the difficulties outlined above.

1.3.4 Effects of reducing subsidies

Financial subsidies encourage increased use of environmental resources compared with an unsubsidised situation. For example, a subsidy to farmers for the use of pesticides will tend to increase the usage of pesticides and, in turn, increase the total negative externalities from pesticides.

Conversely decreasing the subsidy will tend to decrease the use of pesticides and decrease the total negative externalities but will increase net pest damage/control costs to farmers if suitable alternatives to the use of the pesticides are not available at similar or lower cost. Note that evidence from the Netherlands shows that an increase in the price leads to more careful use of the input and the development and implementation of alternatives, a result which can lead to lower input costs.

Reducing environmental subsidies and imposing externality charges will raise costs of the entities causing environmental disruption. The

1 See *Techniques to Value Environmental Resources: An Introductory Handbook*, op. cit.

2 ABS Occasional Paper, *National Balance Sheets for Australia: Issues and Experimental Estimates, 1989–1992*, ABS Catalogue No. 5241.0, AGPS, 1995.

cost increases will tend to reduce the level of activities and the negative environmental externalities. Also, government revenues will tend to be increased, the net effect depending mainly on the subsidy reduction effects on the operations of the negative externality producing activity, on the values of the subsidy and the externalities, and on the tax position of the activity.

The increase in costs to subsidised entities will generally lead to increased prices for their products and services. Over time the cost and price increases will lead to the development and application of improved resource use technologies and other cost reducing techniques.

From the environmental viewpoint the aim of the subsidy removal is to improve price signals to the subsidised entities and their customers in a way that results in resource re-allocation that achieves less environmental disruption.

Whether the subsidy removal achieves the desired level of environmental improvement depends on the strength of the price signal given and the response of the affected economic entities to the modified price signal. If the environmental improvement response is judged inadequate additional levies and/or other initiatives such as tradable emission permits or direct regulation of the environmental impacts may be required. Information programs and finance for research and development may also have an important role in influencing economic behaviour.

Where prices charged by government do not cover the full cost to government of a resources'use, that is where the charges do not fully reflect the resource values and public management costs, the revenue short fall must come from other revenue sources. Thus, apart from improving resource allocation in the economy, the removal of subsidies to natural resource use would tend to improve the fiscal position of governments. A proportion of increased revenues from higher user charges, additional levies, etc., could be used for control of environmental disruption.

Environmental regulations might reduce current government revenues, for example from high conservation value forests, unless this revenue loss is offset by other impacts of the regulations, for example increased revenue from tourism in forest areas.

The study did not attempt to quantify the extent to which subsidy removal would result in environmental improvements for this or future generations. Although a major aim of subsidy removal would be to reduce environmental disruption the extent of the reduction, this issue was not includes in the terms of reference for this study.

1.4 Subsidy policy developments

Currently there are some significant moves towards removal of financial subsidies and internalisation of environmental externalities (subsidies). Financial subsidies are tending to be removed by, for example, competition policy ("Hilmer") reforms, the Council of Australian Govemment's (COAG) agenda for water reform, moves towards requiring a normal rate of return on publicly owned assets, requirements for tax equivalent payments to be made by public corporations and agencies, and through the privatisation of some assets.

Policy developments are continuing and a range of instruments are under consideration. For example, financial subsidies may be removed by competitive neutrality policies, that is policies designed to place public sector activities on a similar basis to accepted commercial norms such as charging user fees based on resource, management and other production costs. Or the subsidies might be neutralised by levies on the subsidised activity. Environmental subsidies may be internalised by imposing a charge estimated to be the value of the external cost, by regulation (standards, etc.), tradable permits or a combination of policy instruments.

In the environmental subsidies area regulations designed to reduce environmental disruption of resource activities are forcing internalisation of some externalities by the entity causing the environmental disruption. The regulations reduce environmental subsidies but may not remove them depending on the stringency of the regulations.

Over time environmental regulations have generally been tightened, particularly for newer facilities. In this situation initiatives (e.g. charges,etc.) which are applied similarly to all facilities will tend to impose higher costs on older plants, equipment, etc. On the other hand, if less stringent initiatives are applied to those facilities that are more environmentally disruptive higher production at those facilities will tend to be encouraged.

The National Environmental Protection Council (NEPC) formed through the IGAE, is to develop consistent national measures for environmental protection and has the potential to improve communication among governments on environmental issues. All states are introducing legislation mirroring that of the NEPC Act. Once established, the NEPC will have the power to pass nationally applicable environment protection measures (NEPMS) covering ambient air and water quality, noise relating to amenity, site contamination, hazardous wastes, motor vehicle emissions, re-use and re-cycling. The measures will harmonise environmental standards in Australia and are likely to advance the internalisation process. It should be noted that the NEPC will not prescribe how the standards are to be met. The required legislation should be in place by the end of 1995.

The above discussion indicates that policies designed to improve environmental performance, i.e. to reduce negative environmental effects, require very careful analysis, development and implementation. The complex set of factors which have led to existing financial and environmental subsidies must be carefully studied before changes are introduced. For example in the case of resources which are internationally traded, financial subsidies and environmental regulations often reflect practices in competing countries. Changing existing market arrangements and rules can lead to loss of some competitiveness; such loss must be weighed against the improvement in environmental performance. On the other hand, changes to achieve environmental objectives can lead to efficiency improvements which enhance both competitiveness and environmental performance.

Another fiscal issue sometimes raised in connection with resource activities is that increases in charges, taxes, etc., on these activities would contribute to balancing the revenue base of government which is currently weighted heavily on capital (corporate tax) and labour (personal income and payroll taxes). Factors to be taken into account on this question include decisions on tax levels and competitiveness effects of such a tax change.

2. Energy production and consumption

2.1 Introduction

The main primary energy sources produced and used in Australia are coal, oil and natural gas. Primary energy sources also include hydro (dams), biomass (wood, sugar cane wastes, etc.), wind and solar sources. In Australia electricity, a secondary energy source, is produced mainly from coal, hydro and natural gas, with minor amounts from oil, biomass, wind and solar sources. The final end-use of energy (tertiary energy) occurs in the transport (cars, etc.), industry (aluminium, etc.), residential (water heating, etc.), commercial (lighting, etc.) and services (in-plant gas use, etc.) sectors.

Financial subsidies to Australia's energy industries include contributions for research and development, non-recovery of costs associated with public agency services and the direct subsidy to ethanol production to support its use as a non-lead octane enhancer in petrol. Federal and State agencies provide basic geological information (for example from the Australian Geological Survey Organisation 96 AGSO) and other information and management services. Support for energy R&D is provided through a number of agencies (CSIRO, the Energy Research and Development Corporation, higher education research grants, tax deductions, etc.).

These subsidies are provided for a range of purposes. Some probably have more than one rationale. Thus, the subsidies to ethanol production and research are probably provided for several reasons: to capture the probable net environmental benefits of ethanol as a fuel; to support an embryonic ("infant") industry, to provide markets for some agricultural products; and to encourage R&D into means of reducing ethanol production costs. Others are provided to meet the costs of perceived community-wide benefits (public goods aspects) provided by their provision, for example to the AGSO, while others respond to lobbying by industry groups on the perceived community advantages (particularly employment) provided by their industry and the need to match subsidies provided to their competitors in other countries.

Charges for access to community owned resources, generally referred to as royalties or secondary taxation, are an important issue. These secondary taxes are mainly assessed on either revenue from resource sales (ad valorem taxes) or profits (resource rent taxes). Secondary tax systems are shifting towards a profits basis, as an ad valorem basis can cause difficulties for resource firms when prices are low and do not enable the community to appropriate a reasonable return when commodity

prices are higher. A major Commonwealth review of petroleum resource taxation in the 1989–90 period resulted in a change from a mainly revenue basis to a mainly profit-based (or resource rent) system. Thus, in 1990 the federal Petroleum Resource Rent Tax (PRRT), introduced in 1987 with effect from 1984, was extended to the major Bass Strait fields and exploration deductibility extended from a project to a company wide basis. State secondary resource taxation, however, remains mainly on an ad valorem basis[1] (see following box for a summary of coal and petroleum resource taxation in Australia). The community returns gained through secondary taxation represent a balance between providing the community with a return for the exploitation of non-renewable petroleum reserves and providing the private sector with a return for the risks undertaken in investing in petroleum exploration and development in competition with foreign suppliers.

The design of a resource charge also has to take into account such factors as compliance costs and the ability to establish a fair cost for deductions. Accordingly, the constraints on community returns reflect the practicalities of developing a taxation system. Factors affecting system development include the constraints of competitiveness and risk factors, market issues such as international prices for traded commodities, and taxation policy issues such as decisions, for various reasons, to tax competitive fuels at different rates.

The pricing of Australian primary energy and end products varies by energy commodity and mainly depends on competition in energy market segments and on variations in Commonwealth product excises and State Government charges. For example, oil is sold at international prices (adjusted for quality and transport costs) while brown coal, with few alternative uses, is essentially priced at production costs; among petroleum fuels, liquefied petroleum gas (LPG), compressed natural gas (CNG) and alcohol fuels are excise free mainly because of their perceived environmental benefits.

In future years the pricing and overall financial regime applying to the energy industries is likely to be significantly affected by competition policy reforms. In April 1995, a national competition policy reform package was endorsed by the Council of Australian Governments (COAG). It includes specific reform elements and agreed processes and principles that will introduce significant microeconomic reforms. These reforms aim to stimulate the competitiveness and growth prospects of sectors such as energy and the overall national economy. The reform package comprises six interrelated elements.

- Extended application of competitive conduct rules. The relevant parts of the *Trade Practices Act* will be made to apply to the unincorporated sector and to State Government business activities. Commonwealth Government businesses are already subject to the Act.
- Legislation review. All Commonwealth, State and Territory legislation and regulation will be systematically reviewed by the year 2000 to identify and reform any restrictions on competition that are not essential to achieve the objectives of the legislation and which do not yield net benefits to the community.
- Structural reform of public monopolies principles. These principles mandate a prior separation of regulatory and business functions of public monopolies and a review of the commercial objectives and business structure of the public monopoly if a government decides to introduce competition into a market previously supplied by the public monopoly.

1 On-shore resources are under State jurisdiction whereas off-shore resources are in federal or shared jurisdictions.

Coal and petroleum resource taxation in Australia

Jurisdiction	Coal	Oil and gas[1]
New South Wales	$1.70/saleable tonne and $0.50/saleable tonne super royalty for specified open cut mines.	10 per cent of well head value for primary licence.[2] 11–12.5 per cent for secondary licence.
Victoria	Ex-SECV brown coal, 4.23¢/GJ. Alcoa brown coal (sold), $0.258/tonne. Alcoa brown coal (power generation), $0.194/tonne. Non ex-SECV/Alcoa coal, 2.75 per cent of sales value.	10 per cent of gross value of production at well head for primary licence. 10–12.5 per cent for secondary licence.
Queensland	7 per cent of free on rail value.	10 per cent of well head value.
Western Australia	Export coal, 7.5 per cent of realised value. Non-export, $2.29/tonne, adjusted each year for Collie 1981 ex-mine value.	10 per cent of well head value. 10–12.5 per cent for secondary licence. Resource rent royalty applies to Barrow Island field (25 per cent to Western Australia).
South Australia	Value of processed, delivered coal, 2.5 per cent.	10 per cent of well head value.
Northern Territory	18 per cent of accounting operating profit where profit exceeds $50 000.	10 per cent of gross value at the well head less specified deductions for each field.
Tasmania	1 per cent of ex-lease value of sales (n) plus 30 per cent of twice assessed profit/n.	10 per cent of well head value for primary licence. 11–12.5 per cent for secondary licence.
Commonwealth	Excise (1993) and export duty (1992) suspended.	Resource rent tax (RRT) applies to off-shore fields (Bass Strait, etc.) except the NW Shelf. Royalties and oil production excises mainly apply to fields in inshore and coastal waters (three nautical mile limit), e.g. Barrow Island, some other WA fields and the NW Shelf. The first 30 million barrels of oil produced from any one field are excise free.

Note:1. State royalties apply to onshore, internal waters and coastal waters (three nautical mile limit); Commonwealth crude oil production excise also applies to these areas except Barrow Island where a profits based resource rent royalty is levied (shared 75/25 with WA).

2. A primary licence applies to the first find within a licence block and a secondary licence to a second find within that block.

Source: Royalty Discussion Paper, ANZMECC, 23 September 1991,updated by discussions with energy departments and agencies. For taxation details see Taxation of the Energy Industries, NIEIR,23 June1995.

- Access to infrastructure facilities. An 'access regime' will allow third party access to services provided by significant infrastructure facilities.
- Competitive neutrality principles. These have the objective of eliminating any net competitive advantage enjoyed by significant government businesses as a result of their public sector ownership. Broadly, this will involve subjecting government businesses to the same tax and regulatory regimes applicable to private business.
- Price surveillance of government business enterprises. Price oversight of monopoly or near monopoly government businesses which supply goods or services will be established, for example, to ensure pricing of electricity generation and transmission reflects costs.

Corporate tax sections of the *Income Tax Assessment Act* (ITAA) includes a range of deductions provisions for capital and operating expenses incurred during exploration, development and production of energy resources. These allowable deductions include those for control and repair of environmental disruption and environmental impact studies. Overall the provisions appear to cover reasonable business expenses in a relatively risky business area. In a 1993 country comparative study Kemp found:

(i) that the overall tax system applying to the Australian petroleum industry extracted high community returns,particularly under high cost and relatively low oil price conditions; and

(ii) the Australian regime extracted community returns not out of line with the other countries studied.[1]

This situation does not reveal the extent of any resource use subsidy but does indicate the difficulty of changing fiscal systems in a competitive field. Further study is required to examine the resource subsidy issue in relation to fiscal systems and assess the benefits and costs of changing the current regime.

A large range of environmental externalities is associated with the production,transport/transmission and use of energy, but our survey indicates that to date few attempts have been made to quantify them using Australian data.[2] Energy related externalities, however, are attracting much attention in Australia and overseas, in particular those associated with the enhanced greenhouse effect (see box). Regulations force internalisation of some of these externalities but thus far no attempt appears to have been made in Australia to use economic instruments (taxation, tradable emission permits) in the energy sector for this purpose. Thus estimates (for example from Victorian and Western Australian studies) of externalities have not been included in prices and no tradable emission programs (for example as used in the United States for sulphur oxides) have been attempted in the Australian energy sector.

This chapter of the report deals in turn with fossil fuels, renewable energy, electricity and end-uses of energy, followed by a discussion of road transport issues. This treatment format permits the treatment of specific external effects associated with each primary fuel, with electricity (which is produced from a range of fuels but with some common externalities) and with end-uses where transport, mainly using liquid petroleum fuels, covers a wide range of financial and environmental subsidy issues.

1 Kemp,A.G., Fiscal Aspects of Investment Opportunities in the UK,CS and Norway, Denmark, The Netherlands, Australia, China, Alaska and the US Outer Continental Shelf, University of Aberdeen,September 1993.

2 A comprehensive description of energy production and use externalities is provided in the Externality Policy Development Project: Energy Sector, Identification of effects and externalities, Department of Energy and Minerals, Victoria. This study (VEPDP), however, provided few estimates of externality values.

The enhanced greenhouse effect

The greenhouse effect, due to the build up of carbon dioxide (CO_2), methane (CH_4), chloro-fluoro-carbons (CFCs), nitrous oxide (N_2O), etc. (the "greenhouse gases" — GHGs), is predicted by an international panel of scientists to raise global surface temperatures and result in higher sea levels and changed weather patterns around the globe. The predicted impacts would not be limited to certain regions of the world and all greenhouse gas emissions contribute to the effect. Thus, global warming, and any action decided on to reduce the effect, is of concern to all countries, albeit to varying degrees. It is truly an international environmental, social, economic and political issue.

Countries produce different amounts of greenhouse gases (GHGs) and GHG sources (e.g. coal) and contribute differently to the absorption of greenhouse gases. The production and absorption capacities of countries will change in the future and countries will be differently impacted by the greenhouse effect. Thus, at the outset, it can be seen that international negotiations to devise greenhouse policies will be difficult and complex due to scientific uncertainty and the different current and future situations of the world's countries.

The major proportion of the man-made CO_2 emissions, and possibly, human-related N_20 emissions are related to energy, while the emission of CH_4 and CFCs from human activities are less related to energy. On a global scale it is estimated that about 60 per cent of GHG emissions emanate from energy production, transmission and use.

Among OECD countries **Australian** economic activities for domestic and export markets are relatively greenhouse gas intensive. That is, per unit of GDP and per dollar of exports, Australian production and consumption produces (or has the potential to produce,e.g. coal) relatively high amounts of greenhouse gases.

The national greenhouse gas inventory (NGGI) estimates that 53.4 per cent of Australian greenhouse gas emissions come from energy related activities, followed by 24.4 per cent from land use change and forestry, 15.2 per cent from agriculture, 5.7 per cent from solid waste disposal and 1.3 per cent from non-energy industrial processes.

Damages likely to be caused by the enhanced greenhouse effect include increased likelihood of extreme weather events, net agricultural losses, reductions in biodiversity, coastal erosion and submergence, net increases in energy costs, net increases in water supply costs, increased urban smog, and increased health risks and costs.

Valuation of the GHG externalities is complex and few attempts have been made. In the United States, Cline for example, estimates that an average 2.5°C temperature rise (the likely result from a doubling of pre-industrial GHG emissions), would cause damage of about 1 per cent of GDP by 2025. Estimates of control costs to attain the target of reducing 1990 GHG emissions by 20 per cent by 2005, range form 0–5 per cent of GDP. Valuation of greenhouse externalities is an evolving field where existing estimates vary considerably.

References: W.R.Cline, Global Warming: The Economic Stakes,Institute for International Economics, Washington DC. United States, 1992; International Greenhouse Issues — a summary, NIEIR, March 1994; NGGI,1994.

2.2 Fossil fuels

2.2.1 Coal

Australia is a major coal producer and the world's number one exporter. Exports account for about 70 per cent of black coal production but brown coal exports are negligible. Domestic use of coal is divided into metallurgical uses (mainly in the iron and steel industry where coal has important chemical and energy uses), as a heating fuel, and as a primary fuel for electricity production.

Financial subsidies

Coal is mainly a community owned resource in Australia and as such is subject to extraction fees (royalties) imposed by the State Governments. Royalties for extraction by private companies vary from State to State; black coal production is dominated by New South Wales and Queensland, while the lower quality brown coal is only produced in Victoria.

Low black coal prices over the past five years have reduced average rates of return in the industry to lower than would be normally sought. Brown coal mines in Victoria are owned by the State and sell coal to electricity generators at essentially the cost of production.

Public agencies provide geological information services and R&D support to the coal industry. The Australian Science and Technology Council (ASTEC)[1] estimated that about $75 million was being spent on coal research in 1994 of which about $45 million was spent by industry and the remainder by governments (mainly federal) either directly or through contributions to research agencies. Government expenditure on coal R&D accounted for about 24 per cent of total government expenditure on energy R&D. In the Greenhouse 21C package of measures to abate greenhouse gas emissions, $25 million was allocated to aid clean technology R&D in India over the 1995–99 period.

To the extent that R&D support to the coal industry reduces the environmental impact of coal production, transport and use, this support improves the environmental performance of the industry. It is sometimes argued, however, that from an environmental perspective support for coal R&D extends coal's environmental impacts that are inherently greater than those from other energy sources such as natural gas and renewable energy forms.

The Diesel Fuel Rebate Scheme (DFRS), which applies to several sectors, was allocated $632.1 million for rebates to the mining industry, $397 million to agriculture, $86 million to forestry, $33 million to fishing, and $22 million to hospitals, etc., in the 1993–94 Federal Budget. This rebate applies to diesel fuel used off-road in mining operations; the rebate currently amounts to 28.4 cents/litre. The DFRS is mainly justified on the non-use of roads by off road uses of diesel fuel in the forestry, fishing, agriculture sectors, residential and health care (see box). The value of these rebates for the coal mining industry is estimated at $300 million in 1994–95, based on discussions with the Department of Industry, Science and Technology (policy responsibility), Customs (administrative responsibility) and our estimates from tonnages of mined minerals. The Industry Commission study on Mining and Minerals Processing (1991) concluded that the various tax concessions to mining more or less balance out against unfavourable tax treatments.

Transport of coal away from the mine site is mainly by rail. The Commonwealth Grants Commission reports that in Queensland coal haulage rates appear to include a royalty (secondary taxation) element.[2]

1 *Energy Research and Technology in Australia*, ASTEC, Occasional Paper No. 28, 1994.

2 Commonwealth Grants Commission, *Report on General Revenue Grant Relativities*, 1994 Update, p.173.

The Diesel Fuel Rebate Scheme (DFRS)

Under the Diesel Fuel Rebate Scheme (DFRS) operated by the Federal Government, rebates of excise are available on diesel purchased for use in specific off-road activities.

In 1994–95 the estimated rebates are[1]: mining $632.1 million; agriculture $396.9 million; forestry $85.9 million; Fishing $32.8 million; and residential, hospitals, nursing homes, etc. $22.2 million.

The Industry Commission (IC), in a 1994 study of petroleum products taxation[2] observed, in discussing the DFRS observed re the off-road rationale:

> "Regardless of the merits of fuel taxes as road user charges, the existing scheme performs this function poorly because rebates are not available on all off-road use of diesel. And not all rebates for off-road use are at the same rate. But the current rebate scheme was shaped by broader objectives. The inclusion of residential use, and aged and health care institutions, but not other commercial accommodation, appears to reflect a social policy objective."

In this study, the IC went on to examine options for exempting all intermediate users from taxes on petroleum products; such an approach would make the DFRS redundant.

Is the DFRS for non-road diesel users a subsidy?

In considering the answer to the question the role of the excise duty must be considered. NIEIR estimates all costs of road provision exceed by an estimated $1.2 billion excise duties imposed by the Commonwealth on road fuels and all the other duties, franchise fees, and other levies imposed on road users by governments. If these imposts are viewed as quasi user charges, all non-road users should be exempt from excises, etc. imposed on transport fuels. Rail use exemption would, however, give a competitive advantage to rail over road transport; the Commonwealth does not want to give this advantage, and so does not exempt rail diesel fuel.

Non-road fuel use of petroleum products give rise to externalities, particularly emission externalities. AN ISC study of atmospheric emissions estimated that the value on non-greenhouse externalities from road diesel use amounted to $4 million outside urban areas, where the DFRS predominantly applies, compared to $783 million in urban areas. Off-road emissions, on this basis, would be valued at about $1 million (1994 dollars). This low estimate reflects the low valuation of emission costs in rural areas. Greenhouse emissions from off-road diesel use total about 7 million tonnes of carbon equivalent (Cosgrove, DPIE).

If the excise tax is seen purely as a revenue tax then the DFRS might be seen as a subsidy to DFRS beneficiaries. However, other end-use energy sources, including diesel competing (in some uses) fuels such as natural gas and electricity, are not subject to excise taxes. If the DFRS is seen as a subsidy, the exemption from excises to these energy forms should, therefore, be seen as a subsidy to these other fuels/energy forms.

On the basis of the above discussion we conclude here that the DFRS should not be seen as a financial subsidy to its beneficiaries. The externalities associated with these uses, however, should be estimated and included in subsidy analyses wherever possible.

1 Australian Customs Service and Budget data.
2 Industry Commission, *Petroleum Industry*, Report 40, July 1994,p.274.

Environmental subsidies

The extraction of coal has a number of environmental impacts. Exploration and mining may cause damage to natural habitats and raise the need for land rehabilitation, which may only partly repair the environmental impacts. Mine wastes may lead to run-off into streams causing siltation and reducing water quality. Black coal mining results in variable amounts of (fugitive) methane emissions thereby contributing to the enhanced greenhouse effect.[1]

In its energy uses (as distinct from its metallurgical uses which account for less than 1 per cent of Australian coal use)[2], coal is mainly used for the production of electricity and steam. Depending on the combustion process, and the composition of the coal, varying solid and atmospheric emissions are produced, for example fly-ash and carbon dioxide. These environmental impacts may be divided into three groups: greenhouse gas emissions; other atmospheric emissions; and solid residues.

Quantification of these impacts in Australia has mainly been for coal use in electricity production, but even in this case the quantification is not comprehensive.[3]

Greenhouse gas emissions (principally CO_2 emissions) from coal-fired electricity generating plants, account for about 25 per cent of total Australian non-Montreal Protocol[4] (i.e. non-ozone depleting) greenhouse gas (GHG) emissions. Brown coal used for electricity generation produces, on average, about 6 per cent more CO_2 per PJ of fuel than black coal when combusted under standard conditions. The actual CO_2 emitted per KWh of electricity produced depends on the actual chemical composition of the coal used and the efficiency of converting the coal into electricity.[5]

Other atmospheric emissions from coal include particulates and oxides of sulphur and nitrogen. Australian coal is relatively low in sulphur content and this, together with the characteristics of Australian soil and water, means that acid rain pollution, a major problem in Europe and North America, is not a significant problem in Australia. A National Health and Medical Research Council report indicates, however, that in coal combustion intensive regions such as Newcastle and Woolongong sulphur dioxide emissions are of some concern.[6] Also environmental problems are associated with coal mining, for example through effects on water supplies from disruption of water tables, leaching from mine wastes, etc.

Solid residues (fly-ash) constitute a storage and disposal problem for electrical utilities;

1 Fugitive Fuel Emissions are those not related to combustion for energy but which arise from emissions associated with production,transmission, storage and distribution of fuel and from mining. In the energy sector, Fugitive Fuel Emissions amounted to a little over 1 Mt of methane or about 16 per cent of total methane emissions, or about 4 per cent of total greenhouse gas emissions. A little under 30 per cent of Fugitive Fuel Emissions were from oil and natural gas systems. Methane emissions from coal mining made up over 70 per cent of Fugitive Fuel Emissions with the majority of emissions from underground black coal mines. From *Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks, and National Greenhouse Gas Inventory 1988 and 1990: Summary,* Department of the Environment, Sport and Territories, 1994,(NGGI Summary, 1994), p.15.

2 ABARE Commodity Statistical Bulletin,1994, p.259.

3 The subject was discussed with Dr Harry Schaap,Director, Environmental Affairs, Electricity Supply Association of Australia (ESAA), who indicated that useful data on externality costs is not available except for the Victorian and Western Australian studies cited below.

4 Greenhouse gas emission totals are generally expressed in these terms as ozone depleting emissions are being reduced under the Montreal Protocol provisions.

5 In 1992, for example, the SECV reported in *The SECV and the Greenhouse Effect,* Discussion Paper No. 2, April,1992, that the amount of CO2 produced per kWh varied between old and new stations by a factor of almost 2. For emission factors see *Australian Methodology for the Estimation of Greenhouse Gas Emissions, Workbook for Fuel Combustion Activities (excluding Transport),* Department of Environment, Sport and Territories, July 1994,draft, Appendix B.

6 Steer, K. and Heiskanen, L., *Options for Australian Air Quality Goals for Oxides of Sulphur,* Public Review Document,November 1993.

efforts are underway to use more of the fly-ash in concrete production, road-works, etc., for example by Pacific Power. Liquid residues are minor but discharge of cooling water has environmental impacts in streams and oceans (e.g. in the Latrobe Valley, Victoria).

In 1992 the Victorian Energy Externalities project identified a range of environmental externalities which can be associated with the supply of electricity from non-renewable primary sources (see Table 1).

An earlier study for the Western Australian Government (Stocker et al, 1990)FStocker, L., Harman, F., Tophan, F., Comprehensive Costs of Electricity Supply in Western Australia, Renewable Energy Advisory Council, Government of Western Australia, 1990, p.25. arrived at estimates of external costs in the range of 4 to 28 cents per kilowatt hour for black coal based electricity.

The externality elements estimated by Stocker, et. al., are presented in Table 2.

The bases for these estimates is as follows. For coal mining the cost of rehabilitation of mine sites was estimated from United States data adapted to Western Australia. The CO_2/greenhouse estimate was derived from a 1988 NIEIR study on reforestation and chemical removal of CO_2. In the case of sulphur and nitrogen oxides the cost data was developed from an OECD study on control of these gases. Finally the resource depletion cost element was based on a German study on the costs of substituting renewable energy for coal in the generation of electricity. Details of these estimates and their sources are set out in Section 4 of the Stocker, *et. al.* report.

Externalities not valued by Stocker, *et. al.*, include:

- air emission damage to non-commercial plants, animals and vegetation;
- water emission damage (cooling water and fly-ash leachates); and
- general ecosystem stress.

Table 1 Potential externalities associated with electricity supply from primary non-renewable fuels

External factor	Details
Greenhouse gas emissions	– release of CO_2, CH_4, N_2O and water vapour.
Degradation of water resources	– waste and coolant discharges – acid drainage from deep and open cut mines into the water table and river systems – acid rain associated with emissions of SO_2 and NOx
Air quality reduction	– discharge of ash and dust particles – NOx emissions react to produce photochemical smog
Land and crop damage	– acid rain affects growth of crops and other flora – open cut coal mining – transmission corridors
Other	– structural corrosion due to acid rain – noise – impact on aesthetic values

Source: Philpott,R., *Identification of effects and externalities*, Externalities Policy Development Project: Energy Sector, Department of Manufacturing and Industry Development, Victoria, Australia, August 1992.

All these cost elements estimated in the Victorian and Stocker studies are controversial 96 particularly those for carbon dioxide and resource depletion.

In the energy segment of the Victorian externalities policy development project (VEPDP) negative externality values were only estimated for the relatively efficient Loy Yang A brown coal station in Victoria's Latrobe Valley.[1] These values are presented in Table 3.

The central values developed, which exclude GHG impacts, amount (central value) only to about 0.1 per cent of production costs (as estimated in the report). Besides GHG impacts, coal mining, depletion, socioeconomic and decommissioning impacts were not included. The report commented that:

1 *Externality Policy Development Project: Energy Sector, Consultants' Summary Report for the Victorian Study (VEPDP, Summary)*, Department of Energy and Minerals,October, 1993.

Table 2 Application of damage/avoided damage costs to black coal based electricity generation in Western Australia

Source of damage (costing basis)	Cost (¢/KWh, 1990 $s)
Mining (land rehabilitation)	0.2
CO_2 (sequestration)	1.8–10.0
NOx and SO_2 (control costs)	0.5–4.0
Resource depletion (sustainability)	1.3–13.8
Total	**3.8–28.0**

Table 3 Estimated externality values for Loy Yang A (A$ 1991/KWh)

Externality category (units)	Annual emissions	Low ($/KWh)	Central ($/KWh)	High ($/KWh)
PM_{10} — Human health (tonnes PM_{10})	383	$1.3x10^{-5}$	$1.8x10^{-5}$	$2.3x10^{-5}$
PM_{10} — Visibility (tonnes PM_{10})	383	$1.3x10^{-6}$	n/a	$1.7x10^{-6}$
NOx — Human health (tonnes NOx)	24 332	0	0	0
SO2 — Human health (tonnes SO_2)	46 862	0	0	0
Ozone — Human health (tonnes NOx)	24 332	$1.2x10^{-6}$	$1.9x10^{-6}$	$3.3x10^{-6}$
Air toxics — Cancer (tonnes As)	0.206	n/a	$1.6x10^{-6}$	n/a
Air toxics — Cancer (tonnes Be)	0.0013	n/a	$3.5x10^{-10}$	n/a
Air toxics — Cancer (tonnes Cd)	0.0118	n/a	$2.0x10^{-8}$	n/a
Air toxics — Cancer (tonnes Cr)	1.38	n/a	$6.2x10^{-7}$	n/a
Air toxics — Cancer (tonnes Ni)	0.0502	n/a	$4.0x10^{-9}$	n/a
Waste water discharge — (ML/year)	18 250	0	0	$5.3x10^{-6}$
Land use/solid waste (hectares/year)	17.8	$9.7x10^{-7}$	$1.9x10^{-6}$	$2.9x10^{-6}$
Greenhouse gas (GHG) (tonnes CO_2)	17 441 000	0	0	0.03
Total ($/KWh)		**0.000017**	**0.000025**	**0.03004**

Source:VEPDP, Summary, p.3–13.

> "the $0.000025 per kWh likely understates the total externality value for Loy Yang. Furthermore, Loy Yang has already installed extensive pollution control equipment and meets or exceeds EPA environmental standards. These factors significantly reduce the impacts of residual emissions and externality costs. Another power station with lower levels of pollution control would be likely to have a higher externality value; possibly in the range of $0.01/kWh."

It should be noted that at the time of the study the Loy Yang A station represented the newest and probably most advanced environmental design of a power station in Australia. Therefore almost all values estimated for this station are likely to be low estimates for the rest of the coal fired power stations in Australia.

As can be seen from **Table 3**, the VEPDP only developed one estimate (in the **high** case) for greenhouse gas externalities. This was undertaken using damage and control cost considerations (see p.3–10 of the VEPDP report) for the Loy Yang A station where a stated high value of 3 ¢/kWh was derived.

In 1988 NIEIR estimated that greenhouse externalities valued by estimating reforestation costs to absorb (sequester) carbon dioxide from then existing Victorian brown coal stations, would add about 22 per cent (2.3¢/kWh in 1994 $s) to average electricity prices.[1] A current NIEIR update of these estimates for the whole of the Australian electricity industry puts the reforestation costs at 4¢/kWh, within a range of 1-8 ¢/kWh[2]. A major caveat to the estimates is the feasibility of attaining the extent of reforestation required given the soil and water resources available.

Integrating the VEPDP, Stocker and NIEIR estimates, and netting out the most extreme and contentious values gives an estimate of externalities associated with electricity production from coal in Australia of about 1-9¢/kWh. If greenhouse externalities are not included the values range from about 0.5¢/kWh (mix of station vintages) to 4¢/kWh for coal based stations.

These estimates are significant in terms of total (capital, operating) electricity production costs which are in the range of 4.5–6.0 cents per kWh[3], depending on how assets are valued and the type of plant being considered.

Recent North American studies indicate externality values for coal fired generation range from 0.5 to 5.0 cents per kWh with CO_2, SOx and NOx accounting for over 85 per cent of the total.[4]

A study of the environmental impact of the German power industry by Hohmeyer (1988) found that if environmental costs associated with conventional generation techniques were factored into production costs, the price of electricity would double.

At 2¢/kWh, the value of the environmental subsidy, including greenhouse externalities, to Australian coal based electricity (88 per cent of total) in 1994 would be about $2.396 billion. As the above discussion indicates, however, the average value could be much higher than 2¢/kWh. Within the 2¢/kWh estimate subsidies to coal *per se* for mining, transport and depletion impacts are given a relatively low weighting (around 10 per cent) as less

1 *Costing and Pricing of Electricity in Victoria*, Victorian Solar Energy Council, 1988.

2 *Abatement of greenhouse gases: policies and their impacts*, NIEIR,Energy Working Party Papers, November 1994. The wide range is due mainly to difficulties in estimating forest sequestration rates and the costs of reforestation (land, planting, maintenance).

3 Personal communication with industry (ESAA,individual utility) personnel; costs net of externality estimates.

4 Haites, E., Potential Rate Impacts of Environmental Externality Regulation in the United States, *Proceedings: 1994 Innovative Electricity Pricing.* EPRI TR-103629, Electric Power Research Institute, Palo Alto, California, February 1994.

work on these values appears to have been undertaken.

These environmental externality estimates from the most extensively analysed and quantified area illustrate:

(i) the wide divergence of opinion on environmental externality evaluation;

(ii) the importance of deciding on what externalities to include and how to value them; and

(iii) the importance in externality valuation of distinguishing between new and older equipment because of the higher emissions usually associated with older equipment.

2.2.2 Natural gas

Natural gas is produced for domestic and export markets from both offshore and onshore fields by a number of private companies. As a community owned resource it is subject to secondary taxation (royalties, etc.) which are collected from the private production companies. As indicated above secondary taxes imposed vary by jurisdiction (Federal and State).

Transport is by pipelines (mainly privately and utility owned) to domestic markets or by privately owned LNG tankers to overseas markets.

Natural gas is mainly used as a heating fuel in the residential, commercial and industrial sectors; it also accounts for about 8 per cent of Australian electricity production.

Financial subsidies

There are no direct subsidies to natural gas production in Australia. However, basic geological information (AGSO and State agencies) and R&D support is provided to the gas industry, and in this study these forms of assistance are treated as a subsidy (see Table 8).

Data on gas R&D support by governments is aggregated with that for oil. The ASTEC report referred to above indicates that oil and gas R&D support by governments amount to about $30 million a year of which about half might be allocated to gas R&D. Gas production and distribution utilities undertake R&D and contribute to R&D in government and university research facilities. In 1993 the Australian Petroleum Cooperative Research Centre (APCRC) was established to plan, coordinate and fund R&D in the oil and gas sector (see box on CRCs).

Extraction charges (royalties, resource rent taxes) vary by jurisdiction (see **Chapter 3.1** above). With the sale of the Moomba–Sydney pipeline, previously owned by the federal Pipeline Authority, federal payments to the pipeline authority ceased in 1994.

Any subsidies to natural gas may have positive and negative aspects. For example, support for gas R&D may enhance its competitive position versus that of coal which, overall, has greater environmental impacts than gas, and of renewables which, overall, have fewer environmental impacts than gas. Reforms to the gas industry proposed by the IC, the Hilmer report and Greenhouse 21C, are aimed at ultimately reducing the price of gas and thus its competitiveness.

Environmental subsidies

Exploring for and producing natural gas has a number of environmental impacts. Access to drill sites and the drill sites themselves disrupt the local environments which, in Australia, are often in fragile ecological zones. Similarly, pipeline construction and maintenance may cause significant environmental disruption depending on the route selected. As gas usage increases and new fields and grids are developed this may become a significant issue.

Natural gas is virtually pure methane, a potent greenhouse gas. Methane leakage from production facilities, pipelines and at user sites thus contributes to the enhanced greenhouse effect. Combustion of natural gas also pro-

Cooperative Research Centres (CRCs)

The CRC program, which began in 1991–92, is a Commonwealth initiative designed to enhance the benefits from publicly funded research and development. Groups are brought together from different public and private organisations with outstanding proven or potential research and research training capabilities. This enables strong links to be built to the users of research in industry and other sectors of the economy and also provides a training ground for Australia's future researchers.

Three selection rounds of CRCs have been completed with 51 centres established and another 10 announced in December 1994 from the fourth round.

In 1994–95 the federal budget allocated $112.7 million to the CRC program, $141.9 million in 1995–96 with forward estimates reaching $145.2 million in 1998–99.[1]

In the energy area the Australian Petroleum CRC conducts research programs to investigate a number of technical issues including the development of technology for the extraction of methane from coal seams. The CRC has Federal funding of $2.7 million per year. Also in the energy area a CRC for New Technologies for Power Generation from Low Rank Coal is developing the science and engineering to support the development of new power generation technologies. Federal funding of $2 million a year is provided to this CRC.

As part of Greenhouse 21 C measures announced in April 1995, a Renewable Energy CRC is also to be established at a cost of $1.6 million over three years beginning in 1996–97.

1 Information from Budget Statements, 1995–96, Budget Paper No. 1, p.3.55,and Technology Directory., Scitech Publications,1994.

duces CO_2 and NOx emissions which contribute to the greenhouse effect.

Electricity production from natural gas produces about 45 per cent less CO_2 per unit of fuel combusted than black coal, and accounts for only about 2 per cent of total Australian non-Montreal Protocol emissions. In their work on electricity supply externalities in Western Australia, Stocker, et. al., estimated that by using natural gas rather than black coal, CO_2 emissions would be reduced by 50 per cent, the NOx/SO_2 component would be reduced by at least 50 per cent, and the mining component would also be reduced significantly. Stocker, et. al., estimated that including a resource depletion surcharge and taking the lower limits of the estimates, it appears that the external costs for gas used in electricity production could be around 1.9¢/kWh compared to coal at around 3.8¢/kWh.

Using the conservative approach adopted in the coal section, where the total cost of a 2¢/kWh for externalities was applied, a 1¢/kWh externality cost for natural gas used for electricity would have amounted to about $109 million in 1994.

Our review did not reveal any additional data on environmental subsidies associated with the Australian gas industry.

2.2.3 Oil

Australia is about 70 per cent self-sufficient in oil. Oil is a community owned resource which is produced in Australia for domestic and export markets. It is produced mainly from off-

shore fields and subject to secondary taxation (see Section 3.1) from State (onshore and offshore) and the Federal (offshore) governments (offshore royalties are shared by the two levels of government). Like coal and natural gas its production is also subject to corporate taxation. Oil transport is by ship,pipeline and truck (products); petroleum products are mainly used in the transport sector.

Financial subsidies

There are no direct subsidies to oil production and transportation but public agencies provide basic geological information to exploration companies at nominal costs. This represents a subsidy to the coal, oil and gas industries in Australia and most other countries. About 50 per cent of the AGSO budget is allocated for petroleum projects (mainly offshore). A 1993 review of the AGSO[1] argued the AGSO's work was primarily of a "public good" (benefits widely distributed) nature, and as such the AGSO should not be subjected to higher revenue and cost recovery targets. Cost recovery revenue was about $1 million in 1992–93, or about 2 per cent of the AGSO recurrent expenditure. As the primary beneficiaries of AGSO are the extractive industries (petroleum and other minerals) it seems that more revenue could be raised from these industries by the AGSO. In 1994, however, the Federal Government failed to get Senate approval for a plan to recover half of the AGSO's $20 million Continental Margins Program from the petroleum industry; this case illustrates the political difficulties of removing financial subsidies.

Excises imposed on aviation fuels are appropriated to the Civil Aviation Authority for the recovery of government provided aviation services where no direct user charges apply. Aviation fuel excises vary by fuel type, being substantially higher (by about 23¢/litre) for aviation gasoline than for aviation turbine (AVTUR) fuel. The rationale for this disparity is that AVTUR users (mainly airlines) pay, in general, much higher direct user (airports, traffic control) charges. All aviation charges are currently under review.

Financial subsidies to road transport use of petroleum products are analysed separately in Section 2.6, Roads.

Environmental subsidies

Production of crude oil can cause environmental damage mainly in the exploration, production and transport stages. There is serious potential for damage to marine environments from oil spills and damage to marine and land environments during exploration.

Australia, unlike some other countries (e.g. United States, United Kingdom), has to date had relatively minor oil spills, though such spills that have taken place have adversely affected local flora and fauna. The threat of oil spills is of particular concern in highly sensitive marine environments such as the Great Barrier Reef, where passage of ships must be accompanied by a pilot. Improved tanker design (e.g. double hulls) and shipping practices (e.g. alternative routes) are reducing the probability of oil spills, but the possibility remains. Double hull requirements for oil tankers are being phased in world-wide over the 1993–2000 period.[2]

In the event of an oil spill, governments would probably be expected to contribute to clean-up operations. In the absence of legislation to pass

1 *Review of the Australian Geological Survey Organisation:composition,structure and administrative arrangements*, AGPS, May 1993.

2 Information on Great Barrier Reef shipping and double hull requirements from personal communication (J. Storey), Great Barrier Reef Marine Park Authority, 13 February, 1995 and *Our Oceans, Our Future: Summary of findings, State of Marine Environment Report (SOMER)*, DEST, 1995,pp.47–51.

on the costs of these operations to the oil and tanker companies involved, the probabilistic level of these costs would constitute an environmental subsidy. Estimates of these probabilities are contentious.[1]

The Australian Maritime Safety Authority (AMSA) has developed a national plan to combat pollution of the sea by oil and under the *Protection of the Sea (Civil Liability) Act*, AMSA is empowered to recover loss, damage and clean-up expenses from individuals and/or entities causing the damage. Most States have similar legislation.[2]

Atmospheric emissions from oil refining (extraction of market products from crude oil) contribute to the greenhouse effect, urban smog and acid rain. Tightening regulations are forcing internalisation of these externalities but some remain. A problem is that each State is responsible for stationary (non-transport) emission sources; harmonisation and updating of these regulations to international levels is a matter that could be taken up by the Australia and New Zealand Environment and Conservation Council (ANZECC).

Except for petroleum products used in road transport, no additional data on environmental subsidies to the extraction, transport and use of petroleum was revealed by our review. Most (about 81 per cent)[3] oil products are used in the road sub-sector of the transport sector; subsidies to this sector are discussed below.

Road transport environmental subsidies

Transport energy use can have significant environmental effects. Combustion of petroleum products dominates transport energy use and produces CO^2, NOx, VOCs, CO and particulate (diesel) emissions leading to localised (lead, urban smog) and global (greenhouse) effects which are not costed or charged to individual road users.[4] The only caveat to this conclusion is that fuel excises, which are usually interpreted as a quasi user charge for roads, could alternatively be interpreted as an environmental charge. This would reduce estimated environmental subsidies to road use at the expense of increasing the estimate of financial subsidies.

As can be seen from Table 4, atmospheric emissions in Australian urban areas come mainly (except for sulphur dioxide) from motor vehicles. Increasing regulation is reducing localised impacts in the areas of lead and urban smog but significant environmental subsidies remain. In congested (traffic capacity constraint) localities, environmental impacts are magnified.

The average percentages for transport emissions quoted in Table 4 are indicative only and are arithmetic averages of the values for Sydney, Melbourne, Brisbane, Perth and Adelaide. The values in parentheses are the lowest and highest percentage of each emission group from the five cities. The figures in this table relate to 1985, a time prior to the introduction of unleaded petrol and phase-out of leaded petrols, and tighter new vehicle emission limits. The introduction of these regulations and technologies has improved some aspects of air quality (e.g. lower carbon monoxide, urban smog and lead levels) but according to the Victorian EPA has not affected the relative contribution of each of the sources. Besides not being recent, the information in Table4 does not include data on particulate and heavy metal (e.g. lead) emissions and noise.

1 See SOMER,Summary, *op.cit.*, p.50.

2 *National Plan 96 Australia's National Plan to Combat Pollution of the Sea by Oil*, Australian Maritime Safety Authority, and *Protection of the Sea (Civil Liability) Act*, Part IVA, p.13.

3 ABARE Commodity Statistical Bulletin,1994, p.323.

4 Besides the effects from the use of petroleum products road transport infrastructure and vehicles produce negative landscape/aesthetic effects and cause damage to wildlife through habitat disruption and the injury to, or killing of, wildlife on roads.

Table 4 Relative contribution to atmospheric pollution in Australian cities by source, 1985 (per cent)

Source	Carbon monoxide average (range)	Hydro-carbons average (range)	Nitrogen oxides average (range)	Sulphur dioxide average (range)
Motor vehicles	86 (82–89)	45 (41–50)	67 (54–80)	10 (4–18)
Other mobile	3 (2–3)	2 (2–3)	5 (4–5)	2 (1–5)
Waste combustion	1 (1–2)	1 (1–2)	<1 <1	<1 (<1–1)
Fuel combustion	7 (4–12)	10 (6–16)	21 (9–34)	32 (14–76)
Petroleum/solvent	<1 (<1)	35 (30–38)	4 (2–5)	37 (12–64)
Miscellaneous	2 (<1–3)	5 (4–8)	4 (1–6)	18 (<1–68)

Note:Discussions with environmental protection agency officials around Australia indicate a more recent assessment of the overall Australian is not available.

Source: Australian Environment Council,1988,as presented in Final Report 96 Transport,Ecologically Sustainable Development Project, AGPS, November 1991.

The Inter-State Commission (ISC 1990) estimated that the total cost of atmospheric pollution (excluding GHG emissions) from road transport was in the order of $787 million in 1989–90. These estimates are presented in Table 5.

In the ISC study data from a United States Federal Highway Administration Study undertaken in 1982 was combined with 1990 Australian data on vehicle use patterns (travel distances, etc.) to obtain the estimates presented in Table 5. A recent study of Australian transport externalities[1] reviewed the ISC results and those from recent studies undertaken in other countries. This review revealed that estimates of total costs of air pollution as a proportion of GDP for the United States and a number of countries in Europe were in the 0.16 to 1.04 per cent range and concluded that:

> "The proportion of these costs attributable to transport is unknown, although some authors have assumed that transport accounts for about one third of the total. If this ratio is accepted, the costs of transport emissions might represent between 0.05 and 0.34 per cent of GDP. Too much should not be made of the fact that the single 'Australian' estimate of 0.21 per cent falls in this range."

The same study also compared, for a range of countries, transport externalities expressed in terms of gross domestic product percentages. Results of this comparison are given in Table 6, data in which indicates that Australian road

1 Victorian Transport Externalities Study (VTES), Vol. 1, The Costing and Costs of Transport Externalities in Selected Countries. A Review, Victorian Environment Protection Agency, May 1994,p.49.

Table 5 Aggregate costs[a] of vehicle emissions in Australia 1989–90

Vehicle type	Area of operation Rural	Urban	Total
Automobiles			
Unit cost of emissions (cents per km)[b]	0.006	0.677	n.a.
Annual travel (million km)[c]	48 791	99 022	147 813
Annual cost of emissions ($ million)	3.1	670.5	673.6
Heavy duty petrol-engined vehicles			
Unit cost of emissions (cents per km)[b]	0.024	2.269	n.a.
Annual travel (million km)[c]	908	1 238	2 146
Annual cost of emissions ($ million)	0.2	28.1	28.3
Heavy duty diesel-engined vehicles			
Unit cost of emissions (cents per km)[b]	0.014	1.625	n.a.
Annual travel (million km)[c]	5 371	5 168	10 539
Annual cost of emissions ($ million)	0.7	84.0	84.7
All vehicles			
Annual cost of emissions ($ million)	**4.0**	**782.6**	**786.6**
Annual cost as percentage of GDP	**0.00**	**0.21**	**0.21**

Notes:

(a) In 1989–90 prices, do not include greenhouse externalities.

(b) Based on studies by the United States Federal Highway Administration (1982).

(c) Australian estimates based on Survey of Motor Vehicle Use (ABS 1990).

n.a. Not applicable.

Source: Inter-State Commission (1990),as summarised in Victorian Transport Externalities Study, p.48.

transport noise and emissions (non-GH) externalities are valued at 0.3 per cent of GDP.

Particular attention is drawn to the caveats and notes which accompany the table.

Translated into dollar values, 0.3 per cent of Australia's GDP would, in 1994, be about $1.320 billion for the environmental (noise and non-GHG emission) externalities. In reviewing these estimates the VTES summary report claimed they are likely to be conservative because since they were estimated in the 1980s environmental problems have increased, societal valuations of environmental externalities have increased and not all transport externalities (e.g. greenhouse effects) were considered.

The VTES report went on to develop estimates for transport externalities in Victoria based on studies for the project conducted over the 1991–1993 period. Noise, ozone, carcinogenic effects, accidents and congestion were covered but not greenhouse effects. For the 1988–1992 period estimates ranged from $6.0 96 6.17 billion, but the values are dominated by estimated accident ($4 billion in 1988 in 1992 dollars) and congestion ($2.031 billion in 1991 in 1992 dollars) costs. These two groups of externalities are not generally regarded as environmental externalities and are not considered here.[1]

Including only the environmental (noise, health) externality estimates from the VTES and adjusting for Victoria's estimated share of

1 Congestion costs are estimated in terms of time lost valuations; air pollution effects of congestion are included in atmospheric emissions estimates.

Table 6 Indicative[1] transport externality costs for selected countries (per cent of gross domestic product)

	Externality				
Country	**Noise**	**Emissions[2]**	**Accidents[3]**	**Congestion**	**Total**
France	0.24	0.15	0.8	0.9–3.0	2.1–4.2
Germany	0.2	0.2–0.34	0.8	2.0[4]	3.2–3.3
Netherlands	0.23[4]	0.14–0.23	0.5	2.0[4]	2.9–3.0
United Kingdom	0.5	0.05–0.12	0.5	3.2	4.2–4.3
United States	0.06–0.2	0.1–0.2	0.6–0.7	1.0–1.6	1.8–2.7
Australia	0.1	0.2	0.6	1.15	2.0

Notes:

1. Caution! The externality costs in this table are obtained from studies using varied methodologies for different purposes. Ranges indicate the lowest and highest estimates encountered (the absence of a range indicates that only one estimate was obtained from the literature reviewed). The estimates are not, in any rigorous sense, comparable. They are presented as the only indication available of the scale of the problem and as a very rough indication of the relative magnitudes of these transport externalities.
2. The Australian estimate is for costs due to road transport. Estimates for other countries are based on studies of the costs of air pollution due to emissions from all sources. In a recent study by the OECD, transport was assumed to account for one third of these costs. This approach also has been adopted in producing the results presented in this table.
3. Based on estimates of the full costs attributable to road accidents (over 90 per cent of costs due to accidents on all modes). In a recent study by the OECD, it was assumed that 30 per cent of these costs are external. This approach also has been adopted in producing the results presented in this table.
4. European Economic Community average.
5. Based on twice the estimated congestion costs for Sydney.

Note that due to rounding, the "total"estimates in the final column do not necessarily reflect the sum of the component estimates in columns 2 to 5 of Table 10.

Source:VTES, summary report,p.8.

the Australian total (30 per cent), gives a value of $200–$400 million,considerably lower than the amounts estimated via the GDP percentage estimates from the VTES international comparison and the ISC study. None of these studies estimated costs of GHG emissions from the transport sector; in 1990 the transport sector accounted for 12 per cent of Australian greenhouse gas emissions in 1990 (NGGI, 1994). Transport greenhouse externalities are included in the estimates below (Section 2.2.4) of energy related greenhouse emissions.

On the basis of the above discussion, non-greenhouse environmental externalities associated with the use of petroleum products in road transport are estimated to lie in the range $0.200 to $1.320 million in 1994.

2.2.4 Greenhouse externalities associated with fossil fuels

In a recent study NIEIR estimated the cost to attain Australia's interim greenhouse target of stabilising energy related 1988 emissions by 2000. The cost,estimated in terms of discounted (8 per cent real) GDP foregone over the period would be about $3 billion (in 1994 dollars) using a combination of low cost ('no regrets') demand measures and supply measures (mainly a switch to gas for electricity generation)[1]. Caveats on the use of this approach to greenhouse externality valuation in the energy sector include uncertainty as to

1 See *Measuring the Economic Impact of Reducing Greenhouse Gas Emissions*, NIEIR and ESAA,September 1994.

costs, the short time available to achieve stabilisation,and the uncertain extent of the effort required given the range of business-as-usual emission forecasts. It should also be noted that other studies on the impact of greenhouse gas abatement on GDP have given different results. The NIEIR results, however, are not too dissimilar to those from other essentially econometric modelling studies.[1] The results of such approaches should be cautiously applied because of assumptions made on economic linkages, for example between consumption and investment patterns, in the economy.

If greenhouse externalities associated with electricity production are valued 1.50¢/kWh for coal and 0.75¢/kWh for natural gas generating facilities, that is 75 per cent[2] of the total externalities estimated to be associated with these activities (see Sections 2.2.1 and 2.2.2), the greenhouse externalities associated with non-electricity energy activities would have been about $1.371 billion (3.0 96 2.172 x .75) in 1994.

It should be noted that because of the caveats outlined above and the approach taken, this value should be regarded as a broad order of magnitude estimate only. An extensive Industry Commission greenhouse study, for example, declined to attempt such an estimate.[3]

2.3 Renewable energy sources

2.3.1 Introduction

A range of renewable energy forms are used in Australia but currently the main one used is hydro from which up to 10 per cent of Australia's electricity is produced each year depending on climatic conditions and the dispatch of hydro-electricity by electrical authorities. Bio-energy from renewable sources (biomass, wastes) is also an important renewable energy form, followed by the use of solar energy for hot water production, mainly in the residential sector.

In general:

(i) renewable energy forms face more institutional and financial barriers to their use than non-renewable forms; and

(ii) their production and use results in fewer negative externalities.

For these reasons it is often argued that there is a case for assistance to them for "infant industry" and environmental reasons. Others argue that removal of barriers and the inclusion of externalities in the prices of all energy sources would provide a level playing field on which renewable energy forms could compete on their intrinsic merits.

2.3.2 Renewable energy and subsidies

Renewable energy forms vary widely in their environmental impact, for example combustion of biomass produces emissions while solar energy produces no emissions, but may have detrimental effects associated with the manufacture of solar energy components (for example, cadmium based photovoltaics). Generally, however, renewable energy forms (and improvements in the efficiency of energy use) have lower, often significantly lower, environmental disruption impacts associated with their "fuel" cycle (manufacture, installation and use). For this reason financial subsidies to these energy forms and energy efficiency can have positive environmental effects, a situation not found with non-renewable energy forms, indeed with other resources discussed in this report. Development of a competitive neutrality regime in the energy sector, for example the inclusion of externalities in pricing and of directed subsidies through RD&D support and

1 See for example, results from an ABARE study reported by Jones, Zhao-Yang, Peng, Naugten, *Reducing Australian energy sector greenhouse gas emissions*, Energy Policy, April 1994, pp.270–286.

2 75 per cent on the basis of Australian and North American studies discussed in Section 2.2.1.

3 Industry Commission, *Costs and Benefits of Reducing Greenhouse Gas Emissions*, Report 15, AGPS, Canberra, 1991.

grants, could accelerate the commercialisation of these less environmentally disruptive energy forms. The current Australian situation with respect to financial subsidies to renewables is discussed briefly in the Section 2.3.4.

2.3.3 Renewable energy trends

Indications are that a number of renewable energy technologies have the potential to compete with non-renewable energy forms, particularly if externalities were included in the pricing of all energy forms. Due to higher costs and environmental subsidies renewable energy is not generally competitive, although a 1992 study for the Department of Primary Industries and Energy (DPIE) indicated that electricity generated from wind and biomass sources (landfill gas, bagasse-sugar industry wastes, wood) were close to being competitive without externality inclusion.[1] For water heating, solar and biomass (wood, landfill gas) energy sources are economic in some locations, particularly where gas is not available.

By 2010 the DPIE study showed that technology advances and the inclusion of externalities at around 1–2¢/kWh would render these and other technologies such as photovoltaics and solar thermal systems competitive with fossil fuel generated electricity. Since 1992 some of the technical advances foreseen show promise of occurring, for example in the photovoltaics field where Professor Martin Green's research team at the University of New South Wales is developing advanced photovoltaic systems. Technical problems still to be overcome if wind and solar energy systems are to come into much wider usage include lower cost storage systems for evening out the periodic nature of the energy produced by these sources.

2.3.4 Renewable energy forms

2.3.4.1 Biomass

Though some bio-energy comes from combustion of non-renewable wastes, it is generally treated as a renewable energy source.

Biomass sources of energy (bio-energy) are numerous, the most important in Australia being wood and wood wastes, agricultural wastes (sugar cane processing residues, biogas from animal wastes, etc.) and municipal refuse (methane from landfill). Biomass currently accounts for just under 5 per cent of primary energy consumption in Australia, mainly for heat, electricity and ethanol production. As biomass energy use often involves combustion and hence, combustion emissions, residues, etc. it is generally treated differently from other renewable energy forms in environmental discussions.

Besides direct combustion, biomass may be converted to other forms by processes such as gasification, anaerobic digestion, and fermentation of grains and other crops. Uses of these converted forms include heating (with gaseous forms) and as liquid transport fuels either directly or after being further converted to octane enhancers such as ethyl tertiary butyl ether (ETBE). Considerable RD&D work is under way in Australia and other countries to improve the economic competitiveness of biomass fuels, for example the production of ethanol and methanol from lignocellulose.[2]

Financial subsidies

The main financial support for biomass is for RD and D work by public and private agencies. Also ethanol production from biomass (grains,sugar cane, etc.) is supported by a Federal ethanol bounty program. This program, aimed at encouraging non-lead petrol octane enhancement to lower noxious emissions, is allocated $8.1 million in 1994–95 and is

1 Stephens, M., *Renewable Electricity for Australia*, Discussion Paper No. 2, Energy Division, Department of Primary Industries and Energy, 1992,particularly pages 11, 12,13 and 25–27.

2 See *Alternate Fuels in Australian Transport*, Bureau of Transportation and Communications Economics, Information Paper No. 39, AGPS, 1994,Chapter 5, and *Biomass in the Energy Cycle*, Parts 1 and 2, Energy Research and Development Corporation, Canberra, 1995.

included in estimates of financial subsidies to energy production and use. Currently ethanol provides less than 0.1 per cent of transport fuel and the bounty scheme is only scheduled to operate for three years. It is highly unlikely that a viable ethanol industry will develop over the program period (1994–97) given that no major technical break throughs are foreseen in that time frame and to date the program take-up has been low (DPIE, pers. comm.) as at 18 cents/litre the bounty amount is considered by most prospective users to be insufficient for commercial viability (DPIE, pers. comm.).

Environmental subsidies

Environmental damage from bio-energy includes effects of solid and liquid residues, atmospheric emissions from bio-energy sites (methane, carbon dioxide, NOx and particulates) and some bio-diversity effects (see Forestry, Chapter 6).

An important issue in the environmental impact of bio-energy relates to the net greenhouse impact of producing bio-energy (for example ethanol) from renewable sources such as forests and sugar cane. Growth of the biomass absorbs carbon dioxide, so potentially enough biomass could be grown to absorb the CO2 emitted during its processing, transport and combustion. Several studies in North America have, however, failed to reach a consensus on the net greenhouse effect.[1]

2.3.4.2 Non-biomass renewables

Financial subsidies

The so-called newer renewable energy forms (i.e. forms excluding large scale hydro) such as solar, wind and geothermal are generally financed by small companies in the private sector which do not benefit from the financial advantages of large public and private organisations, particularly gas and electrical companies. In general, the economics of these renewable energy forms compare more favourably (but are generally still uncompetitive) with non-renewable energy forms when a financial level playing field and environmental subsidy analysis is performed.

Financial support for these renewables is provided through a federal industry renewables support program ($2.4 million) in 1994–95 including the Solar Energy Card program to promote solar water heating. Renewable R&D support was about $2.5 million from all government and public agency sources in 1994–95. This support is provided mainly because of the lower environmental impact of these energy sources. Increased support will be provided in future years through the Federal Greenhouse 21C package and by other public agencies. For example, Pacific Power, owned by the New South Wales Govemment, is investing $45 million in solar R&D over the 1995–2000 period ($11 million spent in 1994–95) in a joint R&D venture with the University of New South Wales.[2]

Environmental subsidies

Use of renewable resources other than biomass generates quite different externalities than those associated with fossil fuels. In the case of hydro electricity, for example, the flooding of agricultural and conservation area lands imposes environmental costs and cold water flows from dams affects fish spawning. Compensation is generally negotiated with private land owners, but not usually with public land owners, to compensate for forest, other flora and fauna loss. Hydro-electricity activities also contribute to the greenhouse effect by causing methane emissions from decaying biomass in

1 See for example, *Alternative Fuels in Australian Transport*, Bureau of Transportation and Communications Economics, Information Paper No. 39, AGPS, 1994, Chapter 5.

2 Information from federal budget papers, discussions with DPIE and Pacific Power officials, and from the ASTEC energy R&D study, *op. cit.*

and around dams and removal of some vegetation greenhouse gas sinks.

Leaching of minerals (e.g. mercury) from the soil underlying the hydro electricity catchment area can negatively impact the food chain, e.g. mercury poisoning in humans eating fish from the catchment.

Solar energy has few apparent environmental externalities. However, some observers have noted the negative aesthetic externalities of solar collectors and the negative externalities of manufacturing processes involved in solar systems. These effects are present, but seldom mentioned, in the case of fossil fuel generating units.

Wind energy externalities include aesthetics, noise and possible effects on birdlife.

Geothermal energy developments may result in some greenhouse gas emissions if drilling to extract geothermal energy releases trapped carbon dioxide and methane.

Financial and environmental subsidies to electricity production from renewable energy sources do not appear to have been evaluated in Australia. A United States study[1] gave a range of 0–1¢/kWh for negative externalities from renewable electricity compared with a range of 0.5–10¢/kWh for fossil fuel generated electricity.

No Australian work appears to have been done on quantifying financial and environmental subsidies to renewable energy forms.

2.4 Electricity

Electricity is produced from a range of primary energy forms in Australia, but predominantly from coal (82 per cent), natural gas (8 per cent) and hydro (about 9 per cent). At present virtually all electricity is produced by State public enterprises though this situation is changing, particularly in Victoria.

In Australia and many other countries the electricity supply industry has been characterised by large publicly owned enterprises having little or no direct competition. This industry structure came about largely due to concerns about natural monopolies, a desire to achieve social goals through electricity pricing and, originally, the inability of the private sector to raise the capital necessary to overcome the economies of scale barriers. These concerns are now much mitigated because of better understanding of the industry, changing social policies and the emergence of new electricity generating technologies. Competition among generators and distributors is now being actively encouraged, through the national competition policy reforms outlined above, through specific state reforms, for example in Victoria, and through inter-connections between Queensland, New South Wales, South Australia and possibly Tasmania.[2]

More work has been done on financial and environmental subsidies in this energy subsector than in any of the other sub-sectors. In this report environmental subsidies to electricity production are partly covered under the primary energy source from which the electricity is produced.

Financial subsidies

Until recently virtually all electricity was produced in Australia by State owned utilities. These utilities were not subject to corporate income tax and were not required to generate normal rates of return. Rates of return were low, surplus capacity was sometimes substantial (and is still significant) and overall productivity was low. In recent years, however, and particularly since 1990, these utilities have been required by most State governments to

1 *Environmental Costs of Electricity*, Pace University Centre for Environmental Legal Studies, Oceana Publications, September 1990.

2 The National Grid states.

operate in much the same way as if they were private commercial enterprises. For example, to achieve "commercial" rates of return based on replacement cost of assets,and to make dividend payments and/or tax equivalent payments to their owners. This is particularly true of the larger electricity organisations: Pacific Power, the State Electricity Commission of Victoria (SECV 96 now being disaggregated and partially privatised) the Queensland electricity supply industry and the Electricity Trust of South Australia. Set out below is a review of financial performance of major electrical utilities in Australia. The review is for 1992–93, the last year in which a complete coverage is possible and trends in the 1990s can be discerned. In 1993–94 and 1994–95 considerable change took place in the electricity industry, particularly in Victoria where the SECV was in transition to a system of disaggregated entities (13 in 1995).

In 1992–93 Pacific Power generated a return on assets (valued at depreciated replacement cost) of 12.5 per cent (16.2 per cent on equity) and made dividend payments of $299 million, together with tax equivalent payments of $260 million on revenue of $3317.6 million.[1]

In the same year the SECV reported a return on assets (depreciated current cost at year end value) of 10.0 per cent and paid $191 million as a Public Authority Dividend on revenues (net of asset sales) of $3170.7 million[2]. As part of the commercialisation process for State Owned Enterprises, the Victorian Government introduced a surrogate income tax, including capital gains tax, for 1993–94. The process requires payment to the Victorian Consolidated Fund of amounts determined to be equivalent to those payable if the new entities were taxed under the Income Tax Assessment Act of the Commonwealth. The State Treasurer may make modifications to the surrogate tax laws as considered appropriate by the Treasurer.

For 1992–93 the Queensland electricity supply industry[3] (generation, transmission and distribution) reported a 9.3 per cent return on assets (9.1 per cent on equity) from revenue of $2159.9 million on operating profit of $614 million and dividends paid of $125.0 million.

The Electricity Trust of South Australia (ETSA) in 1992–93 reported a 10 per cent return on assets and paid $153.7 million to the State Government from revenues of $897.3 million.[4]

In the case of the State Energy Commission of Western Australia (SECWA), until 31 December 1994 gas and electricity operations were combined. Data in annual reports to the end of 1994–95 were insufficiently disaggregated to compare financial performance for electricity operations with the other major utilities. However, data from a study on the performance of government trading enterprises estimated that in 1993–94 the electricity operations of SECWA achieved a rate of return on assets of 12.6 per cent.[5]

The smaller electrical utilities are improving their financial performance but are generally not as advanced in this trend as the major utility organisations. For example, the ACT Electricity and Water Authority (ACTEW) accounts for 1992–93 indicated a 6.5 per cent return on electricity assets, and a negative return on water assets. Dividend payments to the ACT Government amounted to $24.5

1 Pacific Power Annual Report, 1993,pp.3,11 and 41.
2 SECV Annual Report, 1993, pp.21, 32 and 41, 45 and 64.
3 Annual Report, Queensland Electricity Commission, 1992–93, p.40.
4 Annual Report, Electricity Trust of South Australia, 1992–93.
5 Government Trading Enterprises' Performance Indicators, 1989–90 to 1993–94, Standing Committee on National Performance Monitoring of Government Trading Enterprises, April 1995 (GTE PI, 95), Summary, p.36.

million, from total revenue of $323.2 million.[1] Thus, for the smaller electricity utilities the failure to achieve an 8 per cent real rate of return may be of some significance. Assessment of the situation in the many (plus 50) smaller generating and/or distribution utilities would require comprehensive analysis beyond the resources available for this study.

Prior to 1990 investments by the State owned electrical authorities did not, in the main, generate normal rates of return. Hinchy, *et al*[2] estimated that electricity prices in 1989–90 were, on average, 28 per cent below the levels needed for utilities to earn a real rate of return of 8 per cent on capital; the effect of changes since that time has not been studied in detail but it seems that real rates of return have risen considerably over the past five years.[3]

While the financial performances of electrical authorities cannot be directly compared with private sector returns due to different asset valuations[4] and the evolving nature of the business, it is difficult to argue that the larger electricity enterprises are now producing financial returns to their state owners lower than "similar"commercial enterprises. Currently they are realising reported rates of return at or above a level which could be viewed as a subsidy and are making payments to State governments in lieu of dividends and taxes.

Community service obligations such as pensioner rebates and uniform pricing are a potential source of inefficiency in electricity pricing.[5] Pensioner rebates and concessions to other groups were estimated from state budget data and included in Table 8. Uniform pricing among users within the same broad end-use categories fails to take account of differences in the cost of supplying each user. Conversely, different electricity prices are often applied to different users with the same supply cost. As a group, industrial users typically pay more than the cost of supply, whereas domestic and farm consumers pay considerably less than cost, implying a cross-subsidy between these user groups. Estimates of cross-subsidies were not covered by the study's terms of reference.

In the evolving electricity regime it is not yet clear how community service obligations and cross-subsidies will be actually treated in the future. The intention is to remove them from operation of the electricity sector and address them directly, for example by social and industrial policy, where deemed necessary. To some extent this is now occurring. In practice, however, the outcome will depend on the approach taken by regulatory authorities and the individual governments concerned.

The above discussion indicates that a variety of factors are currently involved in Australian electricity pricing. Each of these factors can cause electricity prices to diverge from real cost levels in an efficient system. Some factors suggest that electricity prices are overall too

1 Annual Report, ACT Electricity and Water Authority, 1992–93.

2 Hinchy, M.D.,Naughton, B.R.,Donaldson, P.K.,Belcher, S. and Ferguson, E. (1991), *The Issue of Domestic Energy Failure*, Project 4127.101, Australian Bureau of Agriculture and Resource Economics (ABARE), AGPS, Canberra.

3 Different estimates of the capital base lead to different conclusions on the degree of under-pricing. While past practice among utilities has been to value their asset base according to historical costs rather than replacement cost (Hinchy *et al* 1991), changes to the capital base will alter rates of return under ruling prices. Write off of poor investments and the elimination of excess capacity under microeconomic reform will reduce the effective asset base of some suppliers. The losses estimated by Hinchy, *et.al.* reflected current rather than efficient capital stocks and made no allowance for write-off of poor investment decisions; hence the losses estimated tend to be overstated.

4 Each of these entities now predominantly value their assets at current replacement costs rather than historical costs. A national committee (of COAG) has recommended use of a deprival value approach; this approach is based on the present value of prospective returns from assets.

5 Industry Commission (IC), *Energy generation and distribution*, 1991.

low, while the influence of other factors such as inefficient operations point towards prices being too high. A 1994 BIE report concluded that current evidence is insufficient to obtain a firm estimate of the net influence of these factors on electricity prices.[1] Over the medium to long term, if opportunities for efficiency gains from competition in a national grid are realised, and if production externalities are not included, the average real price of electricity could fall and thus encourage an increase in demand.

Environmental subsidies

Electricity transmission and distribution activities can give rise to aesthetic extemalities (particularly in areas of tourism potential), to biodiversity impacts (in sensitive ecological areas) and to health effects from electro-magnetic fields (EMF). Each of these impacts, particularly those associated with EMFs, are contentious and no attempts to value them in financial terms appear to have been made.

As indicated in the introduction to this chapter, environmental subsidies associated with different energy sources of electricity are covered under each primary energy source.

2.5 Energy use

Energy use is usually analysed on the basis of the major end-use sectors: residential (households); commercial (retail offices, etc.); industrial (manufacturing, primary industries); and transport (road, air, rail, etc.).

Road transport is the energy use sector which has attracted the most attention in the analysis of financial and environmental subsidies. This sector is analysed separately in Section 2.6, Road transport below.

Improvements in energy use efficiency reduce, *ceteris paribus*, the magnitude of financial and environmental subsidies associated with the production, transmission and use at a given level of services provided by energy. Energy efficiency improvements can be promoted by a combination of higher energy prices and other instruments such as efficiency standards, information programs and support for R&D on energy efficient techniques. There is considerable debate on the choice of instruments to promote energy efficiency. In selecting among these instruments there is a need to consider the possible market distorting impacts of their deployment.

Financial subsidies

Financial subsidies to non-transport energy users are mainly for electricity cost concessions to low income groups. These concessions amounted to around $300 million a year in 1994 according to our survey of 1994 budget papers. These subsidies encourage inefficient use of energy, an effect which could be reduced if this subsidy were delivered through general social assistance programs. However, income elasticities of demand are low and the disturbing effect therefore small.

In 1994–95 the federal government allocated $5.6 million to the National Energy Management Program which promotes energy efficiency in the business sector and thereby reduces environmental impacts of energy systems.

Environmental subsidies

Environmental effects from the use of the various energy forms are discussed above in the sections on these energy forms.

2.6 Road transport

Road transport, which in Australia and other countries dominates transport energy use

1 *Energy labelling and standards*, Bureau of Industry Economics, Research Report 57,1994, p.79.

(see Table 7) and which mainly uses liquid petroleum fuels as an energy source, is a complex analytical area.

Table 7 Energy consumption in Australian transport, 1992–93 (petajoules)

Sector	Energy use	Percentage
Road	**783.0**	**78.9**
Cars	513.7	
Trucks	249.7	
Buses	16.4	
Motorcycles	3.2	
Air	**139.1**	**14.1**
Domestic	63.9	
International	75.2	
Rail	**25.2**	**2.5**
Marine	**44.5**	**4.5**
Coastal	19.7	
International	24.8	
Total	**991.8**	**100.0**

Source: Transport Greenhouse Emissions,Bureau of Transport and Communications Economics, September 1994, p.xii.

Transport by road produces a range of external effects, including noxious emissions (oxides of nitrogen, etc.), greenhouse gas emissions (carbon dioxide, methane, etc.), disruption of landscapes and wildlife, loss of aesthetic values, noise and congestion. Of these external effects, noxious and greenhouse emissions[1], and to some extent noise, are regarded as environmental externalities.[2]

The financing of roads in Australia is undertaken mainly from general revenues of governments and includes substantial specific purpose grants from the federal government to State governments. Excise taxes on petrol and diesel fuels, which are expected to total over $9 billion in 1994–95, are widely regarded as being predominantly a crude road user charge. None of the revenues from these excise taxes are formally hypothecated to road construction and maintenance and their relationship to the costs of road provision is distant: e.g. they do not recognise urban/rural differences in cost, or differences in costs occasioned by different classes of vehicle and at different times of day.[3] However, revenues from State licence fees are generally devoted to road construction. Financial subsidies to road users are discussed below.

Financial subsidies

Transport financial subsidies which encourage road energy use and associated degradation of natural resources arise when road users do not pay the full costs of road provision. Currently, road fuel excise taxes and other charges on Australian road users exceed total road construction and maintenance costs but they do not fully meet the criteria for user charges set out in Chapter 1 of this report. As a result some road users are not paying the full costs of providing parts of the road system used by them. In particular, the cost of land taken up by roads is seldom included in the costing of roads, and in the case of urban roads these costs are substantial.

Unlike other utilities, roads have not so far been treated as a capital asset which should be required to earn a rate of return. This treatment would recognise not only the capital value of bridges and road pavements, but of the land devoted to roads. The Australian Bureau of Statistics (ABS 5204.0) in its national

1 Discussed above in the sections on energy forms.

2 Noise is regarded as an environmental externality by the State EPAs, and is often treated as such in environmental externality studies. Thus noise is a significant "atmospheric" environmental externality, emanating at harmful levels, from the transport (road, air, rail) and non-transport (refrigeration systems,etc.) sectors.

3 The National Road Transport Commission (NRTC),has recommended and the Ministerial Council for Road Transport has agreed, that 18¢/litre of the 30.75¢/litre diesel excise should be regarded as a charge for road damage.

accounts provides an estimate of the replacement value of the accumulated stock of road bridges and pavements. In 1991 the value was $44400 million. By the end of 1994 the value might have reached $50000 million in 1994 dollars, worth $4000 million a year at 8 per cent real.

The theory of land valuation is that all land should be valued at opportunity cost. Applying this to road land would result in its site value being inferred from the adjacent properties. There have been no official attempts to value the land devoted to roads in Australia. However, an order of magnitude can be inferred from data collected by the Commonwealth Grants Commission. According to the Commission, the site value of rateable land in Australia in 1991 was approximately $545 billion, of which $478 billion was accounted for by commercial, industrial and residential land. Government offices and the like were not included in this total. Neither were parks or roads. However, the value of land devoted to these uses could be inferred from the adjacent sites. With roads fairly evenly distributed across residential, commercial and industrial areas, and forming (say) a 25 per cent addition to the rateable land of such areas, the site value of roads in such areas would be approximately $120 billion. Roads in rural areas may be added, but they take up a small proportion of the rural areas and so do not add much to the total site value of roads.

The estimate of 25 per cent of rateable area is obviously a 'ball park' figure. However, before it is rejected the following should be considered: it is only 20 per cent of rateable area plus roads, and assumes that other non-rateable land is valueless. It is certainly not true that the land under public buildings has no site value.

It may be claimed that roads have no site value because without them it would not be possible to access other sites. This is certainly not true at the margin: road extension in urban areas can be very expensive in terms of land purchase, though road authorities typically endeavour to avoid cash costs by using land already in pubic ownership. However, the site value of the roads may be capitalised into the adjacent sites, except for the site value of freeways and many main roads, which has a negative effect on adjacent sites. If this is the case, the site value of roads may be re-estimated as 25 per cent (the share by area) of the site value of adjacent properties,amounting to somewhat over $96 billion, say (conservatively) $100 billion at the end of 1994. At an 8 per cent real rate of return the site value of the roads would be $8 billion a year. Add this to the capital return on the improved site (road pavement, bridges, etc.) value estimated above, and the required revenue is $12.0 billion a year plus maintenance costs estimated at $2.5 billion: total $14.5 billion. For comparison, in 1994 road users paid approximately $13.3 billion in fuel taxes and other quasi user charges to the Federal and State Governments. This gives an order of magnitude financial net subsidy of $1.2 billion.

A recent Industry Commission (IC) study reviewed a number of recent Australian studies on road costs and benefits.[1] This review indicated a wide range of outcomes, from a deficit (net subsidy) to a surplus, when financial subsidies were considered. The main reasons for the differing conclusions were found by the IC to be the unreliability of much data and the differing methodologies and assumptions employed. Our conclusion is, however, that there is a substantial subsidy to road users, particularly those in urban areas.

A major financial subsidy issue relating to roads and other resource areas is, that for efficient use of roads the costs of road provision, maintenance and externalities should be

1 *Urban Transport*, Industry Commission,Report No. 37, February 1994; environmental and other transport externalities were also considered in the review.

charged directly to specific road users. Excises and other levies which are not related to specific road uses should ideally be replaced by true user charges. Direct road pricing, which is now becoming technically feasible and available, would serve this purpose. If excises and other road user payments are not accepted as user charges the subsidy to road users rises to near the $14.5 billion in road costs estimated above.

Other policies and practices encourage the over-use of road transport, particularly low or no parking fees and the provision of cars as part of a remuneration package. To some extent the fringe benefits tax has reduced these benefits to auto users.

Environmental subsidies

Transport energy use can have significant environmental effects; as these effects are mainly due to the use of petroleum products they are covered in Section 2.2.3 above.

Summary of road transport subsidies

The analysis of road transport energy use, set out above and in Section 2.2.3, indicates that financial and environmental subsidies to urban road users are probably substantial. Despite recent progress, more work needs to be done in this area to extend subsidy valuations and to evaluate policy options to remove/internalise these subsidies.

2.7 Other transport modes

Although the road sub-sector dominates transport energy use (see Table 7) other sub-sectors are of importance, particularly air.

The wider application of user pay principles in the case of aviation and marine services, and the reduction in subsidies to state owned rail services, are reducing implicit and explicit financial subsidies to these non-road modes. Some, however, remain but their estimation would require resources beyond those available for this study.

Environmental subsidies (external effects) of these modes while not as substantial as those from the road sub-sector, may be significant. Discussion of some marine transport externalities is included in this chapter in the oil section and also in the fisheries chapter. These externalities are those from shipping oil spills and release of ballast water respectively. In the air sub-sector noise and greenhouse gas emissions are significant, and in the rail sector noise, noxious and greenhouse gas emission externalities are present.

2.8 Summary

The above discussion of financial and environmental subsidies in the energy sector indicates that these remain substantial despite significant removal of subsidies over the past five years. Of particular importance are those associated with electricity production, greenhouse gas emissions and road transport.

A summary of financial and environmental subsidies for the energy sector is provided in Table 8. As indicated in discussion of the various energy areas above, the estimates of subsidies provided in Table 8 are not comprehensive.

Table 8: Summary of financial and environmental subsidies,1994, energy sector

Activity element	Financial subsidies ($ millions,1994)	Environmental subsidies ($ million,1994)	Subsidy removal instruments	Fiscal implications ($ millions,1994)
Energy R&D[1]	153	—	Partial removal of tax allowance. Greater private sector contributions.	
Public agency costs[2]	267	—	Partial removal of tax allowance. Greater private sector contributions.	
Direct subsidies[3]	331.9	—	Removal of subsidies; if necessary replace with general social assistance payments.	
Rate of return[4] subsidies electricity	—	—	Increase rates of return in smaller utilities, e.g. ACTEW.	
Electricity production[5] (coal and natural gas)	—	2 505	Include externalities in electricity prices.	
Energy related (non-electricity) environmental externalities:	—			
– greenhouse		1 371		
– road transport		200–1 320		
Roads[6]	1 200		Raise road user charges; road pricing with externalities included.	
Renewables and energy efficiency[7]	43.1	—		
TOTALS	**$1.995 billion**	**$4.076–$5.196 billion**		**$6.071–$7.191 billion**

Notes

1. Estimate of total government direct expenditure on energy R&D plus value of tax deductions in 1994. Estimates derived from *Energy R&D*, NIEIR Energy Working Party Report, June 1994,p.8.26 and *Energy Research and Technology in Australia*, Australian Science and Technology Council (ASTEC),Occasional Paper No. 28, 1994; excludes renewable energy and energy efficiencies R&D, (approximately 15 per cent of total) 96 see note below.
2. Public agency costs not recovered; estimated from budget papers, agency reports (e.g. AGSO).

Estimates of public energy agency costs not recovered*

		$ million
Commonwealth		
Budget statements,1994–95		
AGSO — operating and capital costs	$68	
DPIE — advice, administration	$30	**$98**
New South Wales		
Budget estimates,1994–95	$30	
Victoria		
Budget estimates,1994–95	$30	
Queensland		
Budget program statements,1994–95	$75.8	
Western Australia		
1994–95 program statements	$15	
South Australia		
Estimates of receipts and payments 1994–95, Financial Paper No. 2	$10	
Tasmania		
The 1993–94 Budget	$5	
Northern Territory		
The 1993–94 Budget	$3.2	**$169**
TOTAL		**$267**

* Where definite items by function were not specified in budget papers and agency reports, estimates were made on the basis of budget and report texts and discussions with officials.

3. Direct subsidies to energy industries and users, e.g. rural users,ethanol bounty, low income groups; does not include diesel fuel rebate scheme (DFRS) payments as this rebate is a proxy for non-use of roads.

Estimates of direct subsidies to energy industries and users

		$ million
Commonwealth (see Note 7)		—
States		
New South Wales		
Budget estimates,1994–95	Energy management and utilisation; pensioner electricity subsidy	36
Victoria		
Budget estimates, 1994–95	Concessions to pensioners and beneficiaries	214.6
Queensland		
State budget,1994–95 Program	Pensioner concessions statements	78.0
South Australia		
Estimates of receipts and payments, 1994–95 Financial Paper No. 2	Subsidies in country areas	3.3
Western Australia		
1994–95 Program	None identified	—
Tasmania		
The 1993–94 Budget	None identified	—
Northern Territory		
The 1993–94 Budget	None identified	—
TOTAL		**$331.9**

4. See text for basis of estimate, pp.43–45.
5. Estimate of all externalities associated with coal and natural gas used for electricity generation. See text for basis of estimate; pp.28–32 (coal) and pp.34–35 (natural gas).
6. See text for basis of estimate; pp.52–54.
7. Estimate of $27 million (15 per cent of total) for R&D, see ASTEC report, *op. cit.*, p.72; plus subsidies to renewable energy industries and users as set out below.

	$ million
Ethanol bounty program (text,p.44)	8.1
Other renewables mainly solar (text,p.45)	2.4
National Energy Management program (text,p.51)	5.6
	16.1

3. Water

3.1 Introduction

Water catchment, storage and distribution for household, business and agricultural (mainly irrigation) use is primarily the responsibility of publicly (mainly State) owned enterprises. As Australia is a dry continent with few natural supplies of fresh water in lakes and streams, and a country with a substantial agricultural industry and a significant concentration of population in coastal areas, water resources and water quality issues are of major significance.

A range of pollutants enter water supplies prior to use. The extent of the pollution depends on the water source. Water from controlled, restricted use catchment areas is relatively free of pollutants while supplies from streams, open and relatively unprotected areas may require decontamination before use. During use a range of pollutants are added to water, and water run-off collects pollutants in urban and rural areas. Treatment of these contaminated water flows before their disposal is often inadequate or non-existent.

While most water use is from surface sources (catchments, streams and lakes) goundwater is also used. There is a tendency, when surface water becomes unavailable or expensive, for consumers to tap into this "free" resource. Groundwater, like surface water, is one mode of water occurrence in the water cycle. However, because of its large storage volume, its hidden nature, slow movement and slow flushing characteristics, it does require different management consideration. Contamination of ground waters can occur from uncontrolled and difficult to control sources such as seepage from landfill disposal sites, leakage from storage tanks or pipelines, poorly constructed tailings dams, etc. Ground water is usually more at risk from these contamination sources, but as many streams are fed by ground water outflow some degradation of surface water bodies can also occur.

Water resource subsidy issues are closely related to waste water subsidy issues and related to those in several other resource activities. For example forests in catchment areas can significantly enhance water quality (see Forests chapter) and solid waste disposal into landfill may result in leaching of toxics into water supplies. In this report water quality is mainly dealt with in Chapter 5 (waste water treatment and disposal).

The water industry produces some positive externalities or non-market benefits, for example bio-diversity preservation and recreational opportunities in catchment areas. These externalities and the costs and benefits of water catchment preservation have not been quantified and are not discussed further.

Reform of the Australian water industry is recognised by Australian governments as

being required. Issues such as those raised in the 1992 Industry Commission report on *Water Resources and Wastewater Disposal*; the Ecologically Sustainable Development process; and environmental problems such as algal blooms led to the creation of the Council of Australian Governments (COAG) Working Group on Water Resource Policy in 1994. This body was established to develop a strategic framework for efficient and sustainable reform of the water industry which will take account of the diversity that exists across the States and Territories.

The COAG Working Group has yet (October 1995) to finalise its work, but indications are that there is a high degree of agreement amongst Australian Governments as to what must be done to improve the efficiency of the water industry. In February 1994 the Working Group reported[1] on its work and recommended that Heads of Government, in implementing a strategic framework for the water industry, have regard to the following principles.

- Water resource policy being seen as delivering on the agenda for ecologically sustainable development.
- An integrated catchment management approach to water resource management.
- Pricing that reflects all the costs of supply and service (including environmental costs) with all government subsidies or community service obligation payments made transparent.
- Water being employed in higher value uses, within the social, physical and ecological constraints of catchments.
- Consistent approaches to pricing, property rights/entitlements, trading and environmental allocations across jurisdictions.
- Institutional arrangements and responsibilities that are clearly defined.
- Measures to address the structural and social impact of reform.
- Community involvement in the water reform process.

When implemented the strategic framework is expected to improve environmental outcomes and result in a restructuring of water tariffs and reduced or eliminated cross-subsidies for metropolitan and town water services. The report notes that financial assistance for particular consumers may be necessary where cost reductions are not available to offset price increases. In the case of rural water services the framework is intended to generate the financial resources to maintain supply systems should users desire this, allow water to flow to higher value uses subject to certain social, physical and environmental constraints, provide irrigators with a tradable asset (which could also serve as a useful structural adjustment instrument in some cases) and devolve, where appropriate, operational responsibility for irrigation schemes to local areas.

Also noted is that:

> "While the need for reform is recognised, the legacy of past investment and poor decisions, particularly in relation to irrigation schemes, means that there are very real constraints on the extent and pace of reform in some areas. Because the changes flowing from the framework are extensive and far reaching in their implications, particularly in rural areas, it is considered that a five to eight year implementation period will be required."[2]

A second report[3] in February 1995 indicated that in the previous twelve months progress had been made in implementing the strategic framework. The report noted concerns in rural areas about the extent of price increases that might have to occur for rural water services to

1. *Report of the Working Group on Water Resource Policy to the Council of Australian Governments*, February, 1994.
2 ibid, p.8.
2 *Second Report of the Working Group on Water Resource Policy to COAG*, February, 1995.

be financially viable. Also noted, however, was that cost reductions may be achievable in rural water delivery systems, as indicated by efficiency improvements in some areas that will help offset the increase in charges that would otherwise be required to place irrigation schemes on a financially viable basis.

In the area of asset valuation, which affects rate of return estimates, the COAG Working Group, has agreed on using the Deprival Value methodology for asset valuation. The current situation is variable but most major agencies had been working towards valuing assets on a Replacement Cost basis.

The Deprival Value approach provides a measure of the real economic costs of service provision. The deprival value of an asset is the value to the entity of the future economic benefits that an entity would forego if deprived of the asset. Under this approach to asset valuation, assets are valued at an amount that represents the entire loss, both direct and indirect that may be expected to be incurred if an entity were deprived of the service potential or future economic benefit of the asset at reporting date.[1] Compared to the Replacement Cost method the Deprival Value approach places a lower value on past investments that have proved uneconomic.

3.2 Financial subsidies

Water supply (catchment, distribution) has been mainly the monopoly of public enterprises. Responsibility for establishment and management of water catchment areas and distribution facilities has been with these enterprises which are often also responsible for waste water and sewerage activities. The authorities have not been subject to taxation, and the opportunity cost of catchment land and full capital and recurrent expenditures have seldom been factored into costs of water supplied.

Financial subsidies to water supply have been substantial in Australia, particularly in irrigation and non-metropolitan reticulated water systems. In no State is an 8 per cent real rate of return achieved and most (see Table 9) irrigation systems fail to achieve a positive rate of return, that is revenues fail to meet operating costs. Revenue short falls of water authorities mean that governments are called on to make payments to water authorities to cover operating deficits and to make capital works contributions.

Although there is movement towards achieving normal rates of return and full cost accounting and pricing as set out in the COAG water reform agenda, financial subsidies remain, and removal of these subsidies appears to be slow.

Moreover, current Australian water pricing practices do not provide adequate price signals for the encouragement of efficient water use. The revenue of most authorities comprises a mixture of user charges and hypothecated taxes. On the strict definition of financial subsidy (costs less user charge revenues) they generally receive large subsidies. Efficiency improvements in the activities of water authorities would reduce the price increases required to meet rate of return targets.

Examples of the varying performance and cross-subsidies among metropolitan and rural systems are provided in Table 9,and in the following box which presents data on the various operating elements of the South Australian Department of Engineering and Water Supply. Other examples, for rural water operations, are that in 1990 the Murrumbidgee Irrigation Area (MIA) reported that a 5 per cent real rate of return on assets would require price increases of 250 per cent[2], and in 1992–93 the New

1 See *Report of the Expert Group on Asset Valuation Methods and Cost Recovery Definitions for the Australian Water Industry*, Working Group on Water Resource Policy, February, 1995.

2 Industry Commission, *Water resources and waste water disposal*, 1992,p.52.

Table 9 Real rates of return for water management in Australia (1990–91) (per cent)

	VIC	NSW	QLD	SA	WA	TAS	ACT
Metropolitan water and sewerage	4.59	2.68 (1) 2.29 (2)	2.03	2.04	4.05	N/A	–0.05
Non-metropolitan water	2.57	2.57	1.62	–1.79	–1.91	2.77	N/A
Irrigation Gravity	–0.34	–1.90	–1.73	–5.10	–5.13(3)	–1.14	N/A
Pumped	0.56	1.53	–1.76	–0.92		N/A	N/A

Notes:

N/A Not available.

(1) Sydney Water Board (2.2 per cent on a real asset value in 1992–93).

(2) Hunter and District Water Board.

(3) All irrigation:no separate figures for gravity versus pumped irrigation.

Source: AWRC Financial and Corporate Management Committee, updated as reported in *A Scarce Resource*, Water Victoria,1992.

South Wales Department of Water Resources reported that total revenues met only 25 per cent of total expenses, and that user charges met only 37 per cent of operating expenses.[1]

As noted above improvements are being made. For example the Rural Water Corporation of Victoria reported a $70 million short fall in revenues to cover operating costs in 1984–85 but by 1993–94 this had been reduced to $13.1 million and the operating deficit is expected to be eliminated in 1994–95.[2]

In assessing the current performance of the water industry, it should be remembered, however, that water supply investments have long useful lives, and most were committed during periods when interest rates were lower than at present, and expected rates of return correspondingly lower. Had they been in the private sector it is likely that, under current high interest rates,some of these assets would have been written down to less than replacement cost. The corollary is that no new headworks investment would be committed until rates of return had risen to current levels.

More recent data than that presented in Table 9 is available for metropolitan areas from the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ). This data is presented in Table 10,and shows that in 1993–94 only Melbourne Water had a real rate of return, including hypothecated tax revenue, above 4 per cent. No authority had a real rate of return above 8 per cent.

From departmental, agency and ARMCANZ data it is estimated here that the 1994 financial subsidy associated with below 8 per cent real rates of return to Australian water authorities amounted to about $3.0 billion.[3] That is, water authorities in Australia needed to raise additional revenue and lower costs in the total of about $3.0 billion to earn normal rates of return on assets at replacement cost and obviate the need for contributions to their activities from the consolidated revenue of governments. It should be noted that this estimate has not used the Deprival Value approach to asset valuation discussed in Section 3.1 above.

1 Annual Report, New South Wales Department of Water Resources,1992–93, p.52.

2 Annual Report, Rural Water Corporation of Victoria, 1993–94, p.4.

3 See notes on Table 11 for basis of estimates.

Department of Engineering and Water Supply, South Australia (DEWS-SA)

The department has five major business undertakings related to water supply, sewerage and irrigation and drainage. Operating results for 1991–92 for each business undertaking are as follows, indicating surpluses for metropolitan segments and deficits for country segments, indicating a cross-subsidy from the former to the latter. Such cross-subsidies encourage over use in the cross-subsidised activities.

Overall return on departmental assets is negative with only one segment, metropolitan sewerage, achieving a rate of return above 4 per cent.

	Metro water $'000	Country water $'000	Metro sewerage $'000	Country sewerage $'000	Irrigation & drainage $'000	Other $'000	Total $'000
Revenue							
Rates	155 916	56 500	115 823	11 830	6 140	—	346 209
Other revenue	4 569	2 196	3 582	343	520	3 806	15 016
Total revenue	**160 485**	**58 696**	**119 405**	**12 173**	**6 660**	**3 806**	**361 225**
Expenditure							
Ops & maintenance	38 710	27 189	25 999	3 788	4 543	5	100 234
Management and support services	25 299	13 627	18 358	3 430	1 333	3 825	65 872
Depreciation	20 588	18 586	11 634	2 119	1 374	15	54 316
Water resources management	2 691	1 200	165	317	50	4 398	8 821
Murray–Darling Basin Commission call-up	—	—	—	—	—	4 681	4 681
Social Justice initiatives	—	937	—	401	—	—	1 338
Interest	47 122	32 468	28 216	10 267	7 692	804	126 569
Other expenses	—	—	—	—	—	401	401
Total expenditure	**134 410**	**94 007**	**84 372**	**20 322**	**14 992**	**14 129**	**362 232**
Abnormal item	6 365	2 991	4 530	817	173	7 732	22 608
Segment profit (loss) 1991–92	**19 710**	**-38 302**	**30 503**	**-8 966**	**-8 505**	**-18 055**	**-23 615**
Fixed assets[1]	981 170	900 735	584 726	124 177	72 548	13 870	2 677 226
Less:Accumulated depreciation	103 238	86 687	79 806	15 696	11 752	3 961	301 140
	877 932	**814 048**	**504 920**	**108 481**	**60 796**	**9 909**	**2 376 086**
Plant and machinery (net)							45 061
Work in progress							163 487
							2 584 634
Estimated return on assets (%)[2]	2.2	-4.7	6.4	-8.3	-14.0-	—	-0.9

Notes:

1 Water and sewerage treatment works,tanks and storage and aboveground mains are valued at current replacement costs; reservoirs,pumping stations, underground mains,service connections,bores and wells,land and buildings, however, are still valued at historical cost and are awaiting a planned revaluation.

2 Segment profit as percentage of asset value; estimated from Annual Report,1991–92, pp.54–55.

Source:Annual Report,1991–92 DEWS-SA,pp 54–55

Table 10 ARMCANZ 1993–94 survey: key outcomes for metropolitan water (preliminary)

Metropolitan water supply systems	Sydney Water	Melbourne Water	Water Authority of W.A.	Engineering & Water Supply S.A.	Brisbane City Council	Hunter Water	A.C.T. Electricity & Water	N.T. Power & Water*	Average
Operating cost per head of population serves									
1989–90	68	52	46	62	81	98	74	143	64
1990–91	77	56	47	67	81	100	80	119	69
1991–92	81	49	48	66	82	98	74	104	68
1992–93	82	48	47	61	85	82	72	128	67
1993–94	81	42	46	61	77	76	78	127	63
Operating revenue per head of population									
1989–90	131	130	132	166	162	180	106	127	138
1990–91	143	140	142	172	170	179	130	130	148
1991–92	141	148	149	163	177	164	128	160	150
1992–93	139	154	149	144	173	164	122	178	148
1993–94	151	157	152	163	169	165	131	161	155
Economic real rate of return* (per cent)									
1989–90	2.31	2.42	3.17	2.42	2.27	2.51	–0.88	–3.98	2.27
1990–91	2.51	2.77	3.31	2.51	2.67	2.36	0.11	–2.82	2.55
1991–92	2.14	4.11	3.63	2.23	3.07	1.67	0.36	–0.73	2.85
1992–93	1.73	4.53	4.36	1.59	2.70	2.78	0.10	–1.00	2.80
1993–94	2.60	5.27	4.80	2.68	2.92	3.52	0.26	–1.18	3.54

Note: * Based on estimated asset replacement values.
Source: ARMCANZ per Melbourne Water.

Recovery of full costs of supply will encourage more efficient use of water to some extent. However, if charges that achieve full cost recovery are based solely on fixed charges rather than on user charges, price incentives will not be provided and use will remain inefficient. Revenues that are raised on the basis of property values and other fixed charges are essentially taxes, not user charges, and give rise to cross-subsidies to higher water users from lower water users.

Water authorities are now moving towards practices that encourage the efficient use of water. In 1993–94, Sydney Water Board increase usage charges as a source of revenue from 21 to 31 per cent.[1] In the same year the Melbourne Water charge was from 23 per cent to 31 per cent and a target of achieving a 50/50 split by 2001 has been set.[2] These pricing changes appear to be impacting on water use. For example, since the Hunter Water Corporation (New South Wales) started to introduce charges based on water use, water consumption per household has declined by almost 25 per cent[3]. The Sydney Water Corporation reported in its (then Sydney Water Board) 1993–94 Annual Report that per capita water

1 Annual Reports, 1993–94, Sydney Water Board (now Sydney Water Corporation) (p.41), and Melbourne Water (p.7).

2 Annual Reports, 1993–94, Sydney Water Board (now Sydney Water Corporation) (p.41), and Melbourne Water (p.7).

3 James, *op.cit.*, p.17.

consumption fell 7.4 per cent over the 1990–1 to 1993–94 period.[1] This reduction cannot be directly attributable to improved financial (pricing, etc.) practices, but it is likely that improved pricing had some impact on water usage and deferral of supply expansion. An example of this likely latter effect is deferral of the Welcome Reef Dam for increased supply to Sydney.

Financial subsidies to water use also include direct subsidies paid to users (such as rebates to pensioners) of water and waste water services; budget papers reveal that these totalled $95.2 million in 1994–95. Removal of these subsidies would raise water prices, particularly in rural areas. Over the longer term, however, subsidy removal would encourage more efficient water supply and use systems and reduce environmental problems associated with water use. Also public agencies, other than water authorities incur costs in the management of water resources. To date these costs have not been recovered from water authorities or water users. In 1993–94 these costs are estimated from budget papers to be about $227 million, some of which could be attributed to public goods aspects of their work.

The above discussion indicates that financial subsidies to water resource activities in Australia are substantial. These subsidies, particularly prevalent in rural areas, probably make a significant contribution to water related environmental problems in Australia. High priority should be given in the COAG reform process to detailed analysis of water provision costs, revenue and prices to determine how these apparent financial subsidies could be removed or modified to achieve more efficient production and use of water, particularly in rural areas. For example, the use of water entitlement transfers could be expanded as restrictions on transfer of entitlements prevent water from moving to users who value it more highly and who probably would use it most efficiently. In 1993–94, the Victorian Rural Water Corporation held a water auction at which one component was sold at a price which reflected the full economic costs of the irrigation water. This development illustrates the potential for future trading in irrigation water and indicates that a range of instruments, not just pricing, can be implemented to improve performance of the Australian water industry. A range of instruments is set out in the COAG agenda for reform (referred to in Section 3.1).

3.3 Environmental subsidies

Environmental impacts of water supply mainly falls into the following three groups:

(i) effects on flora and fauna in the catchment areas;

(ii) impacts on conservation and recreation values; and

(iii) impacts on downstream areas such as diverted/reduced flow and cold flow effects.

Impacts may be positive as well as negative. For example, catchment areas can protect flora and fauna as well as contribute to their destruction through dams; many alternative uses of catchment areas could be more environmentally disruptive. Also recreation values can be enhanced as well as destroyed[2] and catchments can mitigate flooding effects on land, people, flora and fauna.

Negative environmental impacts of water supply include the land disturbance effects of dams and distribution network construction, bank degradation from varied flows due to water withdrawals and possible disruption caused by leakage from the network. Reduced water flows resulting from high water usage

1 Sydney Water Board, Annual Report, 1993–94,p.21.

2 For example, to some the recreational values of Lake Pedder, Tasmania, have been enhanced by its flooding for a hydro dam, while for others its values have been destroyed.

can harm animal and plant life. In some cases this damage can be reduced by water releases (or environmental flows); this has been done for example in the Murray–Darling system.

Environmental subsidies associated with water use mainly arise from the over-use of water and the absorption of chemicals during water use in the residential, commercial, industrial and agricultural sectors and the subsequent discharge of the contaminated water into streams and oceans. Subsidies are associated with the addition of chemicals and other wastes during the use of water, covered in Chapter 5.

Agriculture accounts for about 70 per cent of Australian water use. Over-use of irrigation, together with land clearing, causes severe salinity and water-logging problems in some areas. This situation seriously threatens agricultural sustainability in these areas.

One major agricultural region for which there is considerable environmental concern is the Murray Darling Basin which includes 75 per cent of all irrigated land and produces about one third of total Australian output from rural industries. Widespread land clearing and over-use of water for irrigation have created salinity and water-logging problems in the Basin which are largely irreversible. Production losses have been estimated by the Murray–Darling Ministerial Council to be over $65 million per year. The costs of the current level of salinity on water quality has been estimated to be $37 million per year for agricultural and downstream urban and industrial water users.[1] It is not possible, however, to separate out the various agricultural and other land use practices (land clearing, etc.) that have contributed to this cost. Accordingly these externality estimates are not included in this study's estimates of environmental subsidies.

3.4 Summary

The above discussion indicates that financial subsidies to water activities are substantial. Environmental subsidies are difficult to disentangle from other activities and/or adequate data is lacking except where they are related to waste water treatment and disposal (covered in Chapter 4).

A summary of financial and environmental subsidies of the water sector is provided in Table 11.

1 ESD-A, pp.75–78; it should be noted that soil salinity problems are not only associated with irrigation, but are also of significant concern in dryland areas.

Table 11: Summary of financial and environmental subsidies,1994, water sector

Activity element[1]	Financial subsidies ($ millions,1994)	Environmental subsidies[5] ($ million,1994)	Subsidy removal instruments	Fiscal implications ($ millions,1994)
Rate of return subsidy[2]	3,000		Raise water prices, change structures of pricing, improve operating efficiency.	
Public agency costs[3]	227		Recover costs from water authorities.	
Direct subsidies to users[4].	95		Remove subsidies; if they are deemed necessary replace them with direct income assistance.	
Environmental externalities[5]		Not estimated.		
TOTALS	**$3.322 billion**			**$3.322 billion**

Notes

1. The estimates,derived mainly from agency annual reports,include some wastewater (sewerage, drainage, etc.) subsidies; these are excluded from the estimates for wastewater in Chapter 4. In general it is not practical to separate government expenditure on water and sewerage services as these services are generally provided by the same authority, or are supervised by the same division in a bureaucracy. In view of the close relationship between expenditure on water and waste water services,it is not yet possible to provide a satisfactory estimate of financial subsidies to water services separate from liquid waste services.
2. Order of magnitude estimate of revenue increase required to give 8 per cent real rate of return on water and wastewater activities on the basis of data in ARMCANZ and AWRC reports and authority annual reports. This is a particularly difficult exercise because, as indicated in the text,the situation is changing rapidly and much data for 1994–95 is not yet available from agencies. Therefore the estimates presented must be treated cautiously, but indications are from ARMCANZ and authority reports that in 1994–95, rates of return remained well below the 8 per cent real level.

Estimate of subsidies due to water and waste water authorities failing to achieve an 8 per cent real rate of return

	$ million
New South Wales rural, Department of Water Resources,Annual Report,1992–93	
Net operating cost	105
Non-current assets (written down replacement value)	2 977
Net revenues to give 8 per cent real rate of return (10 per cent nominal)	298
1992–93 shortfall	403
Estimate of rate of return subsidy in 1994–95	**400**
New South Wales, metropolitan, Water Board, Annual Report,1994	
Capital assets at written down cost (97 per cent at replacement or market value)	14 417
Net revenue to achieve 2.7 per cent real rate of return in 1993–94 (ARMCANZ survey)	389
To achieve 8 per cent real rate of return would have to increase to	1 153
Therefore rate of return shortfall estimated at	**764**

Victoria rural, Rural Water Corporation,Annual Report,1993–94	
Net cost of services	13
Non-current assets (written down value at cost no replacement cost estimates available)	469
Net cost of services projected to be zero in 1994–95	
Estimate of rate of return subsidy in 1994–95,	50
But about double if assets valued at replacement cost	**100**
Victoria, metropolitan,Melbourne Water, Annual Report 1993–94	
Non-current assets	10 474
Net revenue to achieve 5.65 per cent real rate of return (Annual Report, p.56)	592
To achieve 8 per cent real rate of return would have to increase to	838
Therefore rate of return shortfall estiimated at	**246**
Western Australia, Water Authority of Western Australia (covers metropolitan and rural areas), Annual Report,1993	
Fixed assets at written down replacement cost	5 721
Achieved 1.8 per cent real rate of return in 1992–93	103
To achieve 8 per cent real rate of return, this would have to increase to	457
Therefore rate of return shortfall estimated at	**354**
Shortfalls estimated	
New South Wales rural	357
Victoria rural	100
New South Wales — Sydney metropolitan	764
Victoria — Melbourne metropolitan	246
Western Australia — rural and metropolitan	354
Total	**$1 818**

For all other water (urban, rural) authorities no analysis was conducted.

To summarise, the analysis conducted yielded an estimate of subsidies of just over $1.818 billion. A full analysis would require a major study with resources well beyond those available to this study.

It is believed that these estimates would cover about 60 per cent of the total for Australia,thus giving a total for the whole country of about $3 billion. The basis for this order of magnitude extrapolation is the judged proportion of Australian water services covered by the estimates made and the most recent data available from AWRC and ARMCANZ surveys as presented in Tables 10 and 12.

3. Estimates of public agency costs not recovered are taken from federal and state budget papers, 1994–95, with no allocation to public goods values.

Estimates of water and waste water public agency costs not recovered.
(Excludes amounts included in rate of return shortfall estimates.)

	$ million
New South Wales	
Budget estimates,1994–95	
Department of Water Resources — administration,services	92.6
Victoria	
Budget estimates, 1994–95	
Net cost of water services,administration	55.6
Queensland	
Program Statements,1994–95	
Current outlays	70.6
Western Australia	
Program Statements,1994–95	None found
South Australia	
Estimates of receipts and payments,1994–95	
Underground water exploration,assessment and protection	3.1
Tasmania	
The Budget,1994–95	
Payments to Rivers and Water Supply Commisison	5.1
Northern Territory	
Not identified	—
Total	**$227.0**

4. Estimated from federal and state budget papers; capital grants allocated at 10 per cent per year to reflect estimated annual subsidy to users.

Estimates of direct subsidies to water and waste water	$ million
New South Wales	
Budget Estimates, 1994–95	
Water and sewerage rebates for pensioners,etc.	61.3
Capital grants (at 10 per cent of amount)	1.7
Victoria	
Budget Estimates,1994–95	
Capital outlays (at 10 per cent of amount)	3.5
Queensland	
Program Statements, 1994–95	
Capital outlays (at 10 per cent of amount)	6.8
Western Australia	
Program Statements,1994–95	
Subsidies to low/medium rainfall cropping and grazing	20.8
South Australia	
Estimates of receipts and payments, 1994–95	
Capital payment to Department of Engineering and Water Supply (at 10 per cent of amount)	0.5
Tasmania	
The Budget,1994–95	None found
Northern Territory	
Not identified	—
Commonwealth	
Budget Statements, 1994–95	
Assistance to Western Australia for sewerage infrastructure (10 per cent of amount)	0.6
Total	**$95.2**

5. Not estimated due to lack of data.

4. Waste water treatment and disposal

4.1 Introduction

Water borne effluents from a range of activities are disposed onto land and into streams and oceans via various sewerage and drainage systems. Treatment of these wastes ranges from considerable in the case of some liquid industrial wastes and sewage to zero or negligible in the case of rainwater run-off into drainage systems, farm wastes and some rural sewerage systems.

Institutionally, waste water treatment and disposal systems are generally operated by agencies responsible for water supply and distribution,and many of the issues are similar to those discussed in the preceding water chapter of this report.

Most Australian urban areas have separate drainage and sewer systems. Surface contaminants are carried into drainage systems which eventually flow or filter into streams and oceans. In sewerage systems, even where satisfactory treatment is provided, problems can arise due to system leakage. Also the illegal connection of roof drainage water causes overflows of untreated sewage when design capacities are exceeded. Significant problems may be experienced with surcharging and overflow of sewers in wet weather.

Despite licencing and other regulatory requirements, industrial effluents mainly from urban areas continue to be disposed of into drainage systems. These effluents can cause considerable reductions in water (streams, oceans) and are often referred to in environmental protection agency annual reports.[1]

In rural areas nutrients, herbicides (see Chapter 8) and other contaminants from farming and other rural activities and effluents from town sewerage systems enter streams through drainage systems.

Impaired water quality in streams and in sea water, due to inadequate treatment of waste water and excessive flows into streams and oceans, is a major environmental problem in Australia, leading among other things to high coliform counts, sea-grass die-back and algae blooms (see box).[2] Testing at a range of sites often shows water quality below acceptable levels. For example, surveys over 1991–93 indicated that two-thirds of rural Victorians drink water of unacceptable quality.[3]

1 See for example, Victorian EPA Annual Report,p.13 and p.32.

2 See also *Our Sea, Our Future*, Major findings of the State of the Marine Environment Report for Australia (SOMER), DEST, 1995, pp.10–12,pp.55–64 and p.69.

3 *Rural Drinking Water Quality:Summary report*, Departments of Conservation and Natural Resources, and Health and Community Services, July, 1994, p.3.

Blue-green algae: a complex environmental problem[1]

Toxic blue-green algae blooms in inland waters are causing increased concern in Australia. In October 1991 algae blooms were observed over a 1000 km stretch of the Barwon–Darling River systems; at the time it was the world's largest recorded riverine algae bloom.

Numerous factors contributing to algae blooms have been identified by ongoing research. **Physical** factors include temperature, evaporation, light attenuation, turbidity, colour, turbulence, flow, flooding, thermal stratification, depth and morphology of water bodies, and sediment. **Chemical** factors include nutrients, micronutrients, pH/carbon dioxide, organics, salinity and dissolved oxygen. The **biological** factors include biological interactions, zooplankton, fish and nutrient regeneration, phytoplankton succession and the effects of other micro-organisms on blue-green algae.

Thus although nutrient run-off from fertilisers, farm and household wastes, sewerage plants, etc., into inland waters is cited as the main cause of algal blooms many factors are involved in the formation, severity and extensiveness of the phenomenon. Enviromental problems arise because blooms impair water quality for humans, livestock and wildlife, and also significantly reduce the tourism attractiveness of inland waters. Precise impacts, however, have not been quantified. Measurement techniques are improving, control costs are being developed and some estimates of damage costs (livestock, tourism losses etc.) are being attempted.[2]

Strategies to abate algae bloom problems fall into three main categories:

- managing algae bloom impacts;
- managing water flows; and
- managing nutrient contributions.

In each of these areas, and in an integrated approach, policy instruments such as regulation, pricing and tradable permits are being evaluated. Algae management strategies are being developed, for example, in the Murray-Darling Basin and the Peel-Harvey River region of Western Australia.

The development of an effective approach to blue-green algae problem involves, among other things, the examination of financial subsidies and environmental externalities mainly in the agricultural, water and waste water areas. Despite increasing efforts to understand and resolve the problem, it is apparent that a solution which balances environmental, economic and social concerns will take some time to develop.

1 See, for example, *Algae Management Strategy for the Murray–Darling Basin*, Murray–Darling Basin,Ministerial Council, August, 1993 and Young, D., et.al., *An economic perspective on the management of the occurrences of blue-green algae*, ABARE Outlook 93,Canberra,1993.

2 See, for example, *Algal Management Strategy for the Murray–Darling Basin,op.cit.*, p.6.

Water quality problems are being addressed by a range of initiatives, for example in the Sydney area by the extensive Clean Water Program (see below), but many problems remain. Trade waste agreements with individual businesses, e.g. by the Sydney Water Board, Melbourne Water and the State EPAs, also appear to be reducing environmental subsidies in water systems.[1] Breaches of guidelines, however, remain common. For example, the 1993–94 Annual Report of the Victorian EPA reports that guidelines for pollutants were often exceeded around Melbourne including for lead, cadmium, and phosphorus. Also guidelines have not been set for some areas of public concern such as water clarity.

A **National Water Quality Management Strategy**[2] (NWQMS) has as its aim to pursue the sustainable use of the nation's water resources by protecting and enhancing their quality while maintaining economic and social development. This strategy is developing a nationally consistent approach to water quality management through guidelines for the management of water quality. In this work both technical and policy guidelines are being developed which in the future are likely to impact on subsidies to the use of water and related resources by:

- setting a framework for the management of water quality, for example by the water use of market based approaches;
- setting water quality standards for a range of resource uses and water treatments; and
- setting guidelines for selected industries which have a high potential for water pollution (negative externalities to the water environment) with the aims of reducing water use and reducing the release of pollutants by encouraging recycling, reducing pollutant production and increasing the effectiveness of effluent treatment.

It may be some time, however, before these guidelines and work of the National Environmental Protection Council (NEPC) as described in Chapter 1, translate into policies and practices. For example, the development of national standards which reduce the substantial water and waste water subsidies identified in this report.

The NWQMS envisages that for achievement of sustainable water quality management there is need to use both market-based and regulatory approaches. The strategy points to the use of economic instruments such as full cost pricing and trading in effluent permits to internalise costs and provide incentives for decision makers to modify their behaviour in a way that leads to more socially acceptable outcomes than would occur in the absence of those incentives. It points out that regulatory mechanisms such as waste release regulations impose barriers to the use of some resource uses and waste disposal options, whereas market-based instruments generally permit selection of the most cost-effective options.

Recognition is given in the NWQMS to the particular problems of diffuse (difficult to pinpoint) sources of pollution. Diffuse sources of pollution occur in both rural and urban environments. However, the potential for this form of pollution is greatest in rural areas and a range of measures will be required for its control. These measures could include identification of current contributors and decisions on the need for changed land uses and improved management practices.

Also recognised is that the application of the adopted policy principles encompass the entire water cycle. To be effective, all those individuals, groups and organisations whose activities have the potential to impact at any point along that chain, must be brought within the scope of the management process. For example,

1 See James, *op.cit.*, pp.37–42.

2 *National Water Quality Management Strategy, Policies and Principles:A Reference Document*, April 1994.

alternative waste water disposal methods, e.g. use of nutrient rich liquid wastes for agricultural, horticultural and forestry purposes, appear to have significant potential but are currently under-utilised in Australia. Realisation of these opportunities would allow profitable internalisation of environmental externalities. Some projects are underway in this area, e.g. in Sydney (under the Clean Water Program), Melboume, Adelaide, Perth and some rural areas.

Despite progress in waste water management it is apparent that contamination prevention in waste water and its treatment and disposal is currently significantly less than that required to meet environmental standards and expectations. Policy issues to be addressed include identifying the sources of contaminants, the costs of treatment and disposal, and the evaluation of options for preventing and reducing contamination.

4.2 Financial subsidies

Financial subsidies to water contamination accrue from non-recovery of costs by public sewerage and drainage authorities, and from fiscal practices which encourage, or do not discourage, liquid waste production. As with water supply, charges tend not to be based on use although the trend is towards use based systems, for example in the licensing for trade wastes based on pollutant loads.[1] However, user charges are not as readily specified as for water supply, and in urban areas compulsory connection to the sewerage system for a flat compulsory charge or hypothecated tax, is likely to remain the main mode of provision for most properties.[2]

Because waste water activities generally form part of water agency operations the financial subsidies of the two activities are difficult to disentangle. Where this is possible indications are that rates of return are low, particularly in rural areas (see Chapter 3 above). For metropolitan areas data is available from the Australian Resource Management Committee of Australia and New Zealand (ARMCANZ). This data is presented in Table 12, and shows that in 1993–94 only Melbourne Water had a real rate of return on its wastewater operations above 8 per cent (with revenue about 60 per cent from hypothecated taxes), with the rest surveyed being below 5 per cent. Comparison of data in Tables 10 and 12 reveals that estimated rates of return for waste water activities are often higher than those for water activities, but like water if an 8 per cent real rate of retum criterion is used, financial subsidies are substantial.

Financial subsidies to waste water activities are included in those estimated for water (see Chapter 3).

4.3 Environmental subsidies

Environmental externalities associated with waste water disposal lead to costs associated with impaired water quality effects on animals, fish, shell fish, human health and tourism. These costs of environmental damage are difficult to estimate but the negative impacts on biodiversity, current and future productivity, etc. are evident.

The Australian Water Resources Council (AWRC) has estimated that new investment of over $2.5 billion is required for urban sewerage treatment assets to provide limited improvements in nutrient removal.[3] The 1990 AWRC survey also indicated that major water

1 See for example, James, D., *op. cit.*, particularly Appendix 1.

2 In 1995, however, Melbourne water authorities, for example Yarra Valley Water, introduced user charges to partly pay for sewerage disposal. These charges are based on winter (mainly sewerage) water use.

3 See Industry Commission, *Water resources and waste water disposal,* Report No. 25, 1992,p.153.

and sewerage authorities planned to spend $500 million in capital works between 1989–90 and 1998–99, i.e. only about 20 per cent of the amount estimated to be required.

This information can be used to provide order of magnitude estimates of costs of controlling currently untreated sewerage effluents, i.e. non-internalised sewerage externalities. At an 8 per cent real return on the additional $2.5 billion of assets, and operating costs of these facilities estimated by the AWRC to be about $800 million per year, the value of these externalities would be about $1.050 billion per year. As indicated above, however, this would be a low estimate because this expenditure would only provide limited improvements.

The Sydney Clean Water Program

The Sydney region Clean Water Program (CWP) has developed a range of future options for reducing negative externalities of waste water disposal in that region. This work is useful for preparing control cost estimates of wastewater externalities in Australia.

The CWP aims to improve marine and inland water quality, reduce odours and restore bush and wetland in the Sydney, Illawarra and Blue Mountains region of New South Wales. In economic terms the program aims to internalise a range of externalities associated with water, waste water and other natural resource activities in the Sydney region. The program was established in 1989, with a planned

Table 12 ARMCANZ 1993–94 survey: key outcomes for metropoltian sewerage (preliminary)

Metropolitan sewerage systems	Sydney Water	Melbourne Water	Water Authority of W.A.	Engineering & Water Supply S.A.	Brisbane City Council	Hunter Water	A.C.T. Electricity & Water	N.T. Power & Water*	Average
Operating cost per head of population served									
1989–90	84	49	45	44	51	82	91	91	64
1990–91	93	45	44	46	54	81	89	76	67
1991–92	99	46	47	48	56	68	85	67	68
1992–93	102	44	46	42	57	66	87	91	69
1993–94	93	38	52	43	60	62	100	91	65
Operating revenue per head of population									
1989–90	197	171	169	111	118	159	111	122	168
1990–91	203	173	184	123	124	160	113	114	173
1991–92	216	189	184	127	142	158	115	147	184
1992–93	213	199	190	130	137	151	132	150	188
1993–94	204	193	192	155	136	139	142	121	184
Economic real rate of return* (per cent)									
1989–90	3.16	6.60	2.68	1.28	1.42	1.37	–1.19	–1.49	3.26
1990–91	2.93	7.00	3.33	1.90	1.66	1.48	–0.75	–1.49	3.47
1991–92	3.22	8.13	3.38	2.10	1.97	2.01	–0.23	–0.87	4.03
1992–93	2.90	8.63	4.60	2.68	2.23	1.71	0.54	2.73	4.22
1993–94	2.87	8.91	3.67	4.33	1.97	1.32	0.29	1.05	4.26

Note: * Based on estimated asset replacement values.
Source:ARMCANZ per Melbourne Water.

expenditure of about $7 billion over 20 years — the largest environmental improvement program ever developed in Australia. It is administered by the Sydney Water Corporation (previously the Water Board for Sydney, Illawarra and the Blue Mountains).

A Special Environment Levy (SEL) provided significant funding for projects identified as being urgently needed to mitigate environmental problems such as raw sewage disposal. The SEL, designed to apply for five years and raise $485 million over the period, was levied at $80 per household per year, and indicated a significant willingness of Sydney region residents to pay for amelioration of water quality and other environmental problems. The water authority's 1993–94 pricing package, as determined by the New South Wales Government Pricing Tribunal, includes a much greater emphasis on water usage pricing. Under this package, the SEL ceased on 1 January 1994, but the CWP is to continue with funding from the Corporation's general revenues. The flat rate of the SEL and the ongoing funding of the CWP from general revenues represent cross-subsidies to higher water polluters from lower water polluters.

Details of 1991–92 and the SEL five year budget are set out in Table 13; about half of CWP expenditures came from the SEL from 1990 to 1993.

Since its commencement to the end of 1992/93, the Clean Waterways Program spent $867 million, including $728 million on capital works of which the SEL contributed $206 million. The SEL also contributed $139 million towards operating costs. In the 1992–93 financial year, $269 million was spent on the CWP; the SEL contributed $106 million, including $61 million towards capital funds and $45 million towards operating funds.

Table 13 Objectives, budget and expenditure for the SEL

Program objective	Five year budget $ million	1991–92 expenditure $ million
Environmental monitoring	13.1	4.30
Community participation	7.9	1.50
Improve effluent quality	127.7	27.44
Improve sludge management	76.8	18.88
Reduce odours and emissions	118.0	18.01
Minimise sewerage overflows	30.5	10.12
Additional sewerage services	76.9	11.74
Controlling urban run-off	9.4	1.07
Bushland and wetland management	9.6	1.68
Source control	10.0	2.33
Total	**485.4**	**97.70**

Source:
Clean Waterways Programme Annual Report 1991–92, June 1992, p.5.
Sydney Water Board, Annual Report, 1992–93.
Water Board (Sydney, Illawarra,Blue Mountains),Clean Waterways Programme Report,1992–93.
Choices for clean waterways,Clean Waterways Programme, March, 1994.

Achievements of the program to date include:

- 97 per cent of Environment Protection Authority licence requirements for the region were met in 1992–93. This compares with 68 per cent in 1989–90.
- New fine screens at the coastal plants have trebled the capture of solid matter from sewage. More plastics, paper, leaves and other material are being removed.
- Nutrient levels have been reduced at inland sewage treatment plants. Ammonia levels have been cut by half, while nitrogen and phosphorous levels have been reduced by approximately 30 per cent.
- There has been over a 99 per cent reduction in the number of times that raw sewage is discharged into the waterways due to sewage treatment plant failure.
- Over 70 per cent of total sludge collected (over 100 000 tonnes) has been treated, dewatered and marketed as biosolids for use in composting, agriculture, forestry and mine site and land rehabilitation during 1992–93. New technologies are also being trialled and a management/marketing plan for state-wide issues has been developed.
- Odours from sewage treatment plants have decreased. At North Head, odour scrubbers have reduced odours by 80 per cent. New low-level odour detection equipment has been designed to assist in further reductions. At 12 sewage treatment plants, the community has been involved in odour annoyance surveys, which have identified other local sources of odours.
- Testing of approximately 430 000 properties has found over 100 000 defects in sewage systems, more than 60 per cent of which are now fixed. A five-year closed circuit TV camera inspection program is assessing the 1700 kilometres of major sewers. Over 400 permanent gauges have been installed to measure flow in the sewerage system.

Control cost estimates

Options for future work on improving environmental performance in the Water Board's jurisdiction are being analysed. Preliminary results of this work indicate present worth values (1994 dollars), at 8 per cent real for construction costs plus 20 years of operating expenditures, of:

- $1–2 billion to provide a basic stormwater management system for the region;
- $1.5–$3 billion to protect recreational and aquatic ecosystem values in inland waterways;
- $0.3–$8 billion to protect recreational and marine ecosystem values of the ocean and beaches in the region; and
- $0–$3+ billion for containment of overflow into ocean, estuaries and rivers.

Depending on the way the options are finally mixed in accordance with customer and regulatory requirements, but netting out any double-counting, the Water Board estimates that the total cost of solutions range from around $2 billion to $19 billion (1994 dollars). These values give control cost estimates of current wastewater externalities in the Sydney region if it is assumed that ongoing, planned expenditures just offset the growth in wastewater externalities.

The higher values provide a better estimate of wastewater externalities in the Sydney region as the lower costs are associated with options with very limited internalisation of the externalities.

This costing of options to reduce waste water externalities appears to be the most comprehensive costing exercise thus far conducted in Australia and can be used to provide an order of magnitude estimate of these externalities for all of Australia. If the CWP estimates were

extrapolated to the whole of Australia the annual control costs for internalising waste water externalities in Australia would be about $3.5 billion in 1994 or a total of at least $35 billion in total control expenditures. This extrapolation assumes that the Sydney region's waste water environmental problems are somewhat more severe than in the rest of Australia and would account for about 50 per cent of total Australian control costs. That is, the limited information available suggests that the Sydney region's waste water problems are somewhat more severe than other population centres and thus warrant a higher weighting than that given on a population share (35–40 per cent) basis.

This assumption and the reliance on estimates for the Sydney region alone indicate that this estimate must be used with caution. However, given the lack of cost estimates of waste water externalities in other States and the reports of water quality problems in State EPA and other reports, this seems to be a reasonable estimate.

4.4 Summary

This review has indicated that waste water treatment and disposal in Australia involves some financial subsidies and probably very substantial environmental subsidies. This appears to be a priority area for detailed examination and analysis, including the assessment of options for subsidy removal such as improved pricing and effluent re-use.

A summary of financial and environmental subsidies in waste water treatment and disposal activities is provided in Table 14.

Table 14: Summary of financial and environmental subsidies,1994, waste water treatment and disposal activities

Activity element	Financial subsidies ($ millions,1994)	Environmental subsidies ($ million,1994)	Subsidy removal instruments	Fiscal implications ($ millions,1994)
Rate of return[1] subsidies	Not estimated but included in estimates provided in the previous Chapter.		Raise prices, change pricing structures, improve operational efficiency.	
Public agency[2] costs				
Direct subsidies[3]				
Damage control costs[4]		3.5	Tighten effluent regulations; increase charges	On these estimates revenues for control expenditures of about $3.5 billion per year would be required.
TOTALS	**—**	**$3.5 billion**		**$3.5 billion**

Notes:
1. Included in water rate of return subsidies due to data aggregation problems. 2. See Water section notes.
3. See Water section notes. 4. See text,pp.82–83.

5. Solid waste disposal

5.1 Introduction

Solid wastes come from a range of sources in urban and rural areas. Some wastes are disposed illegally, e.g. by dumping on roadways, but although this mode of disposal remains a problem, most wastes are collected and disposed of at designated landfill sites. Most are public sites operated by local govemments. Disposal costs are rising as more distant sites are required and as the disposal systems must meet more stringent regulations.[1]

According to the Commonwealth Government paper, *A National Waste Minimisation and Recycling Strategy* (NWMRS) released in June 1991, about 14 million tonnes of solid, domestic, commercial and industrial waste were disposed of through landfills in 1990. In addition, some 200 000 tonnes of liquid and solid industrial waste were taken to special landfills and treatment facilities. The aim of the NWMRS is to have 50 per cent of solid waste diverted from waste streams by 2000 measured in 1991 per capita waste weight terms.[2]

A 1990 survey by the Industry Commission (IC) estimated that landfill, incineration and recycling accounted for 96 per cent, 1 per cent and 3 per cent respectively of waste disposal by local governments in 1989.[3] However, in recent years there have been substantial increases in recycling[4] suggesting that the national recycling rate may have doubled from 3 per cent in 1989 to about 6 per cent in 1994 and that the 1994 disposal to land fill was possibly about 13 million tonnes compared to 14 million tonnes in 1991. It is likely therefore that the trend solid waste growth has been more than offset by increased recycling.

The Recycling and Resource Recovery Council (RRRC) in Victoria has recently prepared some preliminary estimates of waste diversion across the full waste stream (e.g. domestic, industrial, commercial, institutional, building and demolition). This work indicates that about one-third of the waste stream is being diverted to re-use or recycling but that diversion of two-thirds is required if the NWMRS were to be met.[5] This current diversion rate is high in international terms, for example levels

1 This section of the study only covers publicly recorded and managed wastes and does not cover other forms of waste such as mining waste.

2 *National Waste Minimisation and Recycling Strategy,* Commonwealth Environment protection Agency and Department of the Arts,Sport,the Environment and Territories, p.14.

3 Industry Commission, *Waste Management and Recycling: Survey of Local Government Practices*, 1990 (IC 1990a).

4 See, for example, *Monitoring of Performance Against Waste Minimisation and Recycling Targets: Final Report,* prepared by Maunsell Pty Ltd, August 1994 for the federal Environment Protection Agency (Maunsell, 1994).

5 RRRC,Annual Report 1993–94, pp.11–14.

in leading US recycling states are about 40 per cent.

Despite the progress a 1994 report to the federal Environment Protection Agency found that attainment of the NWMRS attainment was lagging at the end of 1993 although some specific recycling targets, for example for glass containers and aluminium cans are likely to be achieved.[1] Only 24 per cent of councils that responded to the survey had a waste management plan, but 81 per cent had regular kerbside collection of recyclables.

An allied problem is that of litter. Litter in urban areas frequently ends up in waterways (via drains), where it can cause damage to local ecosystems. It is also unsightly and detracts from the amenity of urban living. Litter measurement is not easy. Regular counts undertaken by the Keep Australia Beautiful Council suggest that littering has generally been reduced but that the rate of decline has slowed, if not stopped. Paper of various types and plastic items from consumer packaging are particular problems in the litter stream requiring attention from government and from businesses which produce the items which become litter.

Modern landfill engineering practices are significantly improving the environmental performance of landfills. Leachate control and methane extraction, together with improved cover techniques to reduce problems of birds and odour, are reducing the impact of new landfills on host communities. These improvements have effectively internalised many of the costs of landfill operation which were previously external. However, new solid waste problems continue to emerge even though significant advances have been made in areas such as paper, glass and metal wastes. One emerging problem is that associated with electronic office equipment where technical progress and growth in purchases is rapid; in combination these factors are leading to large increases in the disposal of obsolete equipment. Another emerging problem is that impacts associated with the transport of waste to landfills will tend to increase as more distant sites are used.

5.2 Financial subsidies

Financial subsidies to solid waste disposal arise from the failure to recover the full costs of disposal undertaken by public agencies. There is seldom a requirement to fully account for site costs such as the opportunity cost of land, site rehabilitation and replacement, or to achieve normal rates of return on the public assets involved in waste disposal. In addition, most of the revenue for solid waste disposal operations of councils comes from fixed charges based on property values and estimated waste disposal revenue requirements rather than user charges based on the volume and type of waste collected. As indicated in several places in this report this fixed, or unrelated to actual service, charging approach is very inefficient in terms of resource allocation.

One way to increase the emphasis on source reduction programs, as part of waste minimisation strategies, is via implementation of user pays pricing systems for waste. The general absence of such systems in Australia may be a significant reason why source reduction has received little emphasis. Many councils still do not have specific garbage rates and even fewer adopt charging systems for garbage that are based on a pay-by-volume or pay-by-weight basis. There is, therefore, little incentive for residents to minimise their waste.

The trend is to separate general rates from garbage (solid waste) rates, for example in the municipalities of Boorondara and Eltham in Victoria. There is also a movement towards

1 Maunsell 1994, *op. cit.*

partial charging by volume or (rarely) by weight for waste disposal. The 1994 Maunsell report to the federal EPA referred to above found that 17 per cent of councils surveyed in 1993 had charges based on volume or weight. In Australia, councils such as Boorondara provide a 140 litre bin for household waste disposal charged for through rates, but will provide a 240 litre bin for an extra charge of $100 per year. This extra charge is essentially to discourage higher waste disposal per household as it is estimated (by S. Bateman, Maunsell, pers. comm.) to be about 10 times the marginal cost of disposing of the extra 100 litres (5200 litres per year) of garbage.

Similar systems are used in North America. For example in 1981 Seattle in the United States introduced a system of volume based charges. Residents subscribe in advance for weekly collection of waste in increments of one 114 litre bin. Residents who have, say, two bins collected per week pay significantly more than residents who subscribe for only one bin. In response partly to volume based rates and partly to waste minimisation programs, separate collection of recyclables and a composting service, the average number of bins subscribed per household fell from 3.5 in 1981 to only 1 in 1989. In 1989, about 25 per cent of household waste in Seattle was diverted by City-sponsored and other recycling programs.[1]

In the Regional District of Nanaimo (RDN), British Columbia, Canada, residents must purchase tags for attachment to second and more garbage bags left out for collection; untagged bags are not collected (C. McIver, RDN, pers. comm.). Weight based systems are difficult to implement because of problems in estimating, and costs of measuring, the weight of solid waste.

In the IC study on recycling, it was estimated that public sector solid waste disposal operations in Australia achieved an average real rate of return of 6 per cent on estimated assets in 1989.[2] The Industry Commission study indicated that risks in waste disposal warranted a higher than 5 per cent real rate of return, but did not conclude that the 6 per cent return achieved in 1989 was too low as:

- some general waste services such as litter collection, etc. if charged for, would tend to increase the rate of return; and
- revenue from taxes/rates ascribed to waste disposal operations might have been underestimated by municipalities.

Here we consider that the 6 per cent rate of return is too low as the general services should be costed and charged for separately from landfill operations and that it is not evident that waste revenues are under estimated.

Based on the IC data on assets extrapolated to 1994[3], an 8 per cent real rate of return rather than one of 6 per cent would require that net returns from council solid waste disposal operations be raised by about $20 million in 1994. Revenue increases, coupled with cost reductions in waste disposal operations, could come from businesses producing and using packaging as well as entities from whom the garbage is collected.

This estimate, however, does not adequately take into account the replacement cost or rehabilitation of sites. The IC study found that 62 per cent of Councils made no provision for site rehabilitation and replacement costs and few appeared to be making adequate provision given likely replacement costs and the remaining life of existing sites. These costs should be estimated and provision made for them in charges for solid waste operations.

1 As reported in *Waste Management and Recycling: Survey of Local Government Practices,* Industry Commission, 1991 (IC 1990a).

2 Industry Commission, *Report on Recycling,* Volume I, Report No. 6,(IC 1990b) AGPS, 1990,pp.45–48.

3 Assets comprising sites at replacement costs of $700 million based on purchase costs and costs of preparing the site for landfill operations, and plant and equipment $300 million, both in 1994 dollars.

The IC study reported that the average provision in 1989 for acquisition of new sites was 4.7 per cent of estimated replacement cost, when on the basis of average remaining life it should have been 8.3 per cent.[1] On the basis of estimated 1994 site replacement costs of $700 million (extrapolated from the IC 1989 estimates) the replacement provision would need to be increased by about $25 million. This figure assumes that replacement costs rise at the same rate as interest rates, but does not take into account the likely cost of meeting tighter environmental standards at these new sites,site rehabilitation costs, nor increased waste diversion. Assessing the impacts of these factors on financial subsidies to solid waste operations is difficult due to lack of data and the interaction of some with environmental subsidies discussed below. The costs of meeting 1989 environmental standards at these new sites was taken into account in the IC report but tighter regulations since then and in the future are likely to increase that cost. Estimation of this cost would require detailed study.

Site rehabilitation or remediation when landfills close is an important aspect of solid waste management which entails a number of operations. These include covering of the landfill, preparing or cleaning up the site for another use, ongoing monitoring of the environmental conditions of the site and provision for contingent environmental liabilities.[2] Costs of site rehabilitation were not estimated by the IC nor do they appear to be available from later studies. They could be estimated from a survey of likely closures and estimates of rehabilitation costs in each year.

Overall our assessment of the situation is that further analyses and survey would likely reveal an estimate of net costs at least double that made on the basis of the IC data referred to above. That is that the replacement and rehabilitation cost provision should be increased by about $50 million.

Adding the amount of $20 million estimated above for achievement of an 8 per cent rate of return to the $50 million estimated for site replacement and remediation costs indicates that charges should be raised by $70 million to remove financial subsidies to solid waste operations. There is also considerable scope for replacement of fixed charges with user charges.

Thus we estimate that the 1994 financial subsidy to solid waste operations is $70 million, or about $5.5/tonne of solid waste going to landfills in 1994.

5.3 Environmental subsidies

Despite tighter regulatory control of solid waste operations, the range of solid wastes and disposal modes still produces a number of environmental subsidies or negative externalities. These include the visual impact of illegal litter dumping, the aesthetic externalities of garbage disposal sites and the impacts (health, property and habitat damage) of dust and other particles from landfill sites. Also decomposition of solid wastes can result in odours and leaching of landfill causes water quality impairment from run off and into ground water flows. Indirect effects such as odours, litter and noise result from the transport of solid wastes from the waste generation location to the disposal site.

Land fill disposal produces greenhouse gases (methane), as does the combustion of solid wastes. Analysis for the 1994 National Green-

1 IC, *Report on Recycling*, op. cit.,p.47. The IC Survey of local governments (IC 1990a) found that remaining landfill lives were higher in rural than in urban areas, except in South Australia and Tasmania (see p.28) and provision as a percentage of replacement was generally higher for rural areas (see p.30).

2 See, *Waste Management and Landfill Pricing: A Scoping Study*, Bureau of Industry Economics, 1993, pp.15–18.

house Gas Inventory report estimated that in 1990 landfill emissions of methane were 1.344 million tonnes (about 20 per cent of total Australian methane emissions; total emissions from landfill and waste incineration were an estimated 5 per cent of total GHG emissions).[1] Emissions and particulates from combustion and storage of wastes can also result in corrosion and other damage.

In Perth leachates from landfill sites have damaged the tourist and fishing industries. To control this damage landfill sites are being lined at a cost of about $6/tonne of waste going to landfill.[2] On this basis, to line landfill sites taking 75 per cent of solid waste[3] in Australia, control costs might be about $59 million a year in 1994 dollars.[4] However, we do not accurately know the:

(i) costs of lining landfills in other Australian regions; nor

(ii) what proportion of wastes currently go to leachate controlled landfills in Australia.

Therefore this externality valuation based on leachate control must be used very cautiously. Also this estimate does not take into account non-leaching externalities such as dust, litter odours and methane emissions associated with solid waste operations.

Using another basis, Stanley and Maunsell[5] have estimated that improved environmental control techniques at newer landfill sites in Melbourne have increased costs to about $26 per tonne from about $13 per tonne at older sites that do not meet these requirements. This figure of $26 per tonne (annualised) includes $6/tonne (1994 dollars) for site closure costs (capping, gas flaring, monitoring, rehabilitation).

If we use the Stanley/Maunsell estimate of about $13/tonne needed to meet tighter environmental regulations, and assume that 75 per cent of current sites do not meet these tighter regulations[6], landfill externalities would be valued at about $127 million in 1994.

This and the leachate control estimate could be averaged to obtain landfill externalities estimates but as the Stanley/Maunsell estimate is more comprehensive it is used.

In addition to these costs can be added off-site externalities associated with landfill operations. These costs were estimated by Stanley to be about $1/tonne (1994 dollars) on the following bases.[7]

- Litter, spillage, dumping and dust costs were calculated by estimating the impact of solid waste operations (on-site, collection and transport to landfill) on increasing street cleaning costs and the funding of a litter enforcement officer.
- Traffic noise and air pollution impacts are calculated using Interstate Commission estimates of road track costs plus noise and air pollution costs and estimates of traffic volume due to the landfill.
- Administrative costs of the host council dealing with enquiries and complaints about the landfill (noise, litter, odours, dust, etc.) are estimated based on the person hours involved.
- General adverse impacts on the quality of life caused by the landfill. An amount was estimated by the author which would

1 NGGI 1994, *op. cit.*, p.13 and p.19.

2 Industry Commission, *Waste Management Report*, p.41.

3 Estimate of landfills without adequate controls based on discussions with EPA,other waste management officials and consultants.

4 9.8 million tonnes of Australian waste disposal at $6/tonne for leachate control costs.

5 *The Cost of Waste Disposal in Melbourne,* report prepared by John Stanley and Associates Pty Ltd and Maunsell Pty Ltd for Visy Recycling, June 1992.

6 See above for estimate basis.

7 John Stanley and Associates, *Proposed waste disposal site at Clayton Road, South Clayton:Review of economic issues involved in determining site suitability for landfill,* a report for the City of Oakleigh,1991.

enable some "worthwhile" local environmental projects to be undertaken to compensate the 'host community'.

Extrapolated to the national situation on the basis of the estimated 1994 solid waste disposal (see Section 5.1) these costs would amount to about $13 million in 1994.

In total, therefore, we estimate that environmental subsidies to solid waste disposal totalled about $140 (127 + 13) million in 1994. As they are based on limited and uncertain data this estimate should be used very cautiously.

No comprehensive valuation of environmental subsidies to Australian solid waste disposal operations or contaminated sites appears to have been undertaken; the emphasis to date has been on financial subsidies and means of reducing the solid waste stream. More work on both sets of subsidies would be useful.

5.4 Summary

A summary of financial and environmental subsidies to solid waste disposal activities is provided in Table 15.

Table 15: Summary of financial and environmental subsidies,1994, solid waste disposal activities

Activity element	Financial subsidies ($ millions, 1994)	Environmental subsidies ($ million,1994)	Subsidy removal instruments	Fiscal implications ($ millions,1994)
Rate of return subsidies	70[1]		Raise disposal costs and change pricing/ revenue structure.	
Public agency costs	n.e			
Direct subsidies	n.e			
Environmental subsidies – damage control costs – prevention of leaching into water table, etc.		140[2]	Raise disposal costs to pay for liners and other costs of reducing environmental externalities; regulate production and disposal of waste.	
TOTALS	**$70 million**	**$140 million**		**$210 million**

Notes:
1. See text,pp.89–90.
2. See text,pp.91–92.

6. Extraction of forest products

6.1 Introduction

It is estimated that since European settlement in Australia, 40–50 per cent of pre-settlement forest cover has been removed for timber and land clearing purposes. Forest activities encompass logging for the pulp and paper industries,construction timber and fuel supply. These activities take place on public and private land. Activity on public land dominates — about 75 per cent of forested land is publicly owned in Australia. Extraction from community owned forests is subject to a variety of charges, depending on the jurisdiction involved and the type of forest products extracted.

Australian native timbers are mainly hardwood and are predominantly extracted from natural native forests. Over the past 50 years there have been substantial public and private plantings of coniferous softwood plantations and some hardwood plantations and in 1994–95 softwood production was nearly equal to that classified as hardwood. Australia is a net importer of forest products; net imports were valued at about $1.780 billion in 1993–94.[1]

There is considerable debate on whether Australian forestry practices are sustainable. The ESD-Forest Use study (ESD-F) was unable to reach a conclusion on the issue.[2] The States claim that forestry operations are sustainable, and the extensive RAC Forest and Timber Inquiry[3] concluded that State sustained yield management practices for timber production were appropriate. However, there is considerable environmental concern over timber operations, particularly in old growth and other native forests that are important repositories of habitat, biodiversity and aesthetic values.

The National Forests Policy Statement (NFPS)[4] agreed to in 1992 by all States and Territories except Tasmania (which has now agreed),sets down goals in eleven areas. These areas are as follows.

Conservation

Wood production and industry development

Integrated and coordinated decision making and management

1 Australian Year Book, 1988, ESD-Forestry Use, pp.20–25, Australian Year Book, 1994, and ABARE Commodity Statistical Bulletin, 1994 (ABARE, 1994), were among the sources used for background to the Australian forest industries.

2 See ESD-F, p.30.

3 Resource Assessment Commission, *Forest and Timber Inquiry Final Report* (RAC Inquiry), AGPS, 1992.

4 *National Forest Policy Statement:A New Focus for Australia's Forests,* Commonwealth of Australia,1992.

Private native forests

Plantations

Water supply and catchment

Tourism and other economic and social opportunities

Employment, workforce education and training

Public awareness, education and involvement

Research and development

International responsibilities.

While coverage of the aims in each of these areas would require a lengthy discussion the general thrust of the statement is summed up by the following passages taken from the statement.

> "Under the ecologically sustainable development approach accepted by the Governments, the public and private native forest estate will be managed for the broad range of commercial and non-commercial benefits and values it can provide for present and future generations. Efficiently and sustainably managed public and private forests will provide the basis for nature conservation and maintaining forest biological diversity, and for regional economic development and employment opportunities in a wide range of sectors, including wood production from native and plantation forests, tourism and recreation, water supply, grazing and the pharmaceutical industry." (NFPS, p.7)

Within this framework, specific policy objectives and key policy initiatives in each of the goal areas set down above, are underpinned by the following agreed approaches to forest management.

- The governments will set the regulatory framework for the use of native forests in order to meet social and environmental objectives.
- Commercial uses of forests (including wood production) that are based on ecologically sustainable practices are appropriate and desirable activities.
- The governments will seek complementary management of forests for all uses through integrated strategic planning and operational management across agencies with responsibility for forests in Australia.
- There should be a sound scientific basis for sustainable forest management and efficient resource use.

While these principles and approaches appear sound, their translation into forest management practices is not always easy as indicated in the early 1995 debates on wood chip exports and release of areas for timber operations.

Much of the debate on forest policies arises because public forests are today regarded as multiple use resources, a situation which is explicitly recognised in the 1992 National Forest Policy Statement. Thus forests are now valued not only for their marketable timber resources, but also for their other use values.[1] These values include those associated with non-timber products, recreational use, biodiversity preservation and water quality enhancement. This multi-purpose use of forests gives rise to a range of issues as each use has both economic and environmental implications. In some cases, for example biodiversity preservation which can enhance conservation values and the maintenance of genetic material for pharmaceuticals, there is potential for multiple use of forests to address environmental and economic goals. At some stage,

1 A comprehensive assessment of approaches to the valuation of forests with a critique in Australian practices is found in Francis Grey, *Estimating Value*, an unpublished report prepared for the Department of Environment, Sport and Territories, January, 1994 (draft). The valuation of forests from an accounting standards viewpoint is addressed in *"Accounting for Self-Generating and Regenerating Assets"*, a September 1995 discussion paper of the Australian Accounting Research Foundation.

however, these goals come into conflict as for example, harvesting of forest products for pharmaceuticals can cause some environmental damage.

Today it is increasingly clear that timber operations reduce the current and potential value of non-timber products that often do not fully register in the market economy (see box on p.96). The magnitude of the non-timber resource values endangered by forest operations is unknown. In the United States, however, it is estimated that the market value of non-timber forest products may exceed the $1 billion of timber extracted from United States national forests in 1992.[1] Forests are also important for their scenic and recreational values. For example, a study in the state of Oregon, indicated that Oregon's scenic values — mountains, forests, streams and beaches — make a significant contribution to the State's attractiveness as a place to live. Thus surveys show that people will work for less pay in Oregon than for similar work in less scenic locations. The total value of these pay reductions, an average of $500 per employee, almost equalled the combined payroll of all the State's timber and wood product firms.

The economic value of medicines taken from forests is very significant. Forty per cent of prescription drugs dispensed by United States pharmacies have active ingredients derived from wild plants,animals,or micro-organisms, many of them from forests. Given that the global pharmaceuticals industry is worth $200 billion per year, that the use of biologically derived medicines probably exceeds 40 per cent of prescriptions outside the United States, and that a significant share of biologically derived medicines originate in forests, it is likely that annual sales of drugs with active ingredients derived from forests might approach $100 billion per year.[2]

Furthermore, medicinal evaluation has been conducted on only a few thousand of the world's estimated 10 million species — perhaps half of which dwell in tropical forests. Harvard University biologist Edward O. Wilson conveys the magnitude of the potential: "A newly discovered species of roundworm might produce an antibiotic of extraordinary power, an unnamed moth a substance that blocks viruses in a manner never guessed by molecular biologists. . . An obscure herb could be the source of a sure-fire blackfly repellant — at last. Millions of years of testing by natural selection have made organisms chemists of superhuman skill, champions at defeating most of the kinds of biological problems that undermine human health."[3]

Similar observations on the non-timber economic, social and environmental importance of forest "products", particularly those from native forests, have been made in a number of Australian reports and studies.[4] For example in the pharmaceuticals area a Western Australian conospermum species is being evaluated for development of a new drug with potential in the treatment of AIDS.[5] A range of other Australian flora species are the basis of pharmaceuticals.[6] Although these flora species do not currently appear to be under threat from forestry or other activities, species of gastric brooding frogs which produce substances which could be important in the treatment of gastric ulcers, have not been sighted for some

1 World and United States data from Alan T. Durning, *Redesigning the Forest Economy,* State of the World 1994, Worldwatch Institute, Washington D.C.,1994.

2 Ibid, p.34.

3 As quoted in Durning, *op. cit.*

4 See for example the RAC Inquiry and Webb, L., Brereton, J. Le G., Whitelock, D., (Eds.), *The Last of Lands: Conservation in Australia,* Jacaranda Press, 1969. Papers on conservation/bio-diversity values are included, particularly in Part II; for example, *The Australian Flora,* Trace, Webb and Williams, pp.75–82 and Australian Plants and Chemical Research, Webb, pp.82–90.

5 Annual Report, 1993–94, Department of Conservation and Land Management, Western Australia.

6 See, for example, *Biodiversity and its value,* Biodiversity Series, Paper No. 1,Biodiversity Unit, Department of Environment,Sport and Territories,1994, p.18.

time. These frogs are found only in the rainforests of Queensland.

Sustaining timber output without regard for environmental impacts can result in replacement of ecosystems and the reduction of biodiversity. For example loss of trees has a large impact on wildlife. Eucalypt woodland suffering dieback from forestry operations or other causes may have only 10 per cent of the birds found in healthy woodland. In healthy woodland birds may take about half the insects produced, about 30 kg per hectare per year. Small animals such as sugar gliders and predatory insects and spiders take a sizeable proportion of the remainder.[1]

Negative environmental impacts from timber extraction have led to the development of **new forestry** in the Pacific North West of North America. New forestry principles, which attempt to minimise negative externalities, include production techniques which leave elements of forest ecosystems intact, for example canopy layers, patterns of plant succession, cycling of nutrients and protecting biodiversity by means such as preserving waterway corridors. Forest ecosystems are so complex that new forestry will continue to evolve. For example, until ten years ago there was little scientific appreciation of the role that fungi varieties play in forest ecosystems; it is now recognised that they enable tree roots to absorb phosphorous and other nutrients.

Current forestry practices, or old forestry, are less expensive because it externalises many of its costs. For example, Durning reports that in the Pacific North West region of North America the price of old growth for timber does not include the losses suffered by the fishing industry that result from damage to salmon habitats by current logging practices.

Recycling of forest products reduces the demand for virgin forest materials. Thus market trends and government programs which promote recycling of forest products reduce the economic and environmental effects of subsidies to forest resources.

6.2 Financial subsidies

Failure to recover the full costs of public forest management agencies and inadequate resource use payments through access fees, royalties (stumpages) and other user fees are potential sources of financial subsidies to forestry operations.

In principle user charges for timber and other activities in public forests should reflect the full cost of these operations, i.e. they should cover a normal return on capital, the forest management costs related to these operations, appropriate resource use payments and the repair of any environmental damage caused by these operations. Resource use returns to the community (as owners of public forests) should be set at levels that reflect the estimated value of the basic resource, i.e. the trees and other forest resources. If the marginal market value of the extracted products is less than the marginal value of the full resource costs of forestry operations, the operations should alter or discontinue. Valuation of community owned resources raises contentious issues, for example: what costs to include in the valuation, and how to discount future uses. There is also debate on how to structure charges; for example, on a "reserve" or fixed royalty charge basis, or on a profit/economic rent basis.

In practice governments have mainly relied on fixed royalties ("stumpages") for timber operations and no or nominal charges for other uses and the effects of forestry operations. The most recent comprehensive data available (ABARE, 1994) indicates average stumpage fees varied

1 Richard Eckersley, *Regreening Australia*, Occasional Paper No. 3, CSIRO, June, 1989.

Non-timber values provided by intact forest ecosystems

Service	Economic importance
Gene pool	Forests contain a diversity of habitats, species, and genes that is probably their most valuable assets; it is also the most difficult to measure. They provide the changing conditions of climate and soil and can provide the raw materials for breeding higher-yielding strains. The wild relatives of avocado, banana, cashew, cacao, cinnamon, coconut, coffee, grapefruit, lemon, paprika, oil palm, rubber, and vanilla — world-wide exports of which were worth more than $20 billion in 1991 — are found in tropical forests.
Water	Forests absorb rainwater and release it gradually into streams, preventing flooding and extending water availability into dry months when it is most needed. Some 40 per cent of Third World farmers depend on forested watersheds for water to irrigate crops or water livestock. In India, forests provide water regulation and flood control valued at $72 billion per year.
Soil conservation	Forests keep soil from eroding into rivers. Siltation of reservoirs costs the world economy about $6 billion per year in lost hydroelectricity and irrigation water.
Fisheries	Forests protect fisheries in rivers, lakes, estuaries, and coastal waters. The viability of 112 stocks of salmon and other fish in the Pacific Northwest depends on natural, old-growth forests; the region's salmon fishery is a $1 billion industry.
Climate	Forests help stabilise climate. Tropical deforestation removes carbon sinks and releases the greenhouse gases carbon dioxide, methane, and nitrous oxide; globally deforestation accounts for about 25 per cent of the net warming effect of all greenhouse gas emissions. Replacing the carbon storage function of all tropical forests would cost an estimated $3.7 trillion — equal to the gross national product of Japan.
Recreation, tourism	Forests serve as recreation destinations and as tourist attractions. Forest biodiversity values have recently received some higher priority and recognition. For example, Australia's reservation of the Wet Tropics Heritage Area and the allocation by the federal government of $23 million to a Daintree Rescue Program for uses such as buy-back private land of outstanding conservation importance.[1]

1 For example, see N. Preece and P. van Osterzee; Ecoz-Ecology Australia and D. James,Ecoservices Pty Ltd, *Two Way Track: Biodiversity, Conservation and Ecotourism*, Biodiversity Series, Paper No. 5, Biodiversity Unit, Department of the Environment,Sport and Territories,1995.

Source:Adapted from Durning, *op. cit.*, p.33.

significantly by state and type of forest product.[1,2]

Competitive bidding for extraction rights is practised to some extent (e.g. in Victoria and Western Australia), but lack of an adequate number of bidders to ensure competition can inhibit the use of competitive bidding approaches. To some extent this problem can be overcome by use of a floor or reserve price that reflects the opportunity cost of using the resource, but this again raises the resource valuation problems. It should also be noted that the bidding process does not account for non-timber values.

In 1992 the Industry Commission (IC) reported that forest pricing and management practices in some States were not consistent with meeting a 4 per cent rate of return on forest assets. The IC report indicated that returns to forests could be raised by increasing saw log royalties for larger trees, by shorter growing and felling rotations and by a general improvement in forest management practices. Softwood pulpwood royalties in Australia were found by the IC to be high compared with those in New Zealand, the United States, Canada, Chile and Fiji.[3]

The trend is to recover more public agency costs from forest industries and for forest agencies to make dividends and in some cases tax payments, to state governments. That is, public forest operations are becoming more market oriented. This is in line with principles laid down in the National Forest Policy Statement which in this area states that:

- "Prices will be market based, and at least cover the full cost of efficient management (including regeneration) attributable to wood production, include a fair return on capital, and provide an adequate return to the community from the use of a public resource.
- Harvesting rights will reflect security of supply for wood users, will be clearly defined, and will be transferable when this does not result in the creation of excessive market power.
- The allocation system will be flexible and will involve competitive bidding arrangements for appropriate amounts of the resource, thus enabling the entry of new processors and allowing small operators to compete for niche markets." (NFPS, pp.20–21.)

In 1993–94 the State Forests of New South Wales (SFNSW) reported agency revenues of $121.9 million from forest products against operating expenditures of $94.3 million and capital expenditures of $30.9 million, a result substantially better than that achieved in the two preceding years. When revenues from other activities and the incremental value of forest stock estimated by SFNSW were taken into account, the agency reported an 8.8 per cent real return on assets. An allocation of $17.5 million was made for dividend payments to the state government.

The Queensland Forest Production program in the same year reported an operating surplus of $10.4 million and a dividend payment to the state treasury of $8 million.

Again in 1993–94 the Forest Commission of Tasmania and the Western Australian agency (CALM) reported royalty and other fee revenues that just met operating expenditures and in Victoria revenues almost met operating expenditure. In Tasmania dividend and tax equivalent payments of $7.7 million were made. Agencies in these States reported significant improvement in their financial performance compared with previous years; in these States no rate of return analysis was reported.[4]

1 ABARE Commodity Statistical Bulletin,1994, p.120.

2 FABARE 1991, *Pricing and Allocation of Logs in Australia*, Discussion Paper No. 91.7.

3 Industry Commission, *Report on Recycling, op. cit.*, p.12 and p.95.

4 1993–94 Annual Reports of the State Forests of New South Wales, the Queensland Department of Primary Industries, the Forestry Commission of Tasmania, the Victorian Department of Conservation and Natural Resources and the Department of Conservation and Land Management (CALM).

These financial reports vary considerably as to what is reported. For example, treatment of capital outlays, allocation of agency overheads and treatment of loan funds (past and current) is inconsistent. A major study would be required to unravel and report on the impact of these factors on financial performance of the agencies.

One study which attempted to analyse the overall financial performance of a state agency (Victoria) was conducted by Dragun. In a research paper[1] released in January 1995, Dragun found the financial subsidisation of logging in Victoria to be about $50 million a year. This amount is based on Dragun's estimate of direct costs to the State government. Adding in his estimates of social costs (mainly environmental subsidies), Dragun reported an annual subsidy of about $385 million.

The financial subsidies estimated by Dragun are very different from those estimated by the government agency — the Forests Service of the Victorian Department of Conservation and National Resources (CNR). In 1993–94 the CNR allocation to the Land Resources Management function was $169.215 million. The function comprised forestry services activities, national parks, crown lands management, flora and fauna and catchment land management. However, no complete breakdown of the function elements was provided. Dragun estimated the forest services share of the function, from the limited information available, at about $90.8 million; forest service revenues were estimated by Dragun at $40.4 million ($42.4 million in the Annual Report of CNR), leaving a net subsidy of $50.4 million,or $60.4 million when some other costs which might be attributable to forest operations were accounted for.

This is in comparison with comment on financial arrangements in the 1993–94 Annual Report[3] which states that a loss of $3.0 million was incurred on commercial native forest operations in 1992–93. No estimate for 1993–94 was provided. The Annual Report stated that costs of managing areas of State forest without commercial forest operations would have been "$16 million higher in 1992–93", i.e. it is estimated that $16 million of forests services costs are not attributable to commercial forest operations. The report also went on to state that:

> "A review of the costs incurred by Forests Service staff in the North–west Area in supervising mining and extractive operations and related site rehabilitation works found high levels of unrecouped outlays, which suggests that full cost recovery throughout State forest needs to be considered."[3]

These estimates and statements present a wide array of information on costs and revenues and their allocation. While Dragun's estimates of forest costs and revenues appear reasonable from the limited publicly available information it is not clear what proportion of the costs estimated could be attributed directly to forestry operations. The departmental report implies that the public goods aspects and non-forestry elements of the costs could be significant. It is very unlikely, however, that they would be equal to the $50 million financial subsidy estimated by Dragun. They might, however, approach $25 million, leaving a net subsidy of $25 million.[4]

Similar detailed analysis to that of Dragun is required on the other States' forestry operations. Dragun's work, however, casts doubt on the claims of the other States' agencies which indicate varying operating results but with

1 Dragun,A.K., *The Subsidisation of Logging in Victoria*, La Trobe University, January, 1995.

3 Annual Report 1993–94, Department of Conservation and Natural Resources, Victoria, p.30 and discussions with CNR officials.

3 Ibid, p.30.

4 Dragun, p.6 reports that Victorian Auditor-General put the subsidy at $13 million based on specific advice from the Department.

Bio-diversity values

Bio-diversity, that is biological diversity refers to the variety of life of a given area — locality, region, country or the entire planet. In any area biological diversity can be described in terms of three levels of biological organisation — genetic, species and ecosystem.

The importance of bio-diversity lies in the ability of the different biological organisations to provide sustenance within and for each other in the form of habitat, food and resistance to disease and aesthetic utility including the rights of non-human species to survive and evolve. In the ESD report on bio-diversity, values of bio-diversity are classified as follows.

A. **Consumptive use values** — natural products that are consumed directly without market involvement, for example fodder and firewood used on farms.

B. **Productive use values** — natural products that are commercially harvested, for example fish, timber and some species of native flora and fauna.

C. **Non-consumptive use values.** These refer to ecosystem functions such as watershed protection, climate regulation and soil production.

D. **Option values.** These refer to valuation of the role bio-diversity plays in retaining the possibilities for continued evolution and the adaptation of living organisms to change. This helps to keep biological resources available for future generations; society may be willing to pay for the option of future access to a given species or level of diversity.

E. **Existence values.** Although it is a contentious issue, there appears to be increasing public support for the intrinsic right of species existence, that is benefits are derived from the knowledge that species and habitats exist.

Australia has, in a world context, significant bio-diversity. For example Australia has among countries the second highest number of reptile species (686), is fifth in flowering plants (23 000) and tenth in amphibians (197). More families of fauna and flora are endemic (occur only in Australia) than in any other country. Much of Australia's bio-diversity remains to be described but those aspects which often display significant variation — a key factor in species robustness, survival and management. An example of this variation is the River Red Gum (Eucalyptus camaldulensis) which has a wider natural distribution than any other eucalypt and which exhibits marked differences in genetic make-up.

Since European settlement there have been large changes in Australian biological systems through clearing, urbanisation, drainage and the introduction on non-native species. It is estimated that 2.9 per cent of plants and 7 per cent of marsupials have been lost, and that many more are threatened with extinction.

Valuation of this actual and potential bio-diversity loss is difficult and contentious but the limited data available (see Chapter 8 — Natural attractions, of this report) suggests it has a significant value to the current Australian community.

Reference: *The conservation of bio-diversity*, ESD Working Party report, July 1991; Australian Year Book, 1994, pp.433–5.

inadequate treatment of loans and capital costs and the services provided by other agencies and departments.

The Dragun analysis appears to be the only one available on the overall financial subsidies to forestry operations in an Australian situation, and it might be used, with caveats as to its coverage and representativeness, to estimate an amount for all of Australia. Victorian subsidies are probably around 25 per cent of national subsidies, on the basis of Victoria's share of national forest product output (about 20 per cent) adjusted upwards for the apparent higher subsidies in Victoria. On this basis total Australian financial subsidies to forestry operations could be about $100 million.

Overall, then $100 million might be a reasonable order of magnitude estimate of the financial subsidy, through non-recovery of public agency costs, to extraction from public forests.

The total financial subsidy might well be much higher as here although we have not accepted Dragun's higher estimates, we acknowledge that more extensive assessment is required. This might well increase the $100 million estimate significantly as, for example, the above discussion does not consider other possible contentious issues such as that raised by Dragun of how to treat Loans Council and other loans which could be attributable to forests management for all purposes in past years. In some cases these loans are still referred to in agency annual reports (e.g. Queensland)[1] while in others they appear to have been partly written off (e.g. New South Wales).[2] It is for these reasons that we have based the $100 million estimate on a small (5 per cent) upward adjustment in Victoria's share of national product output despite the reported significantly worse performance of Victoria's public forest management. Thus we are doubtful of the comparative performance reported and acknowledge the limitations of our estimates.

This review of financial subsidies to operations in public forests requires more analysis and debate on the issues before some form of concensus can be reached on the matter. It does seem clear, however, that the trend to higher cost recovery from forestry operations will continue and that these activities will be conducted on a more commercial basis. Higher royalty rates from native public forests would contribute to higher returns from these activities and would increase the incentive to produce forest products from public and private plantations. In the meantime there is a clear need to improve financial reporting in this area.

6.3 Environmental subsidies

As indicated in the introduction to this chapter there are numerous environmental subsidies to forestry operations, particularly those in native forests. These externalities arise from forest industry practices, the alternative uses of forests and the management of forests. For example, softwood stumpages (timber royalties) are, overall, significantly higher in Australia than those for hardwood and this tends to encourage production from native hardwood forests which are important repositories of biodiversity and other non-timber values. Removal of these subsidies requires attention to forest industry practices and also to what proportion of forests should be set aside for other (that is non-timber) uses.

The main environmental externalities associated with forests are as follows.

Soil erosion. Loss of productive land and siltation of waterways can result from forestry operations.

1 See Yearbook, Queensland Department of Primary Industries — Forest Service, 1992–93,p.43.

2 See Annual Report, State Forests of New South Wales, 1993–94, pp.61–84.

Flora, fauna and reduction in bio-diversity. There have been no known extinctions of native flora and fauna as a result of timber harvesting operations over a period of more than 100 years,[1] but there are considerable environmental concerns over the bio-diversity and aesthetic impacts of forestry operations, particularly in old growth and other pristine areas in most States.

The stock of bio-diversity held in Australian forests and other natural areas has a considerable, but unestimated, value for current and future aesthetic, general conservation and commercial purposes (see box on p.99). An indication of these values is given in the introduction to this chapter. Surveys indicate the Australian bio-diversity stock has declined since European settlement.[2] What is at issue now, and requires further study, is the effects of current and proposed human activities on this stock, that is, the marginal effects/costs of current and proposed future activities.

Water catchment. Melbourne Water and the Perth Water Authority have studied the value of forests to water quality and concluded that the forested catchment areas confer significant benefits in terms of water yield and quality.[3] Conversely forest removal in water catchment and contiguous areas has significant external costs. Work on the impacts of logging on water catchment for domestic, business and agricultural purposes has been undertaken by the Australian Conservation Foundation (ACF)[4] and in a study for Melbourne Water and the Victorian Department of Conservation and Natural Resources (MW and CNR).[5] In this latter study on the impact of forestry operations on water production in the Thompson River catchment area in Victoria, the net economic value based on net present value of water and timber production of various logging options was estimated. In the base case, using a discount rate of 5 per cent real the net economic value to the State of Victoria from timber and water yields from the Thomson would be increased by any change from current practices, but particularly by either ceasing logging or by increasing the rotation length or by an increased use of thinning techniques. The result is not greatly affected by discount rate changes though the no logging option is more attractive at lower rates, and is not very sensitive to water prices above about $300/ML at the dam (before deducting supply costs).[6] A 1994 study which refined the estimates has not been released by the Victorian Government, but is believed to verify the 1992 study conclusion that foregone water production has a higher value than logging in the area studied.

Aerial forest spraying for pest control can result in significant water quality and biodiversity costs.

Tourism and heritage impacts. It is estimated, for example, that the value of tourism and recreation in and around the Wet Tropics World Heritage Area was $377 million[7]. In 1991–92 logging in these and similar areas would have a negative impact on tourism, the effect depending on logging practices, and the attraction of the area involved. Similarly forest disturbance and removal in some areas can impact significantly on heritage values, particularly for the indigenous community.

1 See ESD-F, p.29 and *RAC Forest and Timber Enquiry Final Report*, Vol. 1, pp.177–178.

2 As reported in *Native Vegetation, Clearance, Habitat Loss and Biodiversity Decline*, Biodiversity Series, Paper No. 6, Department of the Environment, Sport and Territories, Canberra, 1995 and the Australian Year Book, 1994,p.433.

3 See ESD-F, p.20.

4 See, for example, The impact of logging on water production in the Thompson River Catchment, ACF, 1992.

5 Read, Sturgess and Associates, Study of the Thompson River Catchment regarding the value of forests for water catchment,prepared for MW and CNR,1992.

6 Ibid, p.41.

7 N. Preece, *et. al.,op. cit.*, p.42.

Greenhouse impacts. Deforestation contributes to CO2, CH4 and N2O greenhouse gas emissions and reduces greenhouse emission sinks. The net impact of current reforestation and deforestation on greenhouse gas emissions is contentious. It is likely, however, that there is a significant net deforestation effect that leads to a net increase in greenhouse gas emissions.[1]

Fire damage from forestry operations can give rise to greenhouse and other extemal affects such as damage to bio-diversity and property values.

Estimating the magnitude of environmental subsidies to forestry operations is difficult to undertake directly but can be approached in several indirect ways, for example by contingent valuation surveys and by the change in productivity technique, that is, estimating the cost of ceasing operations in high conservation value areas. The latter approach, that of estimating the costs of ceasing operations, is essentially a control cost approach.

For the RAC Inquiry Streeting and Hamilton[2] estimated, for South–East Australian forests on the National Estate Register, that a once-off payment to equilibrate costs and benefits of ceasing forest operations in these areas and paying compensation for unemployment, would amount to about $7 (1994 dollars) per adult in New South Wales and Victoria, a total of about $60 million. Extrapolation of this result to all such areas in Australia is contentious because of the approach used and limitations of currently available data.

Another "control cost" approach is to estimate the loss of turnover for ceasing forestry operations in areas of high conservation values in Australia in 1994. From ABARE data on turnover in native forest operations and DEST Forest Branch estimates (Carl Binning, pers. comm.) of the proportion (40 per cent) of higher conservation value areas being forested[3], estimated cost of ceasing operations in these areas can be determined. Turnover for hardwood log sawmilling and hardwood woodchips in 1994 amounted to about $1.150 billion[4], and with about 40 per cent in high conservation value areas loss of production in these areas would be valued at about $460 million.

An ABS estimate of the commercial timber value of publicly-owned Australian native forests, extrapolated by NIEIR to 1994 from 1992, on the basis (dubious but none other available) of GDP growth was about $7 billion[5] of which 40 per cent (DEST estimate, see above) might be of high conservation interest, giving an estimated commercial value of these areas amounting to $2.8 billion. At an 8 per cent real rate of return, the annual value of these areas in 1994 would be $224 million, an amount which would be lost if these areas were removed from commercial forestry operations.

Estimates using these approaches are, however, dubious at this time due to the problems of defining areas to conserve, of valuing the forests resources within them and of valuing the other costs and benefits of conserving these areas.[6] For these reasons these estimates are not included in the study estimates.

The evidence reported above suggests, however, that the negative environmental externalities of current forestry operations, particularly in native forests, are probably substantial.

1 See, for example, ESD-F, pp.192–194,and NGGI,1994 and Buxton, M., Integrating conservation and development through the planning process: the case of vegetation protection and restoration, a paper to the National Greening Australia Conference, 4–6 October, Fremantle, W.A.,1994.

2 Streeting, M., and Hamilton, C., *An Economic Analysis of the Forests of South–Eastern Australia*, Research Paper No. 5,RAC Inquiry, 1991.

3 This proportion is now being re-evaluated.

4 ABS, Quarterly Forest Product Statistics,March quarter, 1995.

5 ABS, National Balance Sheets for Australia, *op. cit.*, p.81.

6 Besides the above approaches,see also Dragun, *op. cit.*

Internalisation of current forestry externalities could be partly achieved by preserving high conservation value areas, partly by regulation of forest use and partly by imposing specific charges on forest operations and other forest activities. The decision by the Federal government in March 1995 to introduce a system to preserve 15 per cent of pre-European settlement forests will reduce the costs of forest operations in terms of biodiversity and other non-timber value losses. The extent of this internalisation is, however, uncertain and other instruments need to be considered after review of the externalities involved.

6.4 Summary

The above discussion indicates that financial subsidies may be significant and that the environmental subsidies to forestry operations are probably substantial. That is, there are probably substantial opportunity costs of current, planned and proposed forestry operations in Australia. Policies should be directed initially at a detailed analysis of these costs and following this analysis consideration should be given to the removal of subsidies.

When considering policies to remove subsidies from forest products there is a need to address subsidies to substitute products, for example concrete, steel and imported timber. Also there is a need to consider social effects of removing subsidies, for example the job and income loss effects in forest activity communities. While in the medium and longer term job and income gains from tourism and recreation may offset the forest activity losses the winners and losers are not precisely coincident groups. The potential impacts of subsidy removal are not confined to the forest sector but are also found in the other resource areas covered in this study.

A summary of the study's findings on financial and environmental subsidies to public forestry operations in Australia is presented in Table 16.

Table 16: Summary of financial and environmental subsidies,1994, public forests

Activity element	Financial subsidies ($ millions,1994)	Environmental subsidies ($ million,1994)	Subsidy removal instruments	Fiscal implications ($ millions,1994)
Access fees, royalties, resource rents below economic basis[1]				
Public agency costs[2]	100		Higher cost recovery through royalties and other fees from forest industries.	Higher revenues from timber companies per unit of timber extracted would be partly offset by removal of some areas from logging.
Direct subsidies[3]	—			
Environmental subsidies[4]		Not estimated	Environmental levies, regulation of use.	
TOTALS	**$100 million**	**—**		**—**

Notes

1. Requires detailed analysis of governments' policies and potential to raise revenues from extraction of forest products to provide appropriate community returns and recover public agency costs. See text pp.95–97 and below.
2. Agency reports indicate forest product revenues are, or close to,meeting agency operating expenditures but the actual situation is unclear; estimate included under access fees, etc. above. See text for basis of estimate.
3. Direct subsidies do not appear to be paid. There are some State consolidated revenue and Commonwealth payments to the States for forest assessments, adjustments, etc. and the estimates on public agency cost shortfalls attempts to take these into account.
4. Not estimated due to current valuation problems — see text, pp.102–103. A priority area for further study.

A review of State budget papers indicated that information contained in them on forest levies, access fees, royalties and expenditures are inadequate. Therefore it was necessary to review State forest agency annual and other reports. No analysis appears to have been undertaken in Australian on the adequacy of community returns from extraction of timber from public forests.

7. Use of publicly owned natural attractions for recreation and tourism

7.1 Introduction

In Australia natural attractions such as coastlines, forests, rivers, mountains, deserts and grasslands are mainly, but not solely, publicly owned, predominantly by the States. Most, but not all, have a reserve status, which means that many potential uses are proscribed; specific permissible uses vary from area to area. These areas are important repositories of flora and fauna and are important for preservation of genetic diversity. However, control of access to them and monitoring of direct (visitor) use impacts appears to be very variable.

Subsidy issues arise because of their public ownership (e.g. what areas to reserve for public parks, etc. and how to pay for them) and partly because of their multi-purpose use (protected repositories of fauna and flora, forestry operations, recreation/ tourism use, etc.). Natural areas are associated with a wide range of values — from the purely commercial (e.g. logging) to the purely aesthetic (e.g. enjoyment of a vista).

Direct and indirect use add a further complexity. Indirect users of natural areas include people who may not visit the area but who value its existence. Thus the existence of natural areas confers positive externalities and damage to or removal of these areas confers negative externalities. A brief discussion by Driml of value categories (existence, bequest, option and quasi-option) associated with indirect use of a natural area is provided in the following box.

There is also a body of opinion which regards free access to natural areas as a right of citizenship; almost a mark of national identity, by contrast with the privately enclosed parklands of Europe.

The range of values associated with natural areas makes for difficult economic valuation of these areas and their associated financial and environmental subsidies, as many of these values are not available from market data. Indirect use or public goods values, which may be significant, provide a possible rationale for the major part of resource costs being covered by general taxation and not from direct users. Direct use by foreigners not subject to Australian general taxation could be charged at a higher rate; this might be judged equitable but

impractical administratively and politically. An alternative which may be feasible, would be to increase the departure tax for persons travelling on foreign passports.

Direct use of natural areas for recreation and tourism activities should be charged for as most of the benefits of this direct use flow directly to the participants in those activities. Considerations involved in establishing charges for direct use are as follows.

(i) Recovery of management costs and costs of repairing damage caused by direct users.

(ii) Rationing of resource use to limit damage to the area, that is the higher the access charge the lower the access demand.

(iii) Earning a rate of return on publicly owned resources. This is a difficult concept to apply to natural areas due to the probably substantial but uncertain values of indirect use benefits.

(iv) Costs of excluding direct users,costs that can be very high in some areas.

Except for (i) and (ii) estimation of values associated with these considerations is difficult, but from an economic perspective the alternative uses of these areas demand that an attempt should be made. In practice attempts are being made to estimate values associated with consideration to (i) and to some extent (ii) and (iii).

Another approach is to consider what private benefit values to direct users are associated with protection of natural areas and to apply estimates of these values to direct user charges. Estimating these values is, however, difficult. Despite these estimation difficulties it is hard to argue that direct users should not be charged for their use of natural attraction areas. Revenues from these charges make it more practicable for governments to maintain these natural areas and to protect them from alternative uses. The issue of direct user charges is discussed further in the financial subsidies section below.

The numbers of direct users, i.e. visitors to the areas, have greatly increased over the past ten years, with the rise of creating the "ecotourism" industry. Estimates for three major natural areas in Australia is presented in Table 17.

Environmental impacts of visitor use to natural attraction areas are recognised in the National Ecotourism Strategy (NES) which also cites potential benefits from ecotourism.

> "The environment can also gain benefits in that ecotourism can:
>
> – be an incentive for conserving natural areas;

Table 17 Estimated visitor numbers of some major natural attractions, 1982–1992

	Great Barrier Reef Marine Park	Kakadu National Park	Uluru National Park
1982, 1982–83		45 800	87 871
1984, 1984–85	1 119 000	75 200	110 160
1986		131 000	141 219
1988		220 000	175 536
1990		238 000	218 160
1992	2 291 000	205 000	250 000

Source:Driml, *op. cit.*, p.5.

Driml discussion of natural area economic values

Many attributes of natural environments are not regularly traded in markets. One reason for this may be historical. Protected natural environment areas are public lands and it has not been usual to charge for the services they provide. Another reason is that many of the services of natural environments have the characteristic of *public goods* and it is not possible to divide them up for exclusive sale, so it is not feasible to trade them in conventional markets. Clean air, biodiversity and functioning ecosystems, for example, have public good characteristics. The values of natural environments that are not able to be observed in markets are given the term *non-market values* by economists.

The total economic values of the protected areas covered in this study include both market values and non-market values. Non-market values are of two types; direct and indirect use values. *Direct use values* include the benefits accruing to people who visit, or live in,an area and enjoy its attributes. This obviously includes people who visit for tourism and recreation. *Indirect use values* accrue to people who may never visit an area but who nevertheless value the fact that it exists in its natural state.

It is widely acknowledged that natural environments produce a range of values to society associated with their roles as havens for conservation of biodiversity, contribution to global life support systems, and amenity arising from knowledge that wild and natural areas exist. *Existence, bequest, option* and *quasi-option* values have been identified as legitimate indirect use values arising from natural environments.

Existence value is the value people place on ensuring an area remains as a natural environment; **bequest** value is the value they place on ensuring it is available to future generations; **option** value is the value they place on ensuring that it remains as a natural environment so that they may visit in the future; and **quasi-option** value is the value people place on conserving a natural environment for the new information which may emerge in the future.

Together, market and non-market values cover all the benefits to humans flowing from the resource whether or not these are normally measured in dollar terms. Economic values are necessarily anthropocentric and do not recognise any value of nature conservation to the non-human elements of nature involved.

It is important to point out that monetary transactions observed from markets that are not working in a competitive mode will not reflect total economic benefits. This is generally the case for tourism and recreation in the protected areas studied. Park management agencies do not charge access (entry) fees from private recreation or commercial tours to cover the full costs of providing the services of the natural environment, in the way a private supplier operating in a competitive market would. It follows that entry fees and prices of commercial tours are below what they would be in a competitive market and do not reflect the full willingness to pay by visitors.

In order to measure total economic benefits of indirect uses and those direct uses where competitive markets do not exist, economists attempt to measure willingness to pay using a variety of valuation techniques. These include *related market methods* and the *Contingent Valuation Method* (CVM). In the former method, markets for related goods are examined to

provide information on how the market for the good in question might function. The most relevant example for protected areas is the *travel cost method* where expenditure on travel to the areas is used to estimate how much visitors would be willing to pay for entry, if entry fees were charged at market rates.

The CVM involves asking people what they would be willing to pay contingent upon a proposed change in the state of things, for example to provide more nature conservation reserves or to avoid damage to existing reserves. The contingent valuation approach can in theory be used to address public good issues and to cover the full range of direct and indirect non-market values that people perceive to flow from protected areas. Considerable debate is occurring about philosophical and technical aspects of this approach (Wilks 1990). It would be fair to say that CVM is not totally accepted inside and outside the economics profession, yet no satisfactory alternative to actually asking people what they would be willing to pay for non-market values has been developed.

Source:Driml,S.,Protection for Profit:Economic and Financial Values of Protected Areas,Research Publication No. 35,Great Barrier Reef Marine Park Authority, 1994, pp 57–58.

– provide resources (both financial and physical) for environmental conservation and management, and incentives to 'repair' degraded ecosystems or 'improve' biological diversity through, for example, client participation in captive breeding programs or volunteer holiday programs; and
– engender an environmental ethic that goes beyond the ecotourism context.

These benefits are often difficult to quantify and, in the absence of work to clarify the effects, tend to be dismissed."

The potential benefits from ecotourism cited in the NES promote the values associated with natural areas. This value promotion, together with the economic growth and employment stimulated by ecotourism, tend to increase public and private resources dedicated to preservation of these areas.

7.2 Financial subsidies

In the case of publicly owned areas the level of charges for the use of the area's resources, along with access provisions, are the major factors affecting use patterns, user impacts and the long term condition of the areas. Access charges never appear to be set at full cost levels, i.e. at levels based on the opportunity cost of the area's use, the costs of management, at levels based on users' willingness to pay for access to the area (see below) or on the opportunity costs of the area's alternative uses. Valuations of the land and resources involved in natural attraction areas is difficult and is seldom attempted.

In general charges, where they apply, are currently set to meet some part of management costs and not to cover full costs of the resource provision, nor to ration access and cover damage that use might cause to the natural area. Where collection costs are likely to absorb a high proportion of potential revenue, i.e. where exclusion costs are high, it might be judged better not to attempt imposition of charges. Where exclusion costs are high an alternative is spot-checking of visitors to ensure access permits are held. Such a system is used in the Tasmanian Wilderness World Heritage Area.

In a study undertaken by Hundloe, *et. al.*[1] in 1987 and cited by Driml[2], the mean willingness to pay an entrance fee to coral sites on the Great Barrier Reef (GBR) was estimated to be $13 (in 1994 dollars) per adult compared to a $1 fee introduced in 1993. This example, albeit in one location, indicates a willingness to pay for access to a natural area that is significantly higher than the fees actually charged. Throughout Australia, access fees to national/State parks are quite variable ranging from zero to $12 for a single visit, and appear to average around $5 per visit where payable (see Table 18). Most charges are based on a flat entry rate for each vehicle and where camping is permitted fees also vary considerably (see Table 18). In Victoria in 1993–94 revenues collected averaged about 30 cents per visitor day from a total of just above 10 million visitor days to these areas; total revenues were only about 12 per cent of total National Parks Service expenditures.[3]

In the eight major natural attraction areas studied by Driml, 1991–92 revenues from users totalled just under $15 million, against a management budget for the areas of $61 million.[4] Assuming that these revenues increased to about $20 million in 1994–95, that revenues from other natural areas totalled about $20 million in 1994–95,[5] the total revenues from Australian natural areas might have totalled about $40 million in 1994.[6]

State and Federal budget papers indicate that in 1994–95 Australian governments will spend about $450 million[7] on national parks, wildlife and conservation. These expenditures cover all aspects of public agency management of these fields, including access management, visitor services, restoration of areas from previous and current use, and wildlife preservation work. It is not possible to determine precisely what proportion of these total expenditures is attributable to the management of natural attraction areas for the provision of services to direct users. Of the $450 million, however, the limited information available in agency reports suggest that these management expenditures could total $200 million.

The other $250 million of agency expenditures is here attributed to public goods aspects of the agencies' work. As indicated above, from Driml estimates and a survey of State and Territorial agencies (see Table 18), fees actually collected in 1994 appear to have totalled about $40 million, leaving a net deficit of $160 million.

If this deficit is regarded as a subsidy to direct users, direct user fees would have had to be quintupled to balance revenues and costs in 1994.[8]

1 Hundloe, T., Vanclay, F. and Carter, M., 1987, *Economic and Socio Economic Impacts of Crown of Thorns Starfish on the Great Barrier Reef*, Institute of Applied Environmental Research, Griffith University, Report to the Great Barrier Reef Marine Park Authority, Townsville.

2 Driml, *op. cit.*, p.78.

3 Information collated for NIEIR by the Victorian Conservation and Natural Resources Department, National Parks Service from National Parks Service annual reports.

4 Driml, *ibid*, p.vi.

5 Estimate from limited data available in agency reports; see Table 18 note.

6 Although this seems to be a reasonable estimate that attempts to balance data limitations it could understate revenue, for example in Commonwealth managed areas such as Jervis Bay National Park where substantial revenue is generated.

7 The possibility of some double counting, because of transfer payments from the Commonwealth to the States,in this estimate is acknowledged (see Section 1.2 for discussion of this general problem).

8 It should be noted that substantial revenues can only be raised in protected areas where visitation levels are high (usually because near large population centres) and that many of the more than 1,000 protected areas in Australia have little prospect for raising significant amounts of revenue even though some incur substantial management costs.

Table 18: Access, entrance fees, revenues, etc. to national parks in Australia,1994

Jurisdication	Fee descriptions	Revenue estimates ($ millions)
Western Australia	Annual pass of $35; unlimited entry. Daily pass of $5 per car single entry charge; non-car entry free. Camping fee of $5 per night per adult, $1 per night per child.	$1.800
South Australia	Access fees charged for only 5 of 200 parks in South Australia. Fees range from $1–3 per person depending on access mode. Camping fees average about $3 per night per person.	$2.860
Victoria	Access fees are charged for 9 of Victoria's 35 national and State parks. $3–$9 per car single entry charge; other $0–$5 per visit; large vehicles (10 plus seats), $13–54 per visit; annual pass $42. Camping fees, $2–$12 per night per person.	$3.200
New South Wales	Access fees charged for 60 parks at $7.50 per vehicle. Annual entry fee is $50–$60 depending on parks. Camping fees range from $5–$15 per night (two persons) depending on facilities available. Kosciusko ($12 per vehicle) included in Driml estimates, not in these, had user revenue of about $13 million in 1994.	$6.470
Queensland	No access fees for national parks; variable fees for access to recreation areas (Fraser Island, Green Island, etc.) Camping fees: $3 per person per night.	$0.660
Tasmania	Daily fee of $8 per car or $2.50 per person for non-vehicle entry and for vehicles of more than eight persons. Annual fee for all parks of $40 or $15 for any one park. (New fee structure from 1 November, 1994). Camping fees vary up to $10 per night per site.	$1.300
Northern Territory	No access fees. Camping varies up to $10 per night per site.	—
Australian Capital Territory	No access fees. Camping fees of $9 per night (two persons) per site.	—
TOTAL		**$16.290**

Note:

1. Excludes revenues from "Driml"areas estimated separately from Driml, *op. cit.* Some licences, fees, charges appear to be included in other aggregated report items and in other agencies; hence total revenues were estimated at $20.000 million.

Source:State and Territorial parks agency annual reports and personal communications.

7.3 Environmental subsidies

The environmental effects of activities in natural attraction areas include:

- physical damage to the areas, including soil, watercourse and coastline erosion and soil compaction;
- damage to flora and fauna, including loss of bio-diversity and damaging effects of invasive non-local species;
- some loss of aesthetic utility, e.g. damage to the landscape from commercial operations associated with recreation and tourism in natural areas; and
- impacts on water and air quality.

Control of environmental impacts is generally by regulation but, as noted above, reports of damage by users indicate that regulatory administration is often inadequate in natural areas. Current regulatory control covers, depending on the area, restrictions on activities such as shooting, camping in non-designated areas and entry of domestic pets; the regulations are generally backed up by fines for non-compliance. In some areas such as Victoria's Point Nepean National Park, visitor numbers and access are restricted to reduce damage to the area's environment.

Valuation of the negative externalities associated with direct use of natural attractions areas is difficult. Several attempts have been made, however, to estimate conservation values of such areas using contingent valuation analysis, damage and control cost assessments.

Using contingency valuation based on the 1987 willingness to pay survey by Hundloe, *et. al.*, Driml also estimated that the economic value of **conservation** in the Great Barrier Reef area was about $86 million ($ 1991–92) per year[1], that is **removal** of the area would result in an estimated $86 million (1991–92) loss in conservation values. The conservation value estimates covered willingness to pay for management of the area by non-users, research into the control of the Crown of Thoms Starfish by non-users and additional access fees for conservation management.

Willingness to pay for prevention or repair of tourism damage was not included, however, in the information sought in the Hundloe survey and subsequent estimates by Driml. The damage may be considerable. For example, the ESD-Fisheries final report indicates (p.82) that studies on rocky foreshores show that for every two kilometres there are an average of 20 people every day collecting 6 or 7 crabs, 4 sea urchins, and 12 turbo snails; some species have been so severely depleted that they require total protection. These "collection" activities, together with erosion from walking tracks, etc. and waste impacts on flora and fauna, can cause significant damage to natural areas that are not captured by the Hundloe/Driml analysis.

Reducing direct user numbers by charging higher access fees, as suggested in the financial subsidies section, would reduce damage by users for natural areas. Economics would suggest raising charges till the marginal direct use revenue was equal to the marginal cost of damage from, and management for, direct use of the area.

Estimating damage costs and difficulties with actually repairing damage may mean that in some areas raising access fees, except to some very high level, may not be adequate for control of damage. It might be argued that a distinction should be made between reversible and irreversible damage, and that the cost and possibility of irreversible damage in some areas might be so high that direct use, except

1 Driml, *op.cit.*, p.79. This estimate was derived from a survey of direct users and non-direct (vicarious) users, and made up of willingness to pay for conservation management and research/control of the Crown of Thorns Starfish (COTS) damage.

for limited scientific investigation, should be precluded or strict access restrictions applied.

Besides anecdotal comments on the damage caused by direct users,and some scattered estimates of damage repair costs, there does not appear to be any estimates of environmental externalities associated with the direct use of natural areas. The above financial subsidy estimate only covers the management costs for natural attractions and even though this may include some damage repair, damage costs might be of similar magnitude, but much more work is required to give credibility to such an estimate. Thus much more detailed work on the environmental impacts of visitors to Australian natural attractions would be needed before an estimate could be prepared.

7.4 Summary

The review indicates that in the financial subsidy area direct user fees should be set at levels based on management costs associated with direct use, willingness to pay surveys, and perhaps the need to ration access. The evidence is that this pricing approach would raise substantially more revenue than is currently collected. Environmentally this would have the effect of reducing damage to the areas by reducing the funding pressure on public management agencies and allowing construction and maintenance of protective infrastructure, such as defined walking tracks. Raising charges may be insufficient to control damage and therefore direct regulation, including access restrictions, may also be required.

In the environmental subsidy area the review indicates:

(a) a sparsity of data; and

(b) controversy over interpretation of data that is available.

However, we consider that the costs of damages attributable to environmental impacts of direct users of natural attraction areas are significant. For example the disturbance of wildlife by vehicles and walkers, picking of wild flowers, introduction of feral species and the erosion of stream banks. Together with the estimate of financial subsidies to direct users this would have required very significant increases in user charge — perhaps by a factor of over five in 1994–95.

More work is necessary on damage, control cost and contingent valuation approaches to evaluating financial and environmental subsidies to direct use of natural areas, for example by assessing damage costs and the possible costs of repairing damage. Other work required is investigation of damage irreversibility in natural attraction areas, and the role of natural attraction direct use in environmental education.

In practice charges are slowly being raised, access restrictions are being introduced in some areas and some restoration work is proceeding.

A summary of financial and environmental subsidies for natural attractions is presented in Table 19.

Table 19: Summary of financial and environmental subsidies,1994, natural attractions

Activity element	Financial subsidies ($ millions,1994)	Environmental subsidies ($ million,1994)	Subsidy removal instruments	Fiscal implications ($ millions,1994)
Public agency costs			Higher direct user charges	Significantly higher direct user revenues — mainly accruing to the States and tribal owners.
– additional revenues from direct users[1]	160		Access restrictions in areas of high conservation values.	
Environmental subsidies[2]		Not estimated.		
TOTALS	**$160 million**	**—**		**$160 million**

Notes

1. Most costs of preserving these areas are currently attributed to the community at large. That is,the public goods element of total costs of maintaining these areas is claimed to be high. However, it seems that much higher direct user fees could be imposed to contribute to public management costs,to restrict access and to pay for damage caused by visitors. See text.

Estimates of public agency expenditures on parks, flora and fauna conservation

	$ million	$ million
New South Wales — national parks and wildlife		
Budget estimates,1994–95		
Net cost of services	$98.5	
Capital (at 10 per cent of amount)	2.7	101.2
Victoria — national park service		
Budget estimates 1994–95		
Net cost of services	45.5	
Capital (at 10 per cent of amount)	0.8	46.3
Queensland — conservation		
State budget, 1994–95		
Program outlays	114.3	
Capital (at 10 per cent of amount)	2.7	117.0
Western Australia — conservation and land management		
Program statements,1994–95		
Net recurrent outlays	25.4	
Capital (at 10 per cent of amount)	0.9	26.3
South Australia — resource conservation and protection		
Estimates of receipts and payments, 1994–95		
Recurrent outlays	47.9	
Capital (at 10 per cent of amount)	1.0	48.9

Tasmania — Crown land and asset management wildlife and heritage		
The Budget,1994–95		
Recurrent services	24.1	
Works and services (at 10 per cent of amount)	1.2	25.3
Commonwealth — national estate and parks		
Budget Statements,1994–95	84.1	
TOTAL		**$449.1**

2. Surveys indicate a significant willingness to pay for prevention or repair of damage to these areas in Australia from recreational and other uses (e.g. mining, forestry), but valuations are very contentious because of the valuation methods that have been used. No estimates of damage caused by the direct use of natural attractions appear to have been made. See text pp.112–113.

8. Agricultural chemicals

8.1 Introduction

Australia is a major producer and exporter of agricultural products which are mainly sold at world market prices and are produced at relatively low costs. In 1993–94 the gross value of agricultural commodities produced was (preliminary) ABARE $23.646 billion, made up of crops (approximately 49 per cent), livestock sales (29 per cent) and livestock products (21 per cent).[1]

About 60 per cent of Australia's land area is used for agriculture — most is used for animal grazing; only about 10 per cent is under crops or improved pasture, a small proportion of which is irrigated.[2] The main environmental impacts of agriculture are degradation of land through clearing, overstocking, irrigation and overcropping, pollution of water from fertilisers, other chemicals and farm wastes, reduction of native species and introduction of non-native species. For example, together with clearing, irrigation has resulted in serious salinity and water logging problems in some areas.

Environmental costs may be incurred both on-farm and off-farm. On-farm costs may be regarded as externalities if the interests of future generations are not taken into account; off-farm costs are external to the financial interests of the farm.

In this study the focus is on financial and environmental subsidies to chemicals used in agricultural operations. Chemicals use covers the application of fertilisers, pesticides, herbicides and fungicides. Expenditure on chemicals (including fertilisers) represents around 10 per cent of farm operating costs (about 5 per cent for fertilisers), according to the ESD-A (p.79).

Trends in fertiliser use are indicated in Table 20.

8.2 Financial subsidies

The ESD-Agriculture study reported (p.55) that in Australia the agricultural sector is only lightly assisted, the effective rate of assistance being an estimated 9 per cent in 1988–89, and noted that farmers receive international market prices for most of their output. However, as this study indicates, input subsidies to irrigation water and possibly to diesel fuel are significant.

The rate of return on the market value of farm assets is low mainly because of acceptance of lower rates of return for lifestyle benefits (over 90 per cent of farmers are family owned), but

1 ABARE Commodity Statistical Bulletin, 1994, pp.19–20.

2 Agriculture accounts for about 70 per cent of water used in Australia, Ecologically Sustainable Development Working Groups, *Final Report — Agriculture* (ESD-A), p.75.

also to some extent because of inefficient practices. Climatic and market conditions significantly affect year to year returns. Tax treatment of farming costs is often cited as favourable, through tax deductions to environmentally disruptive activities including the use of farm chemicals. The recent tendency has, however, been to more favourable tax and other financial treatment of environmentally beneficial practices.

The income tax system (*Income Tax Assessment Act*, ITAA, etc.) is now being used to some extent to encourage farmers to undertake appropriate land management practices:

- Section 75B of the ITAA provides for capital expenditure on water storage and farm reticulation systems to be depreciated over three years; and
- Section 75D of the ITAA provides for expenditure on remedial land conservation work to be deducted from income in the year that it is incurred.

On reviewing the tax system for its sustainable development neutrality, particularly with respect to agriculture, the ESD-A report concluded that:

> "Tax biases are likely to be a minor contributor to any sustainable development problems compared with short sighted planning, a lack of understanding of environmental consequences and a conflict between individual goals and the community objectives of sustainable development, as likely to be more significant factors."

Rebates of diesel fuel excises through the Diesel Fuel Rebate Scheme (DFRS) might represent a significant subsidy to agriculture. The subsidy (currently 30.8 cents a litre) to agriculture was estimated to cost $396.9 million in 1994–95. The DFRS can be viewed as encouraging the inefficient use of fuel in fuel intensive activities such as fertilizer and pesticide application relative to non-rebate fuel uses. Discussions with ABARE indicate that about 10 per cent of agricultural diesel fuel is used for the application of fertilisers and other agricultural chemicals; on this basis the DFRS would provide a financial subsidy to fertiliser, pesticide, etc. use of about $39.7 million per year. Whether, however, this rebate should be

Table 20 Artificial fertilisers: area and usage in Australia, 1986–87 to 1991–92

Year	Area fertilised ('000 ha)	Super-phosphate used ('000 tonnes)	Nitrogenous fertilisers used ('000 tonnes)	Other fertilisers used ('000 tonnes)
1986–87	24 064	1 981	416	830
1987–88	26 651	2454	431	953
1988–89	27 871	2 523	438	971
1989–90	27 360	2 378	483	1 010
1990–91	23 627	(a)	(a)	(b)3 239
1991–92	19 517	(a)	(a)	(b)2 678

Notes:
(a) Not collected.
(b) Includes all fertiliser categories.
Source:Summary of Crops, Australia (ABS 7330.0) data,as cited in Australia Year Book, 1994,p.483.

regarded as a subsidy is contentious as the main rationale for the rebate is that these users do not use public roads and should therefore not pay the excise tax on diesel fuel. As discussed in Section 2.2, in this study the DFRS is not treated as a subsidy to its beneficiaries.

The introduction in July 1989 of the *Agricultural and Veterinary Chemicals Act 1989* established a national system for the clearance of agricultural and veterinary chemicals through the Australian Agricultural and Veterinary Chemicals Council (AAVCC). This process involved a detailed assessment of the efficacy, public safety, environmental safety, and occupational health and safety of individual chemicals. In June 1993 a National Registration Authority (NRA) was established and the NRA board replaced the AAVCC. After a long phase in period, the NRA formally took over responsibility for registration of these chemicals form the states and territories on 15 March 1995 when a series of seven acts replaced the 1988 act. The last four acts in the package contain the cost recovery mechanisms and in particular, the imposition,assessment and collection of a levy on sales of chemical products.

Commonwealth payments to the National Registration Authority (NRA) for Agriculture and Veterinary chemicals, and the National Residue Survey, are estimated to be $12.4 million in 1994–95. Industry levies of about $10.7 million will be collected to defray program costs, thus 86.3 per cent of the program costs are expected to be recovered from the private sector (Budget Paper, No. 1, 1994, p.3.165 and Scott Lydiard, NRA, pers. comm.).

The previous phosphate fertiliser bounty subsidy, which encouraged fertiliser use, was terminated in 1988.

On the basis of available information it is judged that there is no financial subsidy to agricultural chemical usage.

8.3 Environmental subsidies

It is argued that sustainable agricultural practices are encouraged by the high proportion of family successions among farming enterprises. This tends to prevent irreversible and major damage on the farm land owned by an enterprise. However, lack of knowledge of and/or regard for agricultural practice impacts on land and water resources has resulted in environmental disruption on a range of farm types. Also farm practices give rise to external effects on other farms and other activities, for example through impacts on water quality and wildlife.

Land care programs are being used to improve sustainability of agricultural activities; federal payments for the national program were an estimated $37.669 million in 1993–94. Total Landcare expenditures would be much higher because of contributions to the activities by other agencies, firms and non-govemmental organisations, as well as internal activities of individual farmers. Some components of Landcare expenditures might be viewed as a subsidy by the community to the costs of controlling and repairing damage caused by unsustainable agricultural practices. It is difficult, however, to apportion Landcare program expenditures to particular environmental problems such as effects of over-use of pesticides, herbicides and other farm chemicals analysed in this report.

Agricultural chemical use and effects. Agricultural use of chemicals — pesticides, herbicides, fertilisers, fungicides and veterinary chemicals — affect soil, water and air quality and give rise to environmental externalities. The use of agricultural chemicals raises the potential for non-target and off-site contamination, particularly if the chemical is mobile in the environment and moves into ground or surface water. For example, human health, native wildlife and the landscape can be damaged,

and economic losses incurred (fisheries, tourism), when these chemicals seep into water supplies.

Positive sustainability effects of chemicals come from the use of herbicides in less disruptive minimum tillage systems, and the use of fertilisers in replacing soil nutrients.

Most Australians soils are deficient in phosphorous. Because of this and the significant but less widespread deficiency of sulphur in many soils, phosphatic fertilisers, particularly superphosphate, account for the bulk of fertiliser usage. Over half of superphosphate is used on pastures in areas with moderate to good rainfall. Large quantities are also used on cereal crops. Nitrogen deficiency is also general in Australian soils and the use of nitrogenous fertilisers is increasing (see Table 20).

Run off from fertiliser use leads to reduced water quality for humans, stock and native flora and fauna, through algae growth and other water degradation effects (see Waste water section). No estimate of the relative or specific impact of fertiliser run-off on water quality appears to have been made.

Pesticides and fungicides are widely used to prevent damage to crops. A major contributor to the environmental impacts of pesticides and fungicides is the development of resistance by some pests and fungii, which results in more chemicals being applied to the problem. (See ESD-A, p.81 for a discussion of case studies on the use of pesticides in cotton producing areas).

Chemical residues in food including raw produce are regularly monitored by a number of organisations, but mainly through the National Residue Survey (NRS) and the Australian Market Basket Survey (AMBS). Survey data is measured against maximum residue limits (MRLs) set by the National Health and Medical Research Council (NH&MRC). MRLs are established with due regard to the acceptable daily intake (ADI) for that chemical which is derived from toxicological studies using laboratory animals. (An ADI is the daily intake which,during an entire lifetime, is assessed by the NH&MRC to be without appreciable risk on the basis of all the facts known at the time). MRLs are set as low as possible consistent with the effective use of a chemical under field conditions. Both the NRS and the AMBS show that for the most part Australian products meet the standards set for them. For example, the results of the 1990 NRS reveal that of some 50000 samples taken only 400,or 0.8 per cent, had not conformed to the MRLs. However, there are concerns over the adequacy of the standards, i.e. whether residue levels conforming to the standards are harmful to humans and wildlife.

Increasing attention is being given to strategies which aim to reduce or eliminate the adverse effects of chemical use. Integrated pest management (IPM) is one such strategy which through carefully controlled coordinated management combines, for example, the use of plant breeding for pest resistance, biological control through preservation of natural enemies of pests and minimum inputs of pesticides. IPM does not necessarily focus on eradication, but aims to stop insect damage going beyond an economic/ ecological limit. IPM has the potential for the development of acceptable pest control for sustained productivity systems. For example, an IPM system to control the pea weevil, which has become a major pest of field peas in three States, shows considerable promise.[1]

Apart from IPM strategies, research and development corporations dealing with products such as cotton, rice, grapes and apples have developed longer term research plans which include support for research to reduce the use of chemicals.

Soil acidification is of concern in all crop and sown pasture regions. It is of particular

1 ESD-A, *op. cit.*, p.82.

concern in susceptible (light, poorly buffered) soils planted to legume-based (e.g. clover) pastures and crops, or where nitrogenous fertilisers are used. While soil acidification is a natural process, increases in soil nitrogen create the potential for greatly accelerated rates of acidification. If nitrates are absorbed by plants no acidification occurs, but if the nitrate is leached beyond the root zone, acidity increases. As a result some nutrients such as phosphate and molybdate become less available and toxic manganese and aluminium dissolve, reducing plant growth. Subsoil acidity is particularly serious because it denies the plant roots access to reserves of water and nutrients. Contributing factors to soil acidification are over-use of nitrogenous fertilisers and irrigation, and general farming pasture and cropping practices.

The ESD-Agriculture final report indicates that about 25 million hectares of our best agricultural land are already acid or at risk and that soil acidity causes an estimated $350 million a year in lost production. Due to the gradual nature of the acidification process and the adjustment by farmers towards more tolerant species, full recognition of soil acidity effects on agricultural productivity is yet to emerge.

Unfortunately for this study, despite the concern for the environmental and health effects of agricultural chemicals, no monetary valuation of these effects appear to have been made nor is one possible with the data available.

This is similar to the conclusion reached in a 1990 paper[1] and again in a 1994 study by ABARE which reported that there are significant gaps in the ability to assess environmental benefits from use and reduction in use of agricultural chemicals.[2] The ABARE authors suggested that "one step toward addressing these issues is to develop data bases that account more explicitly for the links between different types of chemical use and farm financial,physical and management variables". They did, however, estimate from ABARE survey data that the farm losses due to a 10 per cent increase in the cost of using farm chemicals in 1994 would be $33 million, or an average annual cost per farm of $430. The authors explicitly stated that no attempt was made to analyse any of the potential public benefits associated with a reduction in chemical use.

Nitrous oxide (N_2O) from nitrogenous fertiliser use (and from land disturbance, crop residues and legume pastures) contributes to greenhouse gas emissions. Estimates from the National Greenhouse Gas Inventory project (1994) indicate that about 15 per cent of total emissions not covered by the Montreal Protocol on ozone depleting substances come from agricultural production, a figure which includes about 3 per cent from fertiliser N_2O emissions.[3]

8.4 Summary

The issue of financial subsidies to agricultural operations is inimically associated with competitiveness of Australian agriculture. In the chemical inputs area the diesel fuel rebate scheme would appear to encourage the application of the possible over use of chemicals and, thus, from an environmental perspective it needs to be re-assessed. Environmental subsidies from farm chemicals use do not appear to have been valued. As the externalities associat-

1 Wynen, E. and Edwards, G., *Towards a comparison of chemical-free and conventional farming in Australia*, Australian Journal of Agricultural Economics, Volume 34,No. 1, April 1990, pp.39–55,particularly pp.39–46.

2 Dawn, T., Tulpule, V. and Toussaint, E., *Agricultural chemicals — their use in Australian agriculture*, Australian Commodities — ABARE, Vol. 1,No. 4,December 1994, pp.501–507.

3 National Greenhouse Gas Inventory, 1988 and 1990: summary, 1994 (NGGI 1994),p.13.

ed with agricultural chemicals use could be significant, further work on their effects, and mitigation thereof, is needed.

A summary of our findings on financial and environmental subsidies to agricultural chemicals is provided in Table 21.

Table 21: Summary of financial and environmental subsidies,1994, agricultural activities

Activity element	Financial subsidies ($ millions,1994)	Environmental subsidies ($ million,1994)	Subsidy removal instruments	Fiscal implications ($ millions,1994)
Public agency[1] costs	Not estimated			
Direct subsidies[2]	Not estimated — might be about $40 million through the DFRS.	A portion (10 per cent?) of Landcare expenditures by the federal government to improve agricultural sustainability might be attributed to chemical damage repair and control of impacts.		
Environmental subsidies[3]		Expenditure allocation on Landcare by the federal government was about $38 million in 1994–95; total expenditures on Landcare activities are higher when the contributions of others (States, individuals, etc.) are taken into account.	Initially a charge could be imposed on chemicals for research into their effects and the valuation of these effects.	
TOTALS	—	—	—	—

Notes

1. As indicated in the text costs relating to the National Registration Authority for Agricultural and Veterinary Chemicals are 86.3 per cent recovered from industry. It is not possible to estimate what public agency costs,besides the above, are associated with the use of agricultural chemicals.
2. Subsidies which might be associated with the Diesel Fuel Rebate Scheme are contentious because of the off-road nature of the fuel use. No other direct subsidies were found.
3. Although environmental effects of the use of agricultural chemicals are of concern and may be significant no monetary valuation of these appears to have been made or attempted. As indicated Table 21,a portion of Landcare expenditures might be attributed to damage repair and control of the impacts of agricultural chemicals use in 1994–95. A review of

State budgets indicates direct State contributions are nominal (probably about $1 million) but technical and administrative support is given to Landcare groups by departmental and agency personnel. No costing of this support is given in budget and agency papers, reports,etc.

9. Extraction from publicly managed fisheries

9.1 Introduction

Despite a diverse marine fauna and the world's third largest marine fishing zone, Australia's commercial fish production is relatively low being ranked 55th on a world scale. This production level reflects the low productive capacity of the fishing zone rather than underexploitation of the resource.[1] Although it is overall a relatively small industry in Australia, fishing is very important to some regional economies.

Responsibility for fisheries rests with the States for inland waters and three nautical miles off-shore, and the Federal Government for waters between three nautical miles and territorial limits — generally 200 nautical miles.

In 1993–94 the gross value of commercial fisheries and acquaculture in Australia was estimated to be $1607 million, of which privately managed aquaculture contributed around 20 per cent. About 60 per cent of fish production is exported ($1241 million in 1993–94); imports are also substantial being around $586 million in 1993–94. The gross value of the major fisheries categories are presented in Table 22.

The Australian Fisheries Management Authority (AFMA) was established in 1992 by the Federal Government to manage fisheries under Federal jurisdiction. The AFMA manages fisheries within the Australian fishing zone (AFZ) and in some cases to the low water mark in agreement with States.

Fisheries within coastal and inland waters are managed by the states and the Northern Territory; in some cases management is shared with the Commonwealth.

Fisheries in the AFZ and inland waters are predominantly publicly owned and are subject to a range of regulations covering access to the resources and their exploitation. Administration of this community owned resource is difficult as scientific knowledge of fish populations and movements is limited and because policy stances are in a state of evolution. In the ESD project a survey was undertaken on the status of fish species with respect to their sustainability, under the categories of over fished, fully fished, under fished, and uncertain. The survey results shown in Table 23, indicate that when the uncertain category is combined with those of over and fully exploited, Australia should be concerned about fisheries sustainability.

1 Background to the Australian publicly managed fisheries is mainly from the Australian Year Book,1994,the Annual Report of the Australian Fisheries Management Authority, 1993–94 and the ESD-Fisheries Final Report.

Sustainability and economically efficient harvesting is generally the prime aim of fisheries management, covering particular species and overall aquatic ecosystems. In the harvesting of a particular species of fish, conservation means maintaining the abundance of the exploited stock at a level where the long run productive potential of the stock is not impaired. From an ecosystem perspective it also means applying the same principles to by-catch (unintended catch) species and preservation of the aquatic environment.

Biological reference points may be used to guide decisions on acceptable levels of fish harvesting. These reference points are stock levels above which it is deemed prudent to maintain a particular fish stock. Below that stock level there would be concern that the stock might not be viable. There are two main types of reference points: threshold reference points at which the stock faces the threat of collapse; and precautionary reference points which indicate that remedial action (for example strict quotas) should be taken to prevent any more stock depletion.

To translate these biological concepts into economic and social terms the concepts of maximum economic yield (MEY) and optimal social yield (OSY) are used. The maximum economic yield sets a level of catch below a precautionary reference point at which it is estimated that net returns to fishing effort are maximised. The optimal social yield takes into account social factors, such as employment, income and lifestyle stability, associated with particular fisheries. These factors constrain, to some extent, the attainment of MEYs. Due to uncertainty of fisheries stocks, conservative estimates of 'safe' catches are becoming more acceptable across Australia as both public and private fishery personnel become more concerned about sustainability of operations.

Sound fisheries management also includes recognition of the impact of fishing operations on the environment,such as the effects of trawl gear on the ocean bed, the loss of marine

Table 22 Gross value fishery and selected major fisheries categories ($ million), 1988–1994

	1988–89	1990–91	1991–92	1993–94
Prawns	274	263	226	278
Rock lobster	280	277	340	422
Tuna	19	57	114	117
Other fin fish(a)	215	270	264	325
Abalone	86	91	91	177
Scallops	21	42	48	68
Oysters	41	43	43	50
Pearls	65	129	133	139
Other(b)	22	31	30	33
Total	**1 022**	**1 202**	**1 289**	**1609**

Notes:

(a) For human consumption (excludes aquaculture).

(b) Other aquaculture not elsewhere included.

Source: Australian Bureau of Agricultural and Resource Economics (ABARE), Commodity Statistical Bulletin, 1994, pp.106–108.

Table 23 Summary of responses received from Commonwealth and State fisheries agencies on exploitation of species, species groups or stocks[a]

	Exploitation category								
	Over fished		Fully fished		Under fished		Uncertain		
Agency	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**Totals**
New South Wales	3	7	2	33	4	3	3	39	94
Victoria	—	2	8	5	2	—	3	1	21
Queensland	—	3	7	29	—	—	—	3	42
Western Australia	—	2	2	11	—	2	—	—	17
South Australia	2	1	1	11	2	5	1	4	28
Tasmania	1	2	—	3	2	7	2	10	27
Northern Territory	—	—	1	—	—	1	—	5	7
Commonwealth	—	8	—	9	—	13	—	8	38
Totals	**6**	**25**	**21**	**101**	**10**	**31**	**9**	**70**	
	31		**122**		**41**		**79**		**274**

Notes:

(a)Number of species, species groups or stocks for which knowledge indicators were returned to the Working Group by Commonwealth, State and Territory agencies.

F = freshwater, estuarine and freshwater/estuarine/coastal mixes; M = marine.

Source: ESD-Fish, p.28.

mammals and birds, and the removal and discarding of non-target species (by-catch).

Economic efficiency in fishing operations can only be assessed after sustainable catch levels are set. This is a 'constrained maximisation' objective in that the physical constraint on allowable catch is first determined on the basis of the need for conservation of stocks and the supporting ecosystem.

Following the setting of a sustainable catch constraint, industry structure can then be adjusted so that returns to both fishing capacity and fishing effort are maximised. With objectives determined in this way, it becomes clearer how the aims of resource conservation and efficiency in commercial fishing can be interlinked. In many fisheries, excess capacity and competition between fishing units has resulted in low rates of return on investments. Unrestricted or easy access to fisheries can lead to depletion of stocks and low returns to unit fishing entities; however, over the past 20 years legal entry to Australian fisheries has been tightened and now is limited mainly to the purchase of existing licences. Work reported in the ESD-Fisheries Final Report indicates that further improvements in management arrangements are needed to achieve normal or above normal rates of return in Commonwealth and State managed fisheries. Improved management might be achieved by management of inputs such as boats, crews or outputs (e.g. by transferable quotas), or by pricing (licence fees, etc.) or by a combination of approaches.

World-wide, national fishing fleets have grown too large for existing stocks. The UN Food and Agriculture Organisation (FAO) estimates that $124 billion is spent world-wide each year in order to catch just $70 billion worth of

fish[1] Governments apparently make up most of the $54 billion difference with low-interest loans, access fees for foreign fishers, and direct subsidies for boats and operations. These government subsidies keep more people fishing than the oceans can support. It has been estimated that the maximum sustainable harvest can be achieved with only 20 per cent of current fishing capacity.

Rather than carrying the industry as a net budgetary burden, countries could collect rents for the use of fishing grounds as a part of a larger management strategy to limit access. The fiscal and economic benefits of improved management would be very substantial. Thus, for example, Weber estimates that governments could potentially save some $54 billion a year by eliminating subsidies, and earn another $25 billion in rents. If stocks were allowed to recover, FAO estimates that fishers could increase their annual catch by as much as 20 million tonnes, worth about $16 billion at today's average prices. Although these estimates do not take into account the broader adjustments that societies will have to undergo for the absorption of former fishers into other jobs it gives an idea of the magnitude of the problem.[2]

9.2 Financial subsidies

In principle, commercial use of a natural resource should yield a return to the community, but the ESD-Fisheries final report notes that the combination of past systems and social and political factors in many instances has made this difficult to achieve.

In recent years there has been a concerted effort by the federal and state governments to increase recovery of fishery management costs. In 1994 a taskforce review of cost recovery for Commonwealth fisheries resulted in a government policy to recover 100 per cent of recoverable costs in each fishery.[3] Also in 1994 the AFMA developed a cost allocation policy which allocates all overhead costs across fisheries and community service obligations. This policy was developed and agreed to by the AFMA, the fishing industry and the government. This policy was integrated with the new cost recovery policies and was used as a basis for preparation of the 1993–94 industry levies. In general, the charges being introduced meet the criteria for user charges set out in Chapter 1.

The 1994–95 Commonwealth Budget allocated the AFMA funding of $25.9 million which included $13.8 million recovered from the industry (53 per cent of the allocation). Total fishing industry allocation (includes R&D, other services) by the federal government was $39.0 million of which $17.752 million was recovered from the industry.[4]

As indicated above, public expenditure on fisheries management in Australia is spread among the States and the Commonwealth. Table 24, taken from the ESD-Fisheries final report, presents expenditure, but not revenue, estimates for 1990–91 (before the AFMA was established) indicating an average expenditure of 10 per cent of the gross value of production (GVP).

1 Quantitative information cited Peter Weber, *Safeguarding Oceans*, State of the World 1994, Worldwatch Institute, Washington DC 1994,p.56.

2 If the transition is not addressed before the problem leads to serious fishing unsustainability the economic, fiscal, social costs could be much higher, as evidenced by the costs involved in the collapse of the Newfoundland (Canada) cod fishery.

3 See *Review of Cost Recovery for Commonwealth Fisheries*, March 1994 and AFMA Annual Report 1993–94, p.63.

4 Data on AFMA from AFMA/Industry funding arrangements, AFMA Fisheries Policy Paper No. 2, AFMA, November 1992 and AFMA Annual Reports and 1993–94 and Commonwealth 1994–95 Budget Paper No. 1, pp.3.163–4 and John Oliver, AFMA (pers. comm.).

Table 24 Expenditure on fisheries management and research: Australia 1990–91

	States							Commonwealth			Total
Category	**NSW**	**VIC**	**QLD**	**WA**	**SA**	**TAS**	**NT**	**AFS**	**Other**	**CSIRO**	**AUST**
Expenditure ($ million)											
– Management	10.0	10.6	11.7	7.7	4.6	1.6[a]	1.4[b]	18.3[c]	..	..	65.9
– Research	6.5	2.8	4.2	3.7	3.4	2.5	0.7	11.0	1.61	11.5	47.9
– Total	16.5	13.4	15.9	11.4	8.0	4.1	2.1	29.3	1.61	11.5	113.8
GVP ($ million)	82.6	67.4	167.1	365.6	93.7	114.0	7.4	238.8	..	..	1,136.6
Expenditure as per cent of GVP											
– Management	12.1	15.7	7.0	2.1	4.9	1.4	18.9	7.7	..	..	5.8
– Research	7.9	4.1	2.5	1.0	3.6	2.2	9.5	4.6	..	..	4.2
Total	**20.0**	**19.9**	**9.5**	**3.1**	**8.5**	**3.6**	**28.4**	**12.3**	**..**	**..**	**10.0**

Notes:
(a) Does not include surveillance and enforcement.
(b) Includes large recreational component.
(c) Total recoverable management costs of the Australian Fisheries Service (AFS) were $5.03 million and this represents 2.1 per cent of the GVP of Commonwealth fisheries. This figure also includes $1.5 million for fisheries adjustment and $4.0 million for foreign fishing supervision.

GVP = gross value of production.

Source:ESD-Fish,p.33:GVP values,ABARE 1991; other data supplied to ESD by Commonwealth and State fisheries management and research agencies.

The Industry Commission reported in 1992 that the States collected only a minor portion (20–35 per cent) of public fishing management costs.[1] It appears that State fisheries agencies in Australia still recover less than half of their costs from the industry but currently there is a concerted push towards higher levels of cost recovery. In Victoria in 1993–94 fees, etc., covered 45.7 per cent of fisheries expenditures compared with 38.9 per cent in 1992–93. In South Australia the fishing industry and government have agreed to phase in 100 per cent cost recovery over a ten year period; currently the government recovers about 50 per cent of costs.[2] More independent analytical work is required on the extent to which more revenues should and could be recovered from the fishing industry; for example analysis is required on competitiveness, sustainability, regional employment and "public goods" considerations.

In 1994 it is estimated from budget papers and departmental reports, that the combined federal and State fisheries agencies expended about $148 million on fisheries management and recovered about $65 million from the industry in licence, access fees, etc., leaving a net subsidy of about $83 million depending on what proportion of the net costs are allocated to "public goods" values.

9.3 Environmental subsidies

Besides affecting sustainability of fish stocks, fishing activities can affect the environment in several ways.

1 Industry Commission, *Cost Recovery for Managing Fisheries*, Report No. 17,1992.
2 State data from departmental Annual Reports.

Physical structure of the aquatic environment

Bottom trawling, shell fish harvesting and other fishing practices damage the aquatic environment thereby contributing to a reduction in future fish stocks and biodiversity. The ESD-Fisheries final report (p.78) reported that:

> "The effect on the marine ecosystem from habitat alteration is little understood and in Australia little is known of the effects of most fishing methods on the environment. There is little or no research on potential impacts on the fisheries except where economic loss to the fishery is apparent or when other 'uses' of the aquatic environment may be affected …
>
> There is also growing opinion that the overall physical impact of recreational fishing on the environment is becoming a matter of concern. As the pastime becomes more popular, factors such as anchor damage to the benthos, construction of marinas, the impact of four-wheel drive vehicles on sand dunes and the foreshore, the foraging for bait in the intertidal communities and the loss of fishing lines and lead sinkers (which both entangle and poison bird life) all contribute in some way to environmental damage."

Water quality

Trawling and shellfish dredging can cause water turbidity resulting in destruction of some aquatic life. Aquacultural activities, particularly where feeding is involved, may increase nutrients and biological oxygen demand resulting in eutrophication (excessive aquatic plant growth). Biocides, antifoulants and other chemicals may be introduced into the environment by aquaculture or other activities. For example, elevated tributyltin (antifouling paint) concentrations have been found in areas of high boating activity in New South Wales, at levels well above the toxicity threshold for some species.[1] Powered boating activities can also lead to elevated hydrocarbon levels.

By-catch impacts

The taking of non-target species, i.e. by-catch or incidental catch, affects a wide variety of aquatic species, including dolphins, seals, turtles, seabirds and non-target fish. An indirect effect is the loss of food for predators which can then affect population levels of target species. Thus biodiversity impacts of by-catch practices may be substantial.

In prawn fisheries, a significant feature of trawling is the high by-catch of 'trash' fish and other organisms. Typically, the ratio of by-catch to target species can be as high as 8 to 1 (ESD-Fisheries final report, p.80). Nearly all the by-catch fish are dead when discarded. In the past, by-catch has tended to be regarded as an incidental and inevitable cost of fishing but the biodiversity effects can range from regionally insignificant to globally significant.

Gill nets are used extensively in some Australian fisheries. These nets generally create major environmental damage with a high by-catch of non-target fish, marine mammals, sea birds, turtles and other marine organisms. Gill nets used in the southern shark fishery are bottom set nets that result in relatively little by-catch of non-target species. Driftnets of more than 2.5 kilometres in length are banned in Australian waters.

Commercial exploitation of the fish resource and gathering activities have the potential to threaten species with extinction if not properly managed. Thus, the ESD-Fisheries report indicates that in North America it has been

1 The problems associated with antifouling paints and how they might be resolved are addressed in *Maritime Accidents and Pollution: Impacts on the Marine Environment from Shipping Operations*, ANZECC paper for Public Comment,March 1995. This paper also addresses other aspects of marine pollution including ballast water, oil and chemical spills and debris.

estimated that some 5 per cent of the 151 fish species considered endangered or threatened towards extinction are affected by commercial harvesting. The report also draws attention to the existence of fourteen genetically distinct stocks of barramundi in Australia, and suggests that failure to preserve the genetic diversity of wild stocks will reduce the fitness of the resource.

There has also been a high incidental mortality of seabirds, with albatross being the main victims, using long lining. The birds swoop on the bait, are hooked and consequently drown. An estimate of the mortality of albatross in long lining activities world wide is about 44 000 annually and significant decreases in wandering albatross have resulted. In addition to the obvious effects on albatross populations, this mortality has a considerable economic effect, due to bait loss and therefore lower catch rates. The financial cost to the Japanese long line fleet operating in the southern bluefin tuna fishery alone is believed to exceed A$7 million annually. However, new fishing techniques have been shown to reduce albatross mortality by over 80 per cent and simultaneously increase the productivity of the fishery (ESD-Fisheries final report, p.81).

Debris

Debris from lost or discarded fishing gear can harm and kill wildlife, litter beaches and be hazardous to ships and divers.[1] Gear types involved may be gill nets, lost trawls, discarded fragments of net, or monofilament line fragments. The synthetic materials used in nets do not degrade for a very long time allowing the nets to continue to catch marine life. Other discarded materials from fishing vessels, such as plastic bags also contribute to the problem.

In Australia, it is estimated that as many as 2 per cent of the Tasmanian and Victorian populations of Australian fur seals have signs of entanglement in fishing nets. Many seals have been found with 'necklaces' of net. These fragments of net are known to be discarded from fishing vessels and may be either from trawl nets or shark gillnets.

Actions being taken to reduce fishing debris include discussions on the problem with fishers (foreign, domestic) in the AFZ, public and industry education and awareness programs, gear changes and disposal programs, and research.

Ballast water

Ballast water and other wastes from shipping, including fishing vessels, contribute to the world-wide problem of genetic pollution, that is, introduction of species into new habitats where they are not part of the established ecosystem. This leads, through out-competing of local species, to reductions in marine biodiversity. The problem is also associated with the increased incidence of red tides, and other algae blooms which affect shellfish populations.

Risks associated with foreign ballast water are recognised as a significant threat to Australia's marine ecosystems in the report on the Coastal Zone Inquiry of Resource Assessment Commissions (RAC).[2]

In a 1991 report Jones reported the discharge of ballast water in Australian ports was around 66 million tonnes per year of which an estimated 95 per cent came from overseas, mainly in bulk carriers. Australia introduced voluntary guidelines for ships discharging ballast water in February 1990.[3] The contribution of fishing

1 For more details on the sources, effects and actions on fishing debris see Jones, M.M., *Fishing Debris in the Australian Marine Environment*, Bureau of Resource Sciences, Canberra, 1994.

2 RAC, Coastal Zone Inquiry: *Final Report Overview*, p.9.

3 Jones, M.M., *Marine Organisms Transported in Ballast Water: A Review of the Australian Scientific Position*, Bureau of Rural Resources, Bulletin No. 11, Canberra, 1991.

Table 25 Summary of estimated additional costs over five years

Recommendation category	$ million (1991)
1. Ecosystem and resource management – includes coastal zone management; marine protected areas, aquatic monitoring, freshwater fisheries.	40
2. Administrative and institutional arrangements – enforcement and compliance of fishing controls.	20
3. Information systems and research – includes the data gathering and research component of all recommendations in the Final Report.	50
4. Jurisdictional arrangements	2
5. Education and training	15
6. Other – labour market adjustment	3
TOTAL	**130**

Source: ESD-Fish, p.159.

vessels to this discharge was not examined but is probably very small compared with other shipping.

A 1994 report for the Australian Quarantine and Inspection Service[1] (AQIS) estimated social costs of ballast discharge at about $40 million per year based on ballast water treatment costs of $0.25/tonne. The study stressed the uncertainties associated with this estimate; thus costs could vary from $0.06/tonne to $16/tonne depending on the treatment deemed necessary.

Estimates of environmental subsidies

The ESD-Fisheries Final Report estimated (Table 25) that an additional $130 million over five years (1992–1997) would be necessary to provide a more secure path to sustainable fisheries resource management. This estimate of approximately $150 million in 1994 dollars, or $30 million per year, provides some indication of the environmental subsidies to fishing operations, that is it indicates perhaps the minimum amount necessary to reduce externalities to "acceptable" levels. It does not, however, appear to comprehensively address the range of negative environmental externalities outlined above that are associated with extraction from public fisheries. As such it is probably a very low estimate of environmental subsidies (based on control costs) for this resource activity.

No other data appears to be available on environmental subsidies associated with extraction from publicly owned fisheries in Australia.

9.4 Summary

A summary of the financial and environmental subsidies assessed in this study for public fisheries are presented in Table 26.

1 *Bio-economic Risk Assessment of the Potential Introduction of Exotic Organisms through Ships' Ballast Water,* Report No. 6,Ballast Water Research Series, Australian Quarantine Inspection Service, Canberra, April 1994.

Table 26: Summary of financial and environmental subsidies,1994, public fisheries

Activity element	Financial subsidies ($ millions,1994)	Environmental subsidies ($ million,1994)	Subsidy removal instruments	Fiscal implications ($ millions,1994)
Access fees, licences, etc.[1]			Higher access fees, catch royalties.	Significant increase in revenues — mainly to the States.
Public agency costs[2]	85			
Environmental subsidies[3]		30	Environmental levies, regulation of access and fishing practices.	
TOTALS	**$85 million**	**$30 million**		**$115 million**

Notes

1,2 Data needs to be split-up into:

(i) access fees ("royalties") to the community-owned resource; and

(ii) public agency management costs.

Available data on expenditures and cost recovery suggest that:

(i) access fees in fisheries are low compared with the gross value of production — GVP; 10 per cent of GVP would raise about $130 million (though it is not suggested that this is the appropriate access fee); and

(ii) expenditure on management and research as a per cent of GVP average about 10 per cent; and

(iii) recovery of public agency costs is low (50 per cent or less).

A preliminary estimate, based mainly on a review of State budget papers, but also on latest departmental reports,is that about an additional $85 million might be recovered from the industry in access fees and payment for public agency costs.

Estimates of fisheries expenditures and cost recoveries,1994–95

(Budget Statements,etc. estimates were checked with latest available departmental annual reports and, where necessary, adjusted for other payments and receipts.)

	Estimated expenditure ($ million)	Cost recovery* ($ million)
Commonwealth Budget statements,1994–95,AFMA Annual Reports. (see footnote in text)	$39.0	**$17.8** 45.5%
New South Wales Budget estimates,1994–95	$20.4	**$6.1** 30%
Victoria Budget estimates,1994–95 Budget Paper No. 4	$20.0 (est. of fisheries share of fisheries, fauna and flora allocation)	**$10.0** 50%
Western Australia Program statements 1994–95 Volume 1. Budget Paper No. 3	$16.6	**$4.2** 25%
Queensland State Budget 1994–95 Budget Paper No. 3	$29.0 (est. of fisheries portion of natural resources management allocation)	$10.2 35%

South Australia	$12.0	**$6.0**
Estimates of receipts and payments		50%
Tasmania	$8.6	**$8.6**
The 1994–95 Tasmanian Budget		100%
Northern Territory	$2.6	**$0.1**
Department of Primary Industry and Fisheries,1993–94		(4%)
TOTALS	**$148.2**	**$63.0**

*Estimated from departmental/agency reports.

3. Additional fisheries management costs per year estimated by the ESD-Fisheries Final Report report as necessary for sustainable development over five years. This estimate does not,however, cover all environmental subsidies to fishing operations.

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