"Polluter Pays, Myths and Legends"

Abstract

There has been considerable interest in the *"Polluter Pays Principle"* as outlined in Principle 16 of Agenda 21. This paper looks at the relevance of this principle to chemical pollution in the Murray Darling Basin.

The Polluter Pays Principle implies that those who cause environmental damage by polluting should bear the costs of avoiding it or compensating for it. In 1991, the joint government and industry report on the Impact of Pesticides on the Riverine Environment identified the high potential for pesticide pollution in the Murray Darling basin and noted consistent contamination of inland waterways by the pesticides used in the cotton growing industry. The report stressed that there was little knowledge of the eventual fate of many of the agricultural chemicals in use today.[1] In 1995, the NSW Department of Land and Water Conservation identified atrazine as the most commonly detected pesticide in the valleys of the central and north-west regions of NSW[2]. Later in 1999, the Department of Land and Water Conservation's Water Quality Report identified endosulfan as the most commonly detected pesticide (53% of water samples) in the Murray-Darling Basin followed closely by other pesticides such as atrazine, chlorpyrifos, profenfos, diuron, fluometuron and simazine.[3]
This paper will focus on three priority contaminants, endosulfan, chlorpyrifos and atrazine. All have been recently reviewed by the National Registration Authority yet remain in use in Australian agriculture. The paper will look at their regulatory history, their impacts and their detection in environmental media including wildlife. It will then attempt to identify the "polluter" from a range of stakeholders and look at ways in which an identified polluter could or should "pay".

Polluter Pays Principle has been described as a rallying cry, a philosophy and a sales pitch rolled into one. The "polluter pays principle" implies that the industry or individuals adversely impacting on the environment pay the costs of reversing that damage. It is a market approach to environmental protection complementing and in some cases underpinning traditional government regulation. The costs of mitigation are internalised by the industry sector causing the damage, ultimately encouraging prevention through marketplace economics.

Some of the earliest policy statements on the Polluter Pays Principle can be found in the polluter pays laws introduced in Japan in the early 1970s. The Agricultural Land Soil Pollution Prevention Law and the Law Concerning Entrepreneurs Bearing of the Cost of the Public Pollution Control Works, enacted in 1970, were at the time, some of the most advanced provisions for ensuring a practical application of the polluter pays principle for land restoration.[4] However, the cleanup stipulated by the Agricultural Land Soil Pollution Prevention Law, applied only to agricultural land and varied widely in its application. The concept of 'not burdening the farmer' underpinned the legislation and meant that in reality, the clean-up was often financed from government and public funds.

[1] J.W..H Barrett, S.M. Peterson and G.E. Batley. *The Impact of Pesticides on the Riverine Environment with Specific Reference to Cotton Growing.* Report by Barrett, Purcell and Associates Pty Ltd (Narrabri) for the Cotton Research and Development Corporation and the Land and Water Resources Research and Development Corporation. December 1991
[2] B. Cooper. *Central and North West Regions Water Quality Program. 1994-95 Report on Pesticide Monitoring.* Department of Land and Water Conservation. Paramatta, June 1995.
[3] Department of Land and Water Conservation's 1998-99 Central and North west Region's Water Quality Program Reports on Pesticides and Nutrients art sites in Macquarie, Namoi, Gwyder, Darling and Border Rivers as reported in the Inland Rivers Network News, August 2000, Volume 5, Number 2 at 5
[4] Fumikazu YOSHIDA, "Accumulated Pollution and the Polluter Pays Principle" 1999, http://www.cc.hokudai.ac.jp/~j15275/ACU-P.html

A 1975 European Council recommendation on cost allocations and action by public authorities on environmental matters was another early policy based on a polluter pays principle.[5] Yet, probably one of the most well known application of the principle is found in the US Superfund program set up in 1980 to clean up toxic contaminated sites. The legislation known as the Comprehensive Environmental, Response, and Compensation Act (CERCLA) includes the "Superfund" trust, set up to finance the cleanup of orphaned polluted sites. Under the Superfund, the Environmental Protection Agency (EPA) is responsible for cleaning up contaminated sites using money from the Superfund trust fund and then attempting to recover the costs from businesses and individuals responsible for the contamination. To finance the fund, three taxes were imposed, targeting those industries with the greatest risk of pollution, e.g., the petroleum, gas and chemical industries.

In May 1992, Australian State and Commonwealth governments signed the Intergovernmental Agreement on the Environment (IGAE). Section 3.5.4 of the IGAE, committed governments to environmental protection based on the principles of environmentally sustainable development (ESD)[6] including the polluter pays principle, i.e. those who generated the pollution and waste should bear the cost of containment, avoidance, or abatement. Section 3.5.4 also stated that *"the users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes."*

By June 1992, more than 178 Governments at the United Nations Conference on Environment and Development (UNCED adopted the Rio Declaration on Environment and Development.
Principle 16 of the declaration stated that :

" National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment." [7]

So in practice, how has the principle been applied ? To explore this, this paper will look at three agricultural chemicals that have a history of environmental contamination.

ENDOSULFAN

The organochlorine insecticide, endosulfan ((6,7,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzodioxathiepin-3-oxide has been widely used in Australia for over 30 years.
It is used to control insects in cotton in the Murray Darling basin. Endosulfan and its metabolites have regularly been detected in groundwater, surface water, sediment and rain and snow samples. It is toxic to aquatic organisms at low concentrations and at short durations. Fish accumulate endosulfan directly from surrounding water, where it can persist for months (37.5 [pH7] - 187.3 days [pH5.5]).[8] Sampling of wild catfish in the Gwydir River NSW demonstrated a significant increase in endosulfan residues and its metabolites, endosulfan sulfate and isomers, in fish livers during summer (147.7 - 307.2 ug/kg).[9] As early

[5] "Cost allocation and action by public authorities on environmental matters." 75/436/EURATOM. ECSC,EEC of 3 March 1975, "Guide to the Approximation of European Union Environmental Legislation, Annex 2 , The environmental acquis in force 6 March 1998"
[6] The principles of Environmentally Sustainable Development include the Precautionary principle, the principle of Inter-Generational Equity and the conservation of biological diversity and ecological integrity.
[7] UN General Assembly, REPORT OF THE UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT (Rio de Janeiro, 3-14 June 1992) Annex I, RIO DECLARATION ON ENVIRONMENT AND DEVELOPMENT, A/CONF.151/26 (Vol. I), 12 August 1992,
[8] Handbook of Environmental Fate and Exposure Data for Organic Chemicals,Ed. P.H.Howard Lewis Pub. Michigan 1991
[9] Residues of Endosulfan in the livers of wild catfish from a cotton growing area. Barbara Nowak (unpublished thesis)Uni.of Sydney 1988

as 1968, researchers had established that if rain fell within 4 days of application of endosulfan, the runoff would have significant residue (mean of 16ug/l) [10]

In 1984, sampling by the NSW State Pollution Control Commission in response to a major fish kill, identified endosulfan residues in Gil Gil creek, north west of Moree at levels (0.9-1.5ug/ l^{-1}) well above the LC50 for trout (0.3ug/l^{-1}).[11] Follow up sampling of Boobera Lagoon in the MacIntyre Valley during 1983-84 confirmed the presence of endosulfan and a report on pesticide monitoring from the central and north west regions released in 1995, acknowledged that the *detection of high levels of endosulfan residues in the environment was a consequence of its use in agriculture.*[12] In the 1998-99 sampling in the Murray Darling Basin, endosulfan was detected in 53% of water samples with median levels ranging from 0.02ug/l to 0.04ug/l. [13]

Endosulfan is also highly persistent in soil with the half-life of its metabolites lasting up to 2 to 3 years. It can affect the permeability of root membranes, inhibiting and stunting new growth and is toxic to wide variety of microorganisms. Endosulfan's ability to volatilise is significant and it can be transported over long distances in air. [14]

Despite government claims[15] to the opposite, endosulfan is known to bioaccumulate and in 1996, 23 farms in New South Wales and Queensland were placed in quarantine after inspectors discovered endosulfan above the maximum residue limit in their beef cattle. The residues were probably the result of unintended drift from neighboring cotton fields, contaminating pastures. Some of the beef taken from affected properties in Queensland contained 0.36 mg/kg, almost twice the Australian maximum residue level (0.2mg/kg) and almost four times the international Codex level (0.1mg/kg). The Australian National Residue Survey started monitoring 1,400 cattle farms.

With the subsequent detection in 1996 of the insecticide Helix (chlorfluazuron) in newborn calves (two years after cattle had been fed cotton trash containing residues of the pesticide) the Australian cotton industry launched its "Good Neighbours" environmental stewardship program. After the suspension by several countries of beef imports from Australia, the NRA imposed some restrictions in an attempt to limit the environmental impacts of endosulfan. From July 1999, growers would be required to keep spray application records and limit applications to two per season for non-orchard crops. An earlier proposal to limit applications to "essential" uses was dropped.

The National Registration Authority for Agricultural and Veterinary Chemicals (NRA) assessed endosulfan under their Existing Chemical Review program. They commented that endosulfan's environmental impacts would justify its withdrawal and that some degree of impact was unavoidable. However despite this and the fact that an international assessment had acknowledged as early as 1985 that test animals exposed to endosulfan had demonstrated reproductive effects, mutagenicity and liver changes, [16] here in Australia endosulfan kept its registration.

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[10] State Pollution Control Commission, "The New South Wales Cotton Industry and the Environment", Aust 1990 at 38

[11] State Pollution Control Commission, "Priority Issues Involved in the Diffuse Pollution of Waterways Especially by Agricultural Chemicals" , Sydney, June 1985 at 5

[12] Water Resources " Central And North West Regions Water Quality Program, 1994/95 Report On Pesticide Monitoring" Land & Water Conservation , TS95.087, June 1995 at iv

[13] Department of Land and Water Conservation's 1998-99 Central and North west Region's Water Quality Program Reports on Pesticides and Nutrients art sites in Macquarie, Namoi, Gwyder, Darling and Border Rivers as reported in the Inland Rivers Network News, August 2000, Volume 5, Number 2 at 5

[14] Rome F.Quijano, MD, "Risk Assessment in a Third World Reality , An Endosulfan Case History, Int. J. Occup.Environmental Health, Vol6/No 4, Oct/Dec 2000 at 314-5

[15] Brief Overview Of Endosulfan Review, NRA ECRP Review of Endosulfan, August 1998 at 1

[16] UNEP/IRPTC Data Profile on Endosulfan 1985 Geneva.

The NRA moved instead to ban the use of ultra low volume (ULV) formulations of endosulfan. They noted that there was "clear evidence from the last season's use of the chemical that unpredictable instances of long distance drift deposits from ULV applications could cause residues in cattle." Under the new rules, the registration of ULV formulations of endosulfan was suspended with current stocks to be phased out during next season. These existing stocks could only be used with additional restrictions, i.e.,

- the protective downwind buffer zone is doubled from the current 1,500 metres to 3,000 metres
- the maximum allowed rotational speed of atomisers reduced from the current 4,000 rpm to 2,000 rpm.

The new rules apply to ULV endosulfan used on all crops, not just cotton. Endosulfan has already been banned or severely restricted in many countries including Great Britain, Canada, Denmark, Finland, Hungary, India, Israel, Philipines, Sweden, Thailand, Bulgaria. Identified as an endocrine disruptor, recognised as genotoxic[17] and linked with breast cancer [18], endosulfan is being targeted for global phaseout by pesticide reform groups worldwide and has been included in the joint initiative of United Nations Environment Program and the Global Environment Fund to target persistent, bioaccumulative and toxic substances.

CHLORPYRIFOS

Chlorpyrifos (0,0-diethyl O-(3,5,6-trichloro-2-pyridyl) phosphorothioate) has a similar history of environmental contamination. Used in crops across Australia as a broad spectrum insecticide, it is a common pollutant of the Murray-Darling Basin. Chlorpyrifos is an organophosphorus insecticide dating from the mid 1960s and is now the active ingredient in 164 products registered in Australia. NRA has estimated a current annual consumption of 1,000 tonnes.

The United States Environment Protection Agency (USEPA) recently entered an agreement with Dow Agro-Sciences to withdraw the domestic use of the pesticide in homes, hospitals and preschools as well as severely restricting the crops on which it may be used in the United States. Australia's National Registration Authority (NRA) has decided not to follow the US EPA example citing differences in risk assessment uncertainty/safety factors.

Chlorpyrifos as the name indicates is a chlorinated insecticide. There is insufficient data to fully assess its environmental fate.[19] However, its detection in soil, water and air should have alerted regulators to the significant risk of environmental pollution from its ongoing wide use. In 1992, a study of urban air in Coffs Harbour listed chlorpyrifos as the most commonly detected pesticide in urban air and at the highest levels.[20] Chlorpyrifos is very toxic to freshwater fish, aquatic invertebrates and estuarine and marine organisms as well as birds, [21] and had been implicated in fish and bird kills. In the 1998-99 sampling of the Macquarie, Namoi, Gwyder, Darling and Border Rivers, chlorpyrifos exceeded environmental guidelines and the first stages of the ecological risk assessment indicated a high environmental risk. [22] In 1990, opportunistic sampling found Chlorpyrifos in three eggs of the Little Terns (0.06-0.36ppm), in a

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[17] Yuquan Lu, Kanehisa Morimoto, Tatsuya Takeshita, Toru Takeuchi, and Takeshi Saito Genotoxic Effects of α-Endosulfan and ß-Endosulfan on Human HepG2 Cells", Environmental Health Perspectives Volume 108, Number 6, June 2000

[18] H.L.Bradlow, " Effects of Pesticides on the ratio of 16a/2-Hydoyesterone: a biological marker of breast cancer risk, Env. Health Perspective, 103, Oct 1995

[19] EPA Pesticide Fact Sheet, Chlorpyrifos 1984

[20] Beard J; Westley-Wise V; Sullivan G , "Exposure to pesticides in ambient air.", Aust Journal of Public Health 1995 Aug;19(4) at 357-62

[21] EPA Pesticide Fact Sheet, Chlorpyrifos 1984

[22] Department of Land and Water Conservation's 1998-99 Central and North west Region's Water Quality Program Reports on Pesticides and Nutrients art sites in Macquarie, Namoi, Gwyder, Darling and Border Rivers as reported in the Inland Rivers Network News, August 2000, Volume 5, Number 2 at 5

liver sample from Little Terns (0.02ppm) and in a Pelican egg (0.5ppm) from the Wallace Lake colony on the central coast of NSW. [23] This should have come as no surprise as Chlorpyrifos has a log Kow of 4.96 [24] meeting the criteria for bioaccumulation for a new POPs or persistent organic pollutants. Its residues (breakdown product, 0,0-diethyl 0-(3,6-dichloro-2-pyridyl) phosphothioate) had been detected in the kidney and fat from cattle that had been dipped only once in a 0.025% emulsion of chlorpyrifos for cattle tick.[25]

More recently, a study in regional Australia had shown chlorpyrifos was present in the meconium (first bowel discharge) of new-born babies. Nearly 60% of babies in a study had chlorpyrifos in their bodies at the time of birth.[26] The US EPA review of chlorpyrifos acknowledged that the insecticide and its breakdown products had also been found in the urine of 89% of children tested in one US study.[27] In fact, the chemical manufacturer's (Dow AgroSciences) own data showed that the breakdown products of chlorpyrifos (TCP-3,5,6-trichloro-2-pyridinol) had been detected in 100% of a sample of 416 children tested in the USA in 1998, aged from 0-6 years.[28]

The NRA finalised its review of chlorpyrifos in late 2000. It decided that based on the current uses of chlorpyrifos and with the removal of home garden products containing more than 50g/L chlorpyrifos, and restrictions on indoor spray treatments, that there should be no adverse effects on public health from the continued use of chlorpyrifos in Australia.

However, in their environmental assessment they noted that chlorpyrifos is a contaminant of surface waters reaching high levels on occasion and that it is a common contaminant of sewage in the Sydney region (most likely caused by the public's use of pet washes.) They acknowledged that chlorpyrifos has been detected in cotton areas and in the irrigation regions of southern NSW and that as a broad spectrum insecticide, it is highly toxic to a range of insects, including beneficial ones and is very highly toxic to aquatic arthropods and fish. The NRA reports several fish kills in association with chlorpyrifos in water reaching several hundred parts per billion (ppb). They also noted that chlorpyrifos may have been the cause of a major incident at an ibis rookery in the Macquarie Marshes in early 1995 in which large numbers of nestlings died, apparently from consumption of contaminated invertebrates brought back to the nest by parents. An explanation offered was the higher toxicity of the metabolite, chlorpyrifos oxon, which can reach significant levels in contaminated invertebrates. Chlorpyrifos oxon can remain undetected using standard analytical procedures because of its instability.

In response, the NRA identified the need to improve label warnings but decided that given the wide diversity in its use, it was impractical to devise training program that would suit all users of chlorpyrifos. [29]

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[23]. NSW Department of Agriculture, Pesticide Analysis No. CP90/633-635 , Re: Pelican Eggs, Little Tern - Wallace Lake Colony

[24] J.W..H Barrett, S.M. Peterson and G.E. Batley. *The Impact of Pesticides on the Riverine Environment with Specific Reference to Cotton Growing.* Report by Barrett, Purcell and Associates Pty Ltd (Narrabri) for the Cotton Research and Development Corporation and the Land and Water Resources Research and Development Corporation. December 1991 at 44,

[25] Centre for Human Aspects of Science and Technology, Pub 1., Chlorpyrifos

[26] Environmental pollutants in meconium in Townsville, Australia. Deuble L, Whitehall JF, Bolisetty S, Patole SK, Ostrea EM* and Whitehall, JS.Department of Neonatology, Kirwan Hospital for Women, Townsville. *Deparment of Pediatrics, Wayne State University, Michigan. 1999 (Unpublished)

[27] Comments of New York State Attorney general Elliott Spitzer. In re: United States Environmental Protection Agencies Preliminary Risk Assessment for Chlorpyrifos Reregistration Eligibility Decision, Docket Control Number 0PP – 34203, December 27, 1999, amended January 3, 2000

[28] HED DOC. NO. 014077, April 4, 2000, MEMORANDUM, SUBJECT: *CHLORPYRIFOS* - Re-evaluation Report of the FQPA Safety Factor, Brenda Tarplee, Executive Secretary, FQPA Safety Factor Committee Health Effects Division (7509C)

[29] The NRA Review of CHLORPYRIFOS, September 2000 Volume 1, NRA Review Series 00.5, National Registration Authority for Agricultural and Veterinary Chemicals, Canberra Australia

ATRAZINE

The final environmental pollutant the paper will review is Atrazine (6-chloro-N-ethyl-N-isopropyl-1, 3, 5-triazinediyl-2, 4-diamine). Developed in the late 1950s by Ciba-Geigy, it was first registered in Australia in 1960-61 for the control of annual weeds and seedling grasses in broadacre crops and along fence lines, and irrigation channels. In 1977, this was extended to include the control of weeds in pine plantations.

By the mid 1990s, atrazine was recognised as one of the most commonly detected pesticides in surface and groundwater around Australia (eg, central and north west Tasmania, South Australia). The s-triazine ring of atrazine is fairly resistant to degradation so this should not have come as a surprise. Particularly, as in 1971-2, the U.S. National Soils Monitoring Program had detected atrazine in 80% of samples (range:0.01-0.051ppm) [30] and the chemical had also been identified as the most frequently detected herbicide in the US National Surface Water Monitoring Program. Atrazine or its metabolite was also detected in 80% of samples in a Canadian study of agricultural watersheds, [31] as well as being measured in rain and fog in the United States. The manufacturer states that studies with laboratory animals have not shown Atrazine to be carcinogenic, teratogenic or mutagenic ,[32] however the USEPA considered Atrazine as a Possible Human Carcinogen (Group (C) : limited evidence of carcinogenicity in animals in the absence of human data) and it is listed as a "Known Endocrine Disruptor" in Illinois EPA Endocrine Disruptors Strategy (June 1997) [33] . Banned in Germany, Italy, Norway and Sweden due to its high mobility in soil and potential for water contamination, [34] atrazine was one of the first five pesticides selected for review by the National Registration Authority's Existing Chemicals Review Program.

The review acknowledged that contamination of surface waters and groundwater with atrazine and its metabolite, desethylatrazine was widespread across Australia.[35] The review accepted that the safety margins for aquatic organisms are, in some circumstances, quite narrow. They dismissed concerns regarding the endocrine and carcinogenic potential of atrazine, arguing that it was not a genotoxic carcinogen and that the early onset of mammary tumours in the Sprague Dawley rats was due to a strain-specific hormonal effect.[36]

However they concluded that
"Although precise mechanisms are not fully understood, it is evident that the endurance of atrazine in the environment, together with its limited attachment to soil, significant water solubility and widespread use, are disadvantageous from the environmental perspective as they lead to long-term, low level contamination of surface and groundwater."[37]

Following heavy lobbying by manufacturers, distributors and users and despite weed resistance in a number of states, atrazine was not withdrawn, in fact, a range of new registrations were permitted. Some new protocols were introduced to restrict mixing, loading or use within 20 metres of water, within 60 metres of a lake or dam and no use is allowed in channels or drains and in industrial or non-agricultural

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[30] Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Ed. P.H.Howard Lewis Pub. Michigan 1991
[31] Jeanette and Arthur Conacher, Herbicides in Agriculture, Minimum Tillage, Science and Society. GEOWEST Dept. of Geography, West Australian University, Sept 1986
[32] Manufacturer's Safety Data Sheet Database - Canadian Centre for Occupational Health and Safety CCINFO 1992
[33] Illinois Environmental Protection Agency Endocrine Disruptors Strategy June 1997, pub. National Institute of Health Sciences Homepage, Japan
[34] Products Banned, Severely Restricted Denied Reregistration Or Withdrawn in Sweden 1966-1990
[35] Review Summary on The NRA review of ATRAZINE, November 1997, Existing Chemicals Review Program National Registration Authority for Agricultural and Veterinary Chemicals, Canberra, Australia at 37.
[36] ibid
[37] NRA review of ATRAZINE, at 41

situations. The NRA set up a Task Force to monitor atrazine and the Forest Herbicide Research Management Group (FHRMG) were to report in early 1997.

WHO ARE THE POLLUTERS AND HOW COULD THEY PAY?

While regulatory authorities in Australia are often quick to assure community and non government organisations (NGOs) that pollution is not occurring, or if it is, it is only isolated incidents, it is obvious that at least in the case of these three registered and reviewed pesticides, widespread environmental contamination has occurred. In Australia, there is no nationally coordinated program for the environmental or biological monitoring of agricultural chemicals to gauge the extent of environmental contamination.

The 1997 Aquatech review[38] of environmental monitoring of agvet chemicals in Australia reported that :

- "*No current national environmental monitoring programs were identified",*
- *"No centralised data collection points were identified" and*
- *"there is no existing list of chemicals of environmental concern in Australia"*

A national environmental monitoring program would provide the information base on which to judge the frequency and severity of pollution and set the priorities for addressing it. While NGOs had lobbied hard for the inclusion of agricultural chemicals in the National Pollutant Inventory introduced in 1998, this was defeated and the subsequent commitment to an AGVET Usage Database has not been realised.

While acute pollution events may be detected and punished, it would be difficult to accept that all environmental contamination is caused by irresponsible or malicious use of pesticides. The NSW Pesticide Act only commenced on 1 July 2000 and since then four Penalty Notices have been issued under the new Act for matters that incur penalties of $400 to $800. Maximum penalties under the new Pesticides Act have risen to $250,000. The new Act also relies on the common law principle of vicarious liability. This means that in cases where the person applying the pesticide is an employee of another person, charges can be laid against the employer, as well as or instead of, the employee. A similar liability also applies to a person engaging a contractor where that person has control over the contractor. Company directors may also be personally liable for offences committed by the company. However, one defense against prosecution is due diligence in that a person may show that all reasonable precautions were taken when using the pesticide, and the offence occurred due to factors over which the person had no control. On-farm and residential exception also apply where the injury, damage or harm occurs only on the farm or residential premises where the pesticide was used, unless there was willful or negligent use of a pesticide in a way that significantly harms a protected animal species.

How the new Act will address the issue of ongoing diffuse contamination of the environment via for example, aerial application remains to be seen.

So how could the polluter(s) responsible for ongoing, diffuse pollution be identified ? The user of agvet chemicals claim that the pesticides they use, are registered by the National Registration Authority who are advised by the Department of Health, Environment Australia and the national occupational authorities. The pesticide's use is controlled by State based control of use legislation and is overseen by either

[38] Aquatech "Monitoring of the Environmental Effects of Agricultural & Veterinary Chemicals in Australia – Preliminary Investigations" Submitted to Environment Protection Group, June 1997.

agricultural departments or the State EPA. So unless the user both understands and then wantonly disregards the label warnings, he can not be the polluter ? Industry associations and governments are often quick to claim 'misuse' as the problem but this is just as often vigorously denied by the farming community and pest operators. As the NSW Pesticide Act acknowledges the inability to adequately forecast rain or control wind direction, this cannot be defined as 'misuse'.

The producer of the pesticide may argue that he cannot be the polluter as the chemicals are registered by the appropriate government agencies at the time of use. Even in the case of the organochlorine pesticides or persistent organic pollutants (POPs) where many manufacturers were fully aware of the persistence of their products and their resultant environmental contamination, there has been no requirement or liability for the clean up of POPs stockpiles or POPs contaminated sites. However, the national agricultural chemicals acts clearly state that in relation to any loss or injury from constituent or product, it is not a defense to claim that the NRA had registered the product or issued a permit or license. It is also highly unlikely that NRA could ever be identified as the polluter, as the legislative disclaimers[39] included throughout the national agricultural and veterinary chemicals legislation ensure that the staff and board of the NRA could never be found responsible for any loss or injury directly or indirectly suffered as a result of their registration of the pesticide.

So if the polluter can not be identified as the user, the regulator, either State or Federal, the manufacturer or producer, then there is only one stakeholder left, that is, the consumer. As we have so often been told, no-one would create, register and use the products if the consumer did not wish it. There are major flaws in this argument. Firstly, the consumer or the general community are rarely asked for their opinion and they are not provided with a range of information that allows them to make an informed choice. However, they may just respond with '*well, I'm not an expert and they wouldn't register it if its wasn't totally safe !'*

And even if the party responsible for widespread environmental contamination could be identified how does the polluter pay? Given the difficulties to restore a biological system once it is disrupted or remediate groundwater once it has been contaminated, the assessment of payment in the terms of the loss (loss of biodiversity, loss of habitat, loss of topsoil, etc) is difficult to make. The payment is, at the end of the day, probably a monetary one. Rarely can monetary compensation make up for biological loss or loss of a resource such as underground water. In reality, to some degree at least, the polluter can never pay the real cost of their pollution even when some restoration is possible. And the expression 'the polluter pays principle' is misleading because in the end, it is us the final consumer who must pay.

It has been suggested that this could be addressed by ensuring a potential polluter pays up front prior to the activity that may pollute. That way in order to remain competitive, they will make considerable efforts to minimise pollution, however this is unlikely to be a politically acceptable response. For many environmental and public NGOs , this dilemma can only be solved by the regulatory agencies taking another principle to heart, that of the Precautionary Principle. This would go some way to ensuring that in those cases where the evidence clearly indicates a real potential for environmental contamination such as in the case of endosulfan, atrazine and chlorpyrifos, the regulator would withdraw those products from the market. This may mean changes in agricultural practices and even increased production costs in the short term, but in the end it will still be the consumer who will pay. Hopefully, the price of our pollution will not be the wholesale irreversible contamination of the Australian environment.

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[39] For example, see Section 15 Crown not liable to prosecution, AGRICULTURAL AND VETERINARY CHEMICALS ACT 1994 , Section 38 Exemptions from liability for damages, AGRICULTURAL AND VETERINARY CHEMICAL PRODUCTS (COLLECTION OF LEVY) ACT 1994, Section 69H Exemptions from liability for damages, AGRICULTURAL AND VETERINARY CHEMICALS (ADMINISTRATION) ACT 1992