

ON-SITE WASTEWATER MANAGEMENT TECHNOLOGY IN NSW: REGULATOR AND COMMUNITY ATTITUDES AND PRACTICES

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Abstract

Two surveys were conducted in November 2000 with the aim of determining the attitudes and practices of regulators and the community in New South Wales towards various types of on-site wastewater management. The Council Survey was mailed to all 173 local councils in the state. The Community Survey targeted 160 recent home-builders in eight local government areas with a view to investigating their choice of on-site system. The Council Survey found that septic tank systems comprise 81% of all systems installed, AWTS 13%, composting toilets 0.8% and other systems 5.6%. Forty-seven of the 62 responding councils provide information to the public on septic tank systems, 40 on AWTS and 19 on composting toilets. Twenty-one councils consider both nutrient and hydraulic loadings when sizing an effluent disposal area, with inland councils being significantly less likely to take nutrients into account than councils on the coast. Fifty percent of respondents to the Community Survey chose a septic tank system, 40 % installed an AWTS and 10% opted for a waterless toilet or a worm-based wet composting unit. The most accessed information channels were, in order, local councils, plumbers, environmental consultants and builders. Main factors influencing system choice by householder were found to be, 'ease of operation', 'maintenance cost, 'avoid polluting waterways' and 'health considerations'.

Keywords

attitudes, community, composting toilet, council, on-site, wastewater, management, regulator.

1 Introduction

In recent decades there has been an accelerating trend towards innovation in on-site wastewater management in Australia. Factors driving the trend include: (a) increasing environmental concern in the community at large; leading to (b) politically driven regulatory responses; and (c) studies which have found deficiencies in traditional management practices.

The traditional approach consists of collecting all or part of the domestic aqueous waste stream in a tank or grease trap prior to disposal, usually by absorption trench. Almost all of the treatment that the wastewater receives occurs during downward passage through such the unsaturated soil as exists below the trench. In many instances absorption trench size has been prescribed by rule of thumb regardless of site conditions. While an improvement on earlier approaches like the open cesspit and the pit toilet, the traditional approach can be found wanting when assessed against the hierarchy of waste management options: "avoid, reduce, reuse, recycle, dispose".

The aerated wastewater treatment systems (AWTS) introduced to Australia in the 1980s offered an opportunity to shift up the hierarchy from the disposal to the reuse level. By treating their wastewater to secondary standard and then disinfecting it, AWTS owners could irrigate landscaped areas with what was once wastewater, creating a more efficient local water

cycle (Beavers *et al.*, 1999). Advocates of waterless toilets, which have made an appearance in Australia since the early nineties, suggest that there is no inherent reason to use water as a carrier for human excreta, particularly in areas of water scarcity (Del Porto & Steinfeld, 1999). They point out that, as an example of avoidance and reduction by source control, waterless toilets are at the top of the waste management hierarchy. On the other hand, because they do not conform to social norms regarding what is an appropriate method of dealing with human waste, waterless toilets face cultural obstacles when it comes to acceptance both by the general community and by regulators.

This paper describes the results of two surveys, the first to all councils in NSW and the second to 160 new homeowners. The surveys were designed to assess attitudes and practices on the part of council staff and new homeowners in relation to on-site wastewater management technology in the state of New South Wales.

2 Methods

The 'Council Survey' was mailed to all 173 local councils in NSW on 28th November 2000. The seventeen questions in the survey sought information from each council on: (a) the type and number of on-site systems in its area; (b) the degree to which it provides on-site system information to the public; (c) the methods used to determine the size of effluent disposal areas; (d) its views on and experience with composting toilets; and (e) its views on the relative merits of on-site and centralised approaches.

For the purpose of analysis, council areas were allocated to two groups of four geographical regions (Figure 1). The Coastal Group consists of the North Coast, Hunter/Central, Illawarra and Sydney Regions. The Inland Group contained the New England, Riverina, South-East and Western Regions.

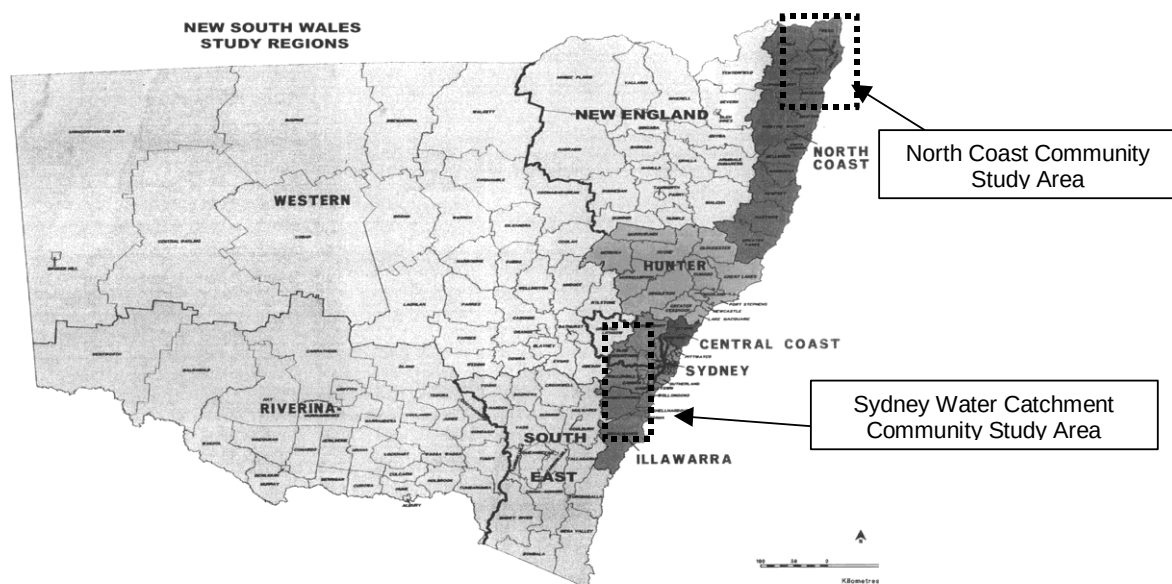


Figure 1: Map of NSW showing the Eight Regional Areas relating to the Council Survey and the Two Study Areas used in the Community Survey

The 'Community Survey' targeted 20 householders, in each of eight local government areas (LGAs), who had recently received council approval to build a home with an on-site wastewater treatment system. Four of the selected council areas, Lismore, Byron, Ballina and

Tweed are located on the North Coast close to Southern Cross University. The other four, Lithgow, Wingecarribee, Wollondilly and Shoalhaven are, at least partially, situated in the Sydney Water Supply Catchment where strong new environmental protection rules have recently been implemented (DUAP, 2000). Total population of each of the two LGA clusters is approximately 178,000. The method for selecting the 20 households varied between LGAs and depended on the council's interpretation of the new NSW Privacy and Personal Information Protection Act. Some councils supplied addresses without householders' names. Other councils were visited and householders' addresses were randomly chosen from public development approval registers or from council business papers. Thirteen questions in the survey sought information from the householder on: (a) the type of on-site wastewater management system chosen; (b) sources of information canvassed in the process of choosing an on-site system; and (c) factors affecting choice of system and types of system considered.

3 Results and Discussion

3.1 Council Survey

There were 74 responses to 173 council surveys, a response rate of 42%. Twelve respondents had no on-site systems in their LGA, leaving 62 responses with useable data. Response rate from the Inland Group was 35% while the Coastal Group response rate was 52%.

The overall proportion of unsewered homes in the 46 LGAs for which this data was available is 13.2%. Thirteen of these LGAs had an unsewered proportion of less than 10%, while the mean unsewered proportion for the 46 respondents was 28% (SD 22%), indicating that the more sparsely populated LGAs have a higher proportion of unsewered homes. Forty councils were able to supply data on the number of unsewered homes receiving reticulated water. Overall, 50% of unsewered homes in these LGAs are on a reticulated supply. Eleven councils reported a rate of over 90%. Ten reported a rate of between 10% and 20% with a mean of 50% (SD 37%) coinciding with the overall mean proportion.

Table 1 shows the numbers of each system type registered (at 30th June 2000) for the 53 councils that could supply this information. Of these 53 LGAs, 51 have septic systems, 47 have AWTS and 29 have composting toilets. Twenty-seven LGAs also contain other system types such as cesspits and pumpout systems. Septic tanks comprise 81% of all systems installed, AWTS, 13%, composting toilets 0.8% and other systems 5.6%. These figures are a reflection of the choice of system over a long period and, given the monopoly enjoyed by septic tanks over several decades, the results are not surprising. The survey contained a question seeking information on systems installed during the year ending 30th June 2000 with the aim of gauging the current popularity of each approach. Unfortunately few councils were able to provide this information.

There is considerable variation in the proportion of system types both within and between regions. Septic tanks account for more than 90% of all systems in five of the eight regions. In the areas where development has been most rapid in recent years the proportion is considerably lower, with 65% in Hunter/Central and only 59% in the Sydney Region. In these last mentioned regions AWTS accounted for 26% and 28% respectively of all systems. One LGA in the Sydney Region has 250 on-site systems, all of which are AWTS. Of the 641 composting toilets reported, 352 are in the North Coast Region, mostly in two LGAs.

Councils were asked to indicate the number of on-site systems approved in a sewerage area. Of the eight councils that replied to this question, all provided estimated figures only. There are an estimated 67 septic tanks, eight AWTS, one composting toilet and six other types of on-site systems reported as installed in sewerage areas. One council (Byron Shire) offers a rebate to householders installing a composting system in sewerage areas.

Table 1: Summary of Type and Number of On-Site Systems Grouped by Region

REGION	SEPTIC		AWTS		COMPOST		OTHER		
	Number per LGA	% total	Number per LGA	% total	Number per LGA	% total	Number per LGA	% total	Total
North Coast	2486	87.4	178	6.26	9	0.3	172	6.45	2845
	4365	84.7	323	6.27	229	4.5	234	4.54	5151
	190	76.0	60	24.0	0	0	0	0	250
	1100	97.9	24	2.14	0	0	0	0	1124
	3356	73.0	281	6.11	9	0.2	952	20.70	4598
	2621	87.9	147	4.93	105	3.5	109	3.66	2982
Subtotal	14118	83.3	1013	5.98	352	2.1	1467	8.65	16 950
Hunter/Central	1694	63.2	882	32.90	15	0.56	90	3.36	2681
	1436	73.9	426	21.94	12	0.62	68	3.50	1942
	300	74.6	100	24.88	2	0.50	0	0	402
	1100	61.1	700	38.89	0	0	0	0	1800
	1713	55.4	603	19.49	24	0.78	754	24.37	3094
	1150	70.1	458	27.93	26	1.59	6	0.37	1640
	922	79.8	98	8.48	15	1.30	120	10.39	1155
Subtotal	8315	65.4	3267	25.70	94	0.74	1038	8.16	12 714
Sydney	0	0.0	250	100	0	0	0	0	250
	1500	86.9	220	12.75	4	0.23	2	0.12	1726
	2232	51.8	1048	24.30	2	0.05	1030	23.89	4312
	1180	42.1	1540	55	0	0	80	2.86	2800
	2400	76.8	653	20.90	30	0.96	41	1.31	3124
	120	70.6	50	29.41	0	0	0	0	170
	1270	50.8	360	14.4	10	0.4	860	34.4	2500
	0	0	0	0	0	0	3	100	3
Subtotal	8702	58.5	4121	27.69	46	0.31	2016	13.54	14 885
Illawarra	290	63.7	134	29.45	8	1.76	23	5.05	455
	6200	91.5	550	8.11	30	0.44	0	0	6780
	183	81.0	40	17.70	0	0	3	1.33	226
	2621	93.1	189	6.71	5	0.18	1	0.04	2816
Subtotal	9294	90.4	913	8.88	43	0.42	27	0.27	10 277
New England	958	96.3	3	0.30	34	3.42	0	0	995
	551	97.4	15	2.65	0	0	0	0	566
	74	100.0	0	0	0	0	0	0	74
	900	99.3	6	0.66	0	0	0	0	906
	1776	96.5	65	3.53	0	0	0	0	1841
Subtotal	4259	97.2	89	2.03	34	0.78	0	0	4382
Riverina	892	98.8	6	0.66	2	0.22	3	0.33	903
	2100	91.3	170	7.39	2	0.09	28	1.22	2300
	1130	86.9	150	11.54	20	1.54	0	0	1300
	718	99.9	1	0.14	0	0	0	0	719
	775	97.9	17	2.15	0	0	0	0	792
	388	98.2	6	1.52	1	0.25	0	0	395
	546	92.9	16	2.72	2	0.34	24	4.08	588
	55	59.8	37	40.22	0	0	0	0	92
	700	99.6	3	0.43	0	0	0	0	703
	18	78.3	5	21.74	0	0	0	0	23
Subtotal	7322	93.7	411	5.26	27	0.35	55	0.70	7815
South-East	2500	98.7	25	0.99	2	0.08	5	0.20	2532
	1700	99.4	0	0	10	0.58	0	0	1710
	20	76.9	6	23.08	0	0	0	0	26
	2700	90.0	300	10	1	0.03	0	0	3001
	150	100.0	0	0	0	0	0	0	150
	4053	89.5	431	9.52	25	0.55	20	0.44	4529
Subtotal	11 123	93.1	762				25	0.21	11 948
Western	682	92.2	33	4.46	6	0.81	19	2.57	740
	900	94.4	50	5.25	0	0	3	0.31	953
	750	93.3	40	4.98	0	0	14	1.74	804
	20	100.0	0	0	0	0	0	0	20
	94	100.0	0	0	0	0	0	0	94
	1200	99.0	6	0.50	0	0	6	0.50	1212
	449	86.0	72	13.79	1	0.19	0	0	522
Subtotal	4095	94.25	201	4.63	7	0.16	42	0.96	4345
TOTAL	67 228	80.69	10 777	12.93	641	0.77	4670	5.61	83 318

Fifty-eight councils replied to the question relating to the sizing of wastewater disposal areas. Councils were asked if they had a blanket requirement for a minimum area, or whether the area was sized on the basis of hydraulic load, nutrient load or a combination of these. Table 2

provides a summary of responses by region. Of the 21 councils which consider both nutrient and hydraulic loadings seven are from the Hunter/Central Region indicating that nutrients are considered to be a regional issue there. Three of the five Illawarra councils and four of the six North Coast councils consider both nutrient and hydraulic loadings when sizing disposal areas. Fifteen of the 28 councils in the Coastal grouping consider nutrients when determining disposal area size, while only six of the 36 Inland councils take nutrients into account.

Table 2: Requirements for Sizing an Effluent Disposal Area within Regions

Regional Grouping	Region	Minimum area (N=23)	Hydraulic load (N=21)	Hydraulic and Nutrient load (N=21)	
Coastal	North Coast (N=6)	2	2	4 (67%)	15/28 (54%)
	Hunter/Central (N=8)	4	2	7 (88%)	
	Sydney (N=8)	3	3	1 (13%)	
	Illawarra (N=5)	2	1	3 (60%)	
Inland	New England (N=5)	1	4	1 (20%)	6/36 (17%)
	Riverina (N=10)	4	4	2 (20%)	
	South-East (N=7)	1	3	2 (29%)	
	Western (N=12)	6	2	1 (8%)	

Respondents who replied that they have a minimum area requirement were asked to indicate the size of the specified disposal area. Answers to this question ranged from 20 to 1000 square metres. Respondents were also invited to name other requirements (in addition to the options given in the questionnaire) they may have for the sizing of effluent disposal areas. Ten councils indicated that they use Australian Standard 1547. Of these, four specified that they use AS 1547 (1994). This is despite the fact that AS/NZS 1547 (2000) had been out for several months at the time of the survey. Five councils named the NSW Guideline (DLG et al., 1998). Three councils reported that they require a geotechnical report and one council replied that it bases the effluent disposal area on the floor space of the house. Three councils indicated that they base the requirements on the soil type where the disposal area is to be located. Nearly all respondent councils use a number of different methods in order to formulate requirements for the sizing of an effluent disposal area.

Table 3: Number of Councils with printed information on system types (N=49)

Information on System Type	# Councils
Total of Septic systems	47
Total of AWTS	40
Total of Composting systems	19
Septic only	1
AWTS only	2
Composting only	1

Table 4: Number of Councils and system type(s) referred to in their OSMS (N=54)

System type(s)	# Councils
Septic	51
AWTS	50
Compost	41
Septic + AWTS	48
Septic + Compost	41
Septic + AWTS + Compost	50
AWTS + Compost	40
Does not refer to any system	1

Of the 49 councils who replied to the question on whether they provide on-site system information to the public, 47 replied in the affirmative. Table 3 shows that all 47 of these provide information on septic systems, 40 on AWTS and 19 on composting toilets. Some councils indicated that they also have information on other related matters such as pump-out systems, effluent disposal areas and site management.

Councils in NSW have been encouraged to prepare an On-site Sewage Management Strategy (OSMS) by the year 2000. Thirty-seven councils indicated that they had an adopted strategy, 17 had a draft strategy and four had neither. Fifty-one of the 54 councils with a draft or adopted strategy indicated that the strategy referred to septic systems, 50 referred to AWTS and 41 made reference to composting toilets (Table 4). Interestingly, one council has an OSMS that does not refer to any on-site management approach.

A total of 641 composting toilets was reported in 29 of the 53 LGAs which could provide information on system types. This constitutes 0.8% of all systems reported. Table 5 shows that this proportion varies from a low of 0.2% in the Western Region to 2.1% on the North Coast. Within regions there is considerable variation in the proportion of composting toilets. For example, in New England they were reported in only one of the five responding LGAs. On the other hand six of the seven responding councils in Hunter/Central reported a total of 94 composting toilets. Of interest is the fact that 334 of the 641 reported composting toilets exist within the boundaries of two adjacent North Coast LGAs, Lismore City and Byron Shire. Pollard *et al.* (1997) surveyed composting toilet owners in the Lismore area and suggest that the relative popularity of the technology there is a result of a combination of factors including: (i) the value systems of the home-builders; (ii) favourable attitudes on the part of relevant local government officers; (iii) availability of information; and (iv) performance based environmental regulations which encourage the use of water and nutrient efficient technologies.

Thirty-eight councils responded to the question on whether they would permit the use of composting toilets. All of these stated that they would allow composting toilets in rural areas, 34 (89%) in rural residential areas and 13 (34%) in urban areas. When asked what problems they had encountered with composting toilets, 15 of the 29 councils (52%) mentioned “greywater disposal”, 10 (35%) reported “no problems”, 8 (28%) reported “lack of maintenance”, 7 (24%) reported “lack of familiarity”, 5 (17%) mentioned “health issues” and 4 (14%) mentioned “management of finished compost”.

Councils were asked to indicate the level of agreement with the statement “as long as it meets the required environmental and health standards, a composting toilet is a good on-site treatment system”. A total of 57 councils responded to this question. Nearly three quarters (74%) of respondents agreed or strongly agreed with the statement, while 9% disagreed and 17% of councils were uncertain. None of the councils strongly disagreed.

3.2 Community Survey

Of the 160 questionnaires mailed out to new homeowners 50 (35%) useable replies were received. Thirty-one of these were from the North Coast Study Area and 19 from the Sydney Water Catchment Study Area. Table 6 shows that, at 50%, the septic tank based system was the most popular choice with AWTS second on 40%. The remaining 10% of respondents chose a composting toilet. Compared with the percentages in the Council Survey, which reflect historical rather than recent choice patterns, both of the new technologies, AWTS and composting toilets, are increasing their market share. Nevertheless the traditional septic tank / absorption trench combination is holding up well. In fact the absorption trench was the most common disposal method reported, with 19 of the 25 septic systems and one each of the AWTS and composting toilet systems using this method. Ten of the 22 AWTS owners chose surface irrigation, with only two using sub-surface irrigation. It is interesting that nine of 20 AWTS owners and four of the five composting toilet owners did not mention which effluent disposal method they used, even though this information was specifically requested. This possibly indicates that decisions regarding the disposal phase of effluent management are left to “the experts”.

Respondents to the Community Survey received information on on-site systems from a variety of sources with council being the most popular at 56% of respondents. Other sources were plumber (36%), environmental consultant/engineer (28%), builder (22%), friend (16%) and architect (12%). Thirty percent of respondents, including all of the composting toilet owners, used other sources such as books and the World Wide Web.

Table 5: Number of Composting Systems in each Council Area within Each Region

Regions	North Coast	Hunter/Central	Sydney	Illawarra	New England	Riverina	South-East	Western	Total
Council	9	15	0	8	34	2	2	6	
	229	12	4	30	0	2	10	0	
	0	2	2	0	0	20	0	0	
	0	0	0	5	0	0	1	0	
	9	24	30		0	0	0	0	
	105	26	0			1	25	0	
		15	10			2		1	
			0			0			
Total	352	94	46	43	34	27	36	7	641
Compost as % of all	2.1	0.7	0.3	0.4	0.8	0.4	0.3	0.2	0.8
LGA with / total LGAs	4/6	6/7	4/8	3/4	1/5	5/10	4/6	2/7	29/53

Table 6: On-Site System Type and Effluent Disposal Method for the 50 Useable Responses from the Community Survey

	Septic	AWTS N=20	Composting toilet		Total Number (% of total)
			Waterless	Dowmus	
Number (% of total)	25 (50%)	20 (40%)	2 (4%)	3 (6%)	50 (100%)
% in Council Survey	(81%)	(13%)	(0.8%)		
DISPOSAL METHOD					
Absorption trench	19	1	1		21 (38%)
Surface irrigation	0	10			10 (18%)
Sub-surface irrigation	2	0			2 (4%)
Sullage/greywater tank	3	1			4 (7%)
Evapotranspiration trench	2				2 (4%)
Pump-out	1	1			2 (4%)
Not mentioned	2	9	1	3	15 (27%)
Total	29	22	2	3	56*

* Total > 50 because some systems reported more than one disposal method

Householders were asked what factors most influenced them in their choice of system. In order of importance these were “ease of operation and maintenance”, “avoid polluting waterways”, “health considerations”, “maintenance costs” and “initial cost”. Of lesser importance to respondents were “impact on rental value”, “garden space availability” and “ease of resale”.

4 Conclusions

On the basis of the Council Survey, the dominant on-site wastewater management approach is the septic tank based system, representing approximately 81% of all on-site systems registered. AWTS accounted for 13% and composting toilets for 0.8% of the total number of systems. When sizing a wastewater disposal area, coastal councils are significantly more likely to consider both hydraulic and nutrients loads than inland councils.

While septic systems and AWTS occur in nearly all local government areas, 24 of the 62 responding councils reported no composting toilets. AWTS are particularly prominent in the Sydney and Hunter/Central Coast regions making up about a quarter of all systems installed in these regions.

Despite the relatively high level of support that AWTs appear to receive from regulators, only 40% of the 50 responding householders chose to install this device while 50% opted for septic systems. Most householders (94%) sought information before installing an on-site system. Of these 56% consulted their council, while 36% received information from a plumber. None of the five householders with composting toilets received information from these two sources but resorted to literature on sustainable living and the World Wide Web for information.

Twenty-nine councils reported composting toilets in their LGA with a total number of 641 units reported statewide. Although the majority (74%) of councils accept composting toilets, over half of the reported toilets (i.e. 334) occur in only two LGAs in the North Coast Region. Comparatively higher numbers of composting toilets were also reported from a few individual councils throughout the state. These councils could be targeted for further investigations that aim to determine cultural and regulatory factors affecting composting toilet uptake.

References

- AS 1547 1994 Disposal systems for effluent from domestic premises, Standards Australia.
- AS/NZS 1547 (2000) On-site domestic wastewater management, Standards Australia – Standards New Zealand.
- Beavers, P., Tully, I. Wooley, A. 1999 Performance Evaluation of On-site Aerated Wastewater Treatment Systems. In Patterson, R.A. (Ed.). *On-Site '99*. Proceedings of On-Site '99 Conference: Making On-site Wastewater Systems Work. University of New England, 13-15 July 1999.
- Del Porto, D. and Steinfeld, C. 1999 *The Composting Toilet System Book*. The Centre for Ecological Pollution Prevention. Concord, Massachusetts, USA.
- DLG (1998) *Environmental Health Protection Guidelines: On-site Sewage Management for Single Households*. February 1998. Department of Local Government, NSW Environment Protection Authority, NSW Department of Health, Department of Land and Water Conservation, Department of Urban Affairs and Planning.
- DUAP (2000) *Sydney and Regional Centres Drinking Water Catchments Regional Environmental Plan*. Discussion Paper. Department of Urban Affairs and Planning.
- Pollard, R., Kohlenberg, A. and Davison, L. 1997 Effectiveness and User Acceptance of Composting Toilet Technology in Lismore NSW. In *Environmental Technologies for Wastewater Management Conference* – Murdoch University, December.
- Schwizer, B. 2001 *On-site Wastewater Treatment Technologies in NSW: regulator and community attitudes and practices*, Honours Thesis, Southern Cross University, Lismore NSW.