NEW ZEALAND BIOSOLIDS; LOST OPPORTUNITY OR JUST LOST

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ABSTRACT

Of the thousands of tonnes of sludge produced annually in NZ wastewater treatment plants over 60% is disposed of in landfills or long term on-site storage, which is seen as a low cost, low risk solution by regulators and biosolids producers. This is a cost to the community, gives no environmental benefit and conflicts with government policy. Uncertainty still exists with regulator, iwi and communities regarding how much of any contaminant to allow on land, and many stakeholders feel their concerns are not adequately reflected in the current NZ Guidelines.

New information is now available to provide defensible limits for the contaminants of concern in biosolids, as well as new policy and methodology into stakeholder engagement. An update to the NZ Guidelines is timely and will give decision-makers and their communities confidence and a protocol to balance environmental, economic, social and cultural factors to increase biosolids use.

This paper provides a history of events related to biosolids regulatory control and its impact within the country. It includes an estimate of the amount and potential value of biosolids in New Zealand and provides a comparison with usage in other countries, thus indicating our ranking relative to our trading partners. This clearly illustrates why an update is an imperative.

KEYWORDS

NZ Biosolids, Biosolids guidelines, organic wastes, waste minimisation

1 INTRODUCTION

New Zealand has a long history of guidance covering sewage sludge and its derivative quality products, biosolids. Each new edition has been an improvement but, based on completed projects, none have achieved the desired effect of encouraging a majority of local authorities to adopt a consistent approach and maintain benefits for their communities.

Over recent years there has been slow uptake of beneficial use and over 60% of the nation's potential biosolids is currently disposed of in landfills or long term on-site storage, which is seen as a low cost, low risk solution by regulators and biosolids producers. This disposal option runs contrary to the thrust of current legislation and to international environmental policy and increased community awareness of, and support for waste minimisation (e.g. Zero Waste initiatives). Unlike many other waste streams, there are good prospects for alternative, beneficial end-use options for biosolids, but despite having science-based guidelines to facilitate beneficial reuse of biosolids through its application to land, progress has been slow towards achieving the NZ Waste Strategy target of improving the efficiency of resource use and diversion of biosolids from landfill. In part this is because there is insufficient understanding of the risks and no accepted protocol for gaining community acceptance and benefit to a practical proposition.

The NZ Guidelines are also due for technical review in 2013 as endorsed by the Ministry for the Environment (MfE) and the water industry. It is important that this review and an updated protocol occur.

2 HISTORY OF EVENTS

The first guide to the disposal of sewage sludge in New Zealand was a circular issued by the Department of Health in 1973, entitled *Disposal of Sewage Effluent and Sewage Sludge on Land*. In 1975 this circular was published as a guidelines document. In 1984 the Department issued a new memorandum, *Disposal of Sewage Sludge on Land*.

The Department continued to monitor the development of guidelines and regulations around the world, and in 1990 initiated further research leading to the 1992 Public Health Guidelines for the Safe Use of Sewage Effluent and Sewage Sludge on Land.

Up until this time the guidelines were focused primarily on protection of human health.

Guidelines for the Safe Application of Biosolids to Land in New Zealand were produced in June 2003 (NZ Guidelines). The aims of the NZ Guidelines were to:

- Safeguard the life-supporting capacity of soils;
- Promote the responsible use of biosolids;
- Protect public health and the environment;
- Identify the risks associated with biosolids use and promote best practice for minimising such risks;
- Encourage local authorities to adopt a consistent approach to regulating the application of biosolids to land;
- Create awareness within the community of the benefits and risks of biosolids use;
- Minimise the risk to the economy.

This was the first time that there was a national focus which included promotion of responsible resource recovery.

It was also noted that the intent of the MfE was to develop national environmental standards (NES) for the application of biosolids to land, under the Resource Management Act. National environmental standards are regulations that have legal standing above regional plans unless the regional plans set more stringent requirements.

The 2003 Guidelines contained requirements for 5 yearly reviews and more stringent standards applying after 31 December 2012. The transitional period – with higher limits for cadmium, copper, mercury, zinc and dieldrin – was proposed to give wastewater treatment plant operators time to set up and implement programmes for cleaner waste streams entering the plant, and to develop sludge treatment facilities. According to the limited information available about contaminant concentrations in New Zealand sewage sludge (Ogilvie 1998), few plants could comply with the more stringent contaminant limits for biosolids without a transitional period. The 5 yearly reviews have not occurred.

The NZ Guidelines also promoted a permitted activity rule for the highest stabilization and contaminant grade (Grade Aa) that would be included in all regional plans. Todate only a few of the 17 Regional Councils have included such a rule. Most Regional Councils classify biosolids applications as discretionary which means each proposal needs to be considered on its merits; an expensive and uncertain option.

In 2004 a Working Group comprising of industry representatives, with input from local and central government and scientific experts, considered the benefits and content of a National Environmental Standard (NES) and concluded that certainty and consistency was required to facilitate the beneficial use of biosolids. A Biosolids NES was proposed as a satisfactory way of providing this. Proposed content for a National Environmental Standard for Biosolids Application to Land was subsequently produced in 2005 for MfE consideration. Unfortunately over and since that period the MfE priorities changed and the NES was not advanced; it still sits on the shelf as a proposal. Few people are left within MfE who have any personal recollection of this.

The NZ Waste Minimisation Act was passed on 25 September 2008 with a purpose focused to:

- encourage waste minimization and decrease waste disposed;
- lessen environmental harm of waste;
- provide environmental, social and economic benefits to New Zealand.

Part of the responsibility of territorial authorities includes to review waste management and minimization plans by 2012. Biosolids should be part of the waste streams managed.

Also, over the last ten or so years there has been substantial growth in both national and international policy and trends towards resource recovery and beneficial use. Substantial scientific research has also been completed in New Zealand on the contaminants of concern and on stakeholder engagement methodology.

3 THE ANZBP

The Australia and New Zealand Biosolids Partnership (ANZBP) is a collective of utilities, consultants, academics and government bodies committed to the sustainable management of biosolids. It commenced in 2006 with an inaugural Advisory Board appointed in 2008. It has grown in membership on both sides of the Tasman. The objectives of the ANZBP include to support the Australian and New Zealand water industry on technical and regulatory components of biosolids management. Major research projects of the ANZBP include:

- A Review of Biosolids Guidelines in Australian and New Zealand.
- A Survey of Community Attitudes to the Use and Management of Biosolids.
- An investigation of Australian and New Zealand Biosolids Production and End Use.

The ANZBP recognizes the need to pursue greater involvement with NZ biosolids management bodies and intends to undertake this by assisting delivery of targeted projects relevant to the NZ water industry. Greater involvement with New Zealand researchers and practitioners will help the water industry on both sides of the Tasman.

Inconsistency in regulation can work against community acceptance of biosolids use. Inconsistency in regulation also causes confusion and increase costs for the industry. Different classifications, monitoring requirements and the like can make biosolids management difficult and more costly, particularly in border areas. Guidelines across Australia and New Zealand should therefore be consistent, be based on science and should support the sustainable use of biosolids.

4 CURRENT QUANTITIES/QUALITIES

4.1 DEFINITIONS

The definitions of ‘Biosolids’ and ‘Sludge’ are clearly set out in the NZ Guidelines and many other regulatory and guideline documents. However, the use of these terms is often loose and inaccurate both within the industry and in the wider community. The main issue is sludges being loosely (and wrongly) referred to as biosolids. The New Zealand definitions in the Biosolids Guidelines are:

Biosolid: “A sewage or sewage sludge derived from a sewage treatment plant that has been treated and/or stabilised to the extent that it is able to be safely and beneficially applied to land and does not include products derived from industrial wastewater treatment plants.” It is accepted that controlled industrial and commercial discharges into a network do not preclude production of biosolids.

Sewage sludge: "The unstabilised organic solid material settled out from domestic and industrial wastewater during the treatment process." The discussion on this definition makes it clear that untreated sludge is not biosolids.

A biosolids grading system has been developed in the NZ Guidelines made up of two parts; the first part is denoted capital 'A' or 'B' represents the stabilisation grade, the second part by lower case 'a' or 'b' represents the contaminant grade. The use of Upper and Lower case letters in terms of stabilisation and contaminant grades is the opposite to that used in Australia.

All guidelines in Australia, New Zealand and the USA have a similar structure in that they mandate contaminant standards, pathogen and vector attraction reduction standards, management standards and sampling and reporting requirements. The EU Sludge Directive does not have specific requirements for management practices and sampling and reporting requirements. The Australian and New Zealand guidelines were developed based on soil limits primarily aimed at protecting the quality of food products. This has resulted in lower allowable contaminant levels than the EU and USA regulations which were developed primarily to protect human health.

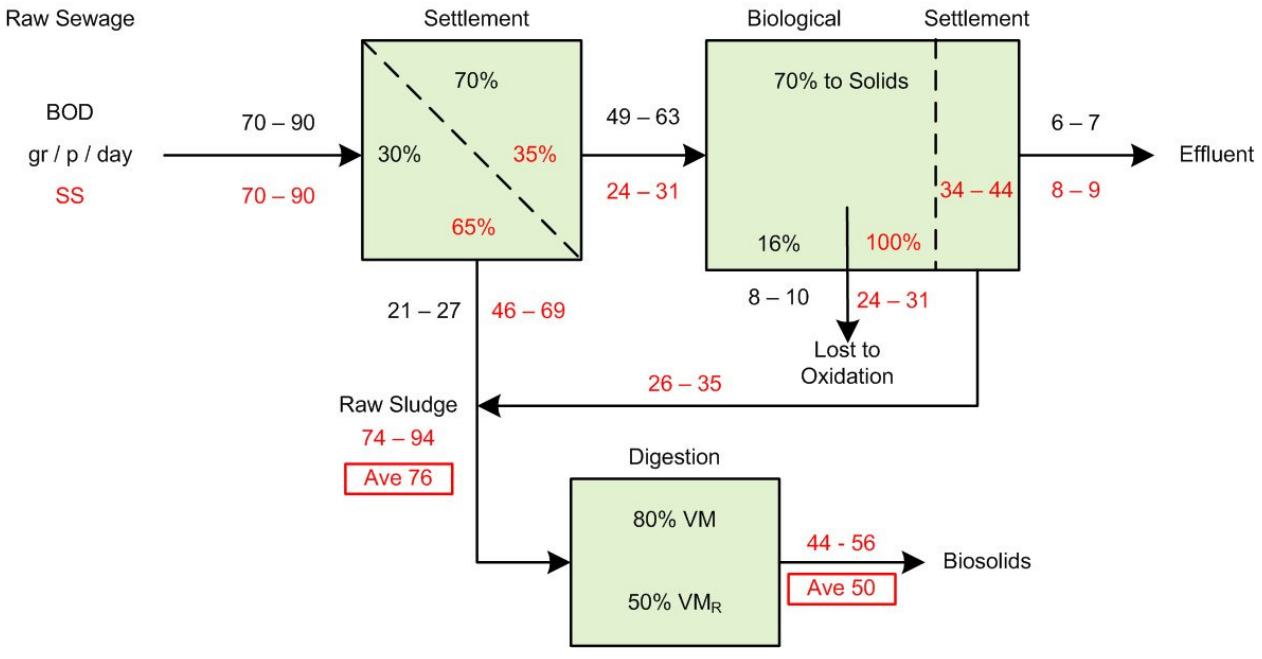
4.2 QUANTITIES

The MfE's State of the Environment Report 2007 estimated that 234,500 tonnes of sludge was produced per annum. 80,000 tonnes was disposed to landfill, 116,000 tonnes diverted to land reclamation at the Watercare Mangere Treatment Plant (Auckland), 600 tonnes to forest, 37,000 tonnes for beneficial reuse and around 900 tonnes diverted to ponds and lagoons. This now appears to be understated.

There is no accurate information on either the amount of biosolids produced annually in New Zealand, or the amount of biosolids beneficially re-used. There has not been a quality survey undertaken since 1998 (Ogilvie, 1998). The WINFO Information Database, administered by WaterNZ was designed to collate information on wastewater treatment in New Zealand; enabling analysis, research and reporting both within New Zealand and overseas. However, many TLA's do not enter information. WaterNZ is currently undertaking a survey to target individual biosolids producers so that a more accurate baseline of actual and potential biosolids produced in New Zealand can be established. This will allow provision of accurate baseline data and to monitor the end-use of these biosolids, over the long-term. It is important that all producers contribute accurate information to this database.

An estimate of biosolids production has been undertaken and is shown as a per capita contribution in Figure 1 below. This is based on a typical treatment plant mass flowsheet using raw sewage contributions based on New Zealand data from Hauber (1995).

Figure 1: Typical Biosolids Production



Based on the above unit biosolids production and rationalized with the latest WINFO returns including sewered populations, the current biosolids production and destination are estimated as:

- 320,000 tonnes/year current production at 20% dry solids content plus substantial backlog (sludge yet to be processed from previous years) stored on site;
- Over 30% is currently reused but not all to current NZ Guidelines standards; 20% to non-agricultural and 10% to agricultural land;
- Nearly 70% currently goes to licenced landfill or remains in on-site storage;
- If NZ met the Waste Strategy target of improving the efficiency of resource use then 200,000 tonnes/year plus backlog could be diverted to beneficial use. This is equivalent to at least; 1,540 tN/year plus 770 tP/year. At fertiliser equivalent values of $5.5/KgN, $4/KgP this is equivalent to $11.5M/year;
- The above gain is also equivalent to saving 33,000 t CO_2equiv/year.

Current wastewater treatment developments are aimed at increasing energy recovery and reducing sludge production within the treatment processes. However sludge and biosolids production will still occur for the foreseeable future.

5 COMPARISON OF TRENDS WITH OTHER COUNTRIES

Between 1990 – 2005, from 290 ECD countries, New Zealand had the highest (>800%) N fertiliser use increase and the 2nd highest (>100%) P fertiliser use increase.

Table 1 summarises the reported uses of biosolids in Australia, Europe and the USA (UN-HABITAT 2008) in relation to the WINFO returns estimate for New Zealand. It is clear that New Zealand has proportionately less biosolids resource use than the others.

Table 1: The Percentage Destination of Biosolids in Several Countries

Use	Australia	EU	USA	NZ
Agriculture	60	45	47	3
Composting	5	7	-	5
Stockpiles (in-pond and on-site)	15	-	-	6
Landfill	15	18	28	62
Reclamation	-	-	1	22
Forestry	-	-	1	2
Combustion	-	23	15	-
Other	5	7	8	-
Total	100	100	100	100

NZ is clearly falling behind in beneficial use of biosolids. Updating the NZ Guidelines and increasing certainty for stakeholders is imperative.

6 PROPOSED NZ GUIDELINES UPDATE

An application has been made to the MfE Waste Minimisation Fund to update the NZ Guidelines. The project purpose is to increase nationwide reuse and reduce landfilling of the valuable biosolids resource through updating the NZWWA/MfE guidelines for safe application to land, increasing knowledge, understanding and acceptance by iwi and the community and to provide user friendly protocols for the user.

The project will contribute to achieving increased reuse of waste by:

- Clarifying and streamlining regulatory and community engagement processes to facilitate greater acceptance of land application of biosolids;
- Removal of non-engineered on-site sludge 'landfills' and backlog of older material that can be beneficially used;
- Integrating new science information which will enable local government, businesses and communities to effectively assess and manage the risk of harm from land application of biosolids;
- Increasing recovery of resources from waste by reduced landfilling and savings in inorganic fertilisers imported and greenhouse gas production;
- Increasing productive soil organic carbon, which is currently depleting at a similar rate to the production of biosolids.

The project aims to remove roadblocks to land application of biosolids by updating the current NZ Guidelines e.g.

- Using the latest scientific knowledge to better understand key soil properties and environmental conditions that determine contaminant bioavailability and the fate and survival of microbial contaminants, and how these can be manipulated to beneficially apply biosolids to soils in a sustainable way that also protects environmental and human health.
- Updated public documentation of the scientific support to enable all stakeholders to understand and gain confidence in the limits proposed;
- Alignment of soil limits with current government methodology and approach e.g. NES for contaminants in soil;
- Incorporating knowledge gained from recent research projects developing stakeholder engagement methodologies that have proved successful in case-study communities in New Zealand;
- Empowering a collaborative Steering Group that comprise acknowledged leaders from relevant government agencies, science researchers, practitioners and producers;
- A Year 1 program focused on the current scientific and regulatory information. At the end of Year 1, an interim summary of updated information will be produced and made available on MfE, WaterNZ and NZLTC websites;
- A Year 2 program focused on identifying and addressing the key barriers to uptake and use of the current NZ Guidelines through consultation and confirming a user protocol. At the end of Year 2 a finalised revised NZ Guideline will be made publicly available;

- Linkage with Water NZ and NZLTC will facilitate extensive stakeholder communication, update the national WINFO data on biosolids production and act as a platform for progress reporting and feedback through the project. This will also allow confident monitoring of improved benefit over time;

- The improvement over the existing Guidelines will enable greater understanding and support by local communities and neighbours of areas where biosolids can be applied, as a foundation to allow regulators and producers to create sustainable business in their regions;

6.1 THE PROBLEM

The current problem includes:

- Reducing the national reliance on land filling of sludges and biosolids, thereby reducing greenhouse gas emission / carbon foot print as a part of NZ's global commitment, odours, leachate generation and enhances the value of remaining land fill air space;

- Lack of confidence in the earlier science and decision making embodied in the current guidelines;

- Lack of understanding and confidence of the implications and risks of biosolids application to land;

- Inconsistency of contaminant limits with current government policy and regulation eg NES for contaminants in soil.

6.2 THE OPPORTUNITY

The opportunity available includes:

- Increased beneficial use of biosolids on land, including turf culture and quarry / mine restoration plus agricultural and forestry land;

- Better use and understanding of the science, public health and risk issues associated with application on land;

- Better informed regulators, communities, iwi, producers and receivers of the biosolids;

- Better use of landfills and reduction of adverse effects;

- A defined user protocol to assess and manage risks;

- More cost efficient management of biosolids resulting in savings to local authorities and their communities.

7 CONCLUSIONS

The above overview clearly shows that there is a need to update the current NZ Biosolids Guidelines and produce a version that:

- Is based on current science related to New Zealand soils;

- Includes a defined user protocol to assess and manage risks;

- Creates the confidence that will increase community support, reduce costs and increase benefits from biosolids projects.

An updated National Guideline will aim to remove roadblocks to land application of biosolids by providing appropriate tools, knowledge and understanding to guide implementation of sustainable biosolids solutions that divert from landfill.

WaterNZ have partnered with the New Zealand Land Treatment Collective, research scientists and the waste water industry in a joint initiative to undertake a formal review of the 2003 Guidelines for the safe application of Biosolids to land in New Zealand. The proposal has been submitted to the Ministry for the Environment Waste Minimisation Fund with co-funding from industry (WaterCare and WaterNZ) and research partners (Biowastes Research Programme).

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