GREYWATER REUSE COMPLIANCE IN NEW ZEALAND AND OVERSEAS

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ABSTRACT

This paper discusses the regulatory compliance of greywater reuse and disposal in a New Zealand context. Comparisons with overseas regulations and compliance allow us to develop recommendations to improve compliance, resulting in a reduced risk to environmental and public health.

The "Greywater-wise" research program at ESR has been investigating the drivers for greywater use in an NZ context. Diversion of greywater for disposal purposes is common and often unregulated - compliance with regulatory requirements for greywater disposal is low.

Overseas, countries such as the USA, Canada and Australia have varying state/territory/regional requirements for greywater reuse. This is often appropriate as these are large, geographically variable countries, with defined internal divisions (e.g. state). New Zealand is a much smaller country and little is gained by all 16 regions having separate and conflicting regulations for greywater reuse.

We would recommend that in order to improve compliance, information regarding greywater reuse and disposal risks needs to be more readily accessible to the homeowners. There should also be an attempt to improve the consistency of information and requirements between different regulatory authorities.

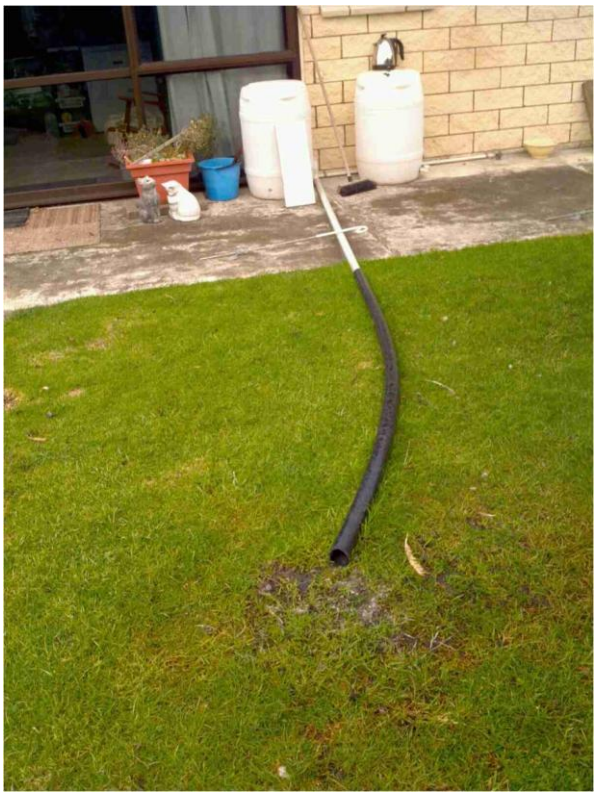
KEYWORDS

Greywater; Regulation; Compliance; Risk Assessment

1 INTRODUCTION

Greywater (from showers, baths, bathrooms sinks and laundry) can account for up to 75% of the wastewater from a domestic household (Eriksson et al., 2002), with the remaining blackwater stream originating from toilet waste. Wastewater from kitchen sinks and dishwashers may be included in either stream, depending on regionally varying recommendations and specifications. It is generally accepted that greywater containing kitchen waste requires some form of treatment, while kitchen waste must be excluded from greywater streams that are reused without treatment.

Although the nature and extent of greywater use in New Zealand is not well documented, there are anecdotal reports that a growing number of NZ households are using some form of unregulated and unreported greywater disposal system. These are typically basic, with no flow regulation, and include pipes from washing machines going through a window and directly onto a lawn area (personal communication, Lowe Environmental Impact).



Photograph 1. Unregulated greywater disposal from a washing machine outlet onto a lawned area.

This has implications for public health as well as environmental contamination concerns. Greywater has been reported to have a potentially high microbial load, including bacterial (Gross et al., 2007), protozoan (Birkes et al., 2004) and viral (O'Toole et al., 2012) as well as chemical contaminants originating from pharmaceuticals (Hernandez Leal et al., 2010) and household cleaning products (Harrow et al., 2011).

2 DRIVERS FOR GREYWATER REUSE

The availability of fresh water is likely to have the biggest impact on the drivers of greywater reuse, and is most likely to vary globally as fresh water is unevenly distributed worldwide.

2.1 AUSTRALIA

In Australia, on-going water shortage issues, susceptibility to drought, high water consumption and low population density result in the strict management of water resources to reduce the demand for high-quality potable water. Therefore, greywater reuse systems are common and may be practiced by 55% of households (Australian Government, National Water Commission, 2008).

2.2 USA AND CANADA

The USA and Canada have the highest annual water consumption per capita in the world; however greywater reuse is generally discouraged in all areas except those that experience critical water shortage.

2.3 UNITED KINGDOM

In the UK, the south east of England has lower levels of water availability than many Mediterranean countries (Environment Agency, 2011) and although greywater reuse is not routinely practiced in the UK, it is increasing in popularity.

2.4 NEW ZEALAND

Lowe Environmental Impact (Cass et al. 2012) reported a common reason for diverting greywater in water rich New Zealand is to reduce the pressure on infrastructure such as septic tanks. Alternative reasons were that there is insufficient infrastructure, or an unwillingness, to pipe greywater from a laundry at one side of the house to a septic tank at the other side of the house. Homeowners also reported issues with undersized septic tanks, particularly at holiday homes that have short-term periods of high occupancy.

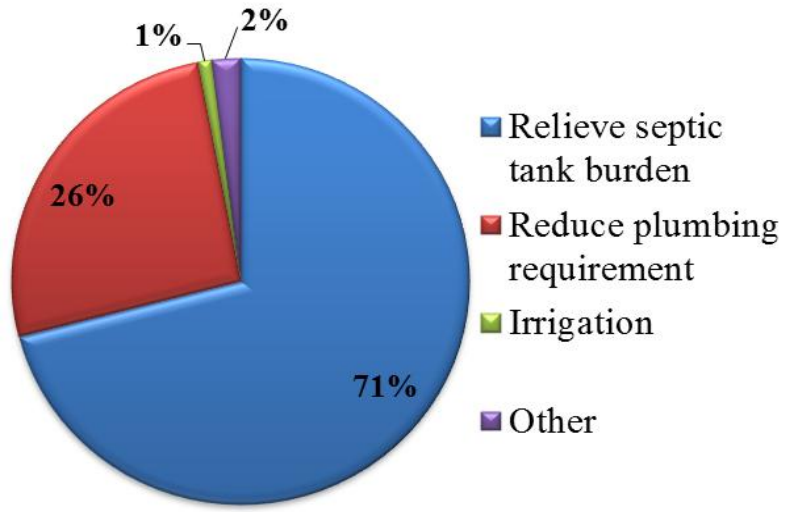


Figure 1. Reasons for greywater diversion, according to an LEI survey on a small community practicing extensive unregulated greywater diversion

A key message that came from the Cass et al., (2012) report was that water shortage was not found to be a significant driver for greywater reuse in New Zealand, except in drier regions, such as the Kapiti Coast, Central Otago, and Nelson. However, factors such as climate change with increasing droughts, population pressures, and increased use of water intensive appliances such as washing machines and dishwashers, could result in increased water shortages in the future. This may result in a greater demand for greywater reuse.

3 CURRENT OVERSEAS GUIDELINES AND LEGISLATION

3.1 AUSTRALIA

The Australian greywater reuse guidelines typically require a high level of treatment prior to reuse (Leonard et al 2008), often to the same level required for sewage effluent.

3.2 USA

There is no national policy regarding greywater use in the USA, and as of 2012, 30 states and one territory had individual, and varying, regulations (USEPA 2012) States that do not have specific regulations for greywater reuse may permit such an activity on a case-by-case basis (USEPA 2004).

3.3 EUROPEAN UNION

There is no uniform regulation regarding water reuse in the European Union, with the European Council Directive 91/271/EEC stating that 'treated wastewater shall be reused where appropriate', although there is no definition of 'where appropriate'. With respect to greywater recycling (treating greywater using membrane filtration and/or biological treatment) there is no European regulation, but certain countries, for example, Germany and the UK have adopted guidance relating to the European Bathing Water Directive (European Union 2006). In these cases, treated greywater is permitted for use in toilets and for laundry washing, but the guidance is based on best practice and voluntary compliance.

3.4 THE UNITED KINGDOM

The Environment Agency provides an information guide for domestic users of greywater systems in the UK (Environment Agency 2011). Water utilities provide advice on the use of domestic greywater systems, but most state that the adoption of greywater systems is slow due to the initial expense of installation and the problem of rapid deterioration in quality when greywater is stored. There is currently no regulatory standard for non-potable water quality. Guidelines for greywater quality are provided in BS 8525-1:2010. They are adapted from the water quality standards in the European Union Bathing Water Directive (European Union 2006). The guidelines suggest monitoring for *E. coli*, enterococci, *Legionella pneumophila* and total coliforms.

3.5 NEW ZEALAND

There are no current national greywater reuse guidelines in New Zealand; some information may be obtained from the relevant sections of the AS/NZS 1547:2012, TP58 (Auckland Regional Council 2004) and NZS 4404:2010, but none of these are specific to greywater reuse. Cass et al (2102) concluded that a lack of suitable guidance regarding the safe and appropriate discharge of greywater was a key hindrance to the diversion or re-use of greywater.

Greywater systems discharging into the environment must comply with the Resource Management Act 1991, Buildings Act 2004, Health Act 1956 and Local Government Act 2002. While most regional councils include greywater reuse as a permitted activity in their regional plans, only a small number of district and city plans specifically mention greywater reuse.

4 DISCUSSION

There are known difficulties associated with the regulation and control of the environmental and public health risks associated with greywater reuse. This is further complicated due to the variable nature of greywater, particularly as the composition of greywater will vary significantly from household to household, based on hygiene habits, consumer choices. Knowledge of the operating of the greywater system will also affect greywater quality, as informed homeowners are more likely to know when it is appropriate to divert greywater for reuse, or when it should be directed to a septic tank/on site treatment system/reticulated sewer system. Greywater quality may also vary hugely within households due to illness, diurnal routines and changes in household products, and occupancy of the household that may vary due to school holidays etc. Ultimately the successful use of a greywater diversion system is the responsibility of the individual homeowner, and they must inform themselves about the "do's and don'ts" of greywater management. Unfortunately, not all homeowners are knowledgeable about their greywater systems. In areas where greywater diversion/reuse is not a requirement

the homeowners that make the effort to install a greywater diversion system are likely to be interested in environmental and water conservation issues, and are therefore more likely to be well informed on safe greywater management practices. Some regions (such as Kapiti Coast) have included a water conservation requirement for new developments into their district plan, which may include a greywater diversion system (KCDC, 2009a). To inform homeowners about safe greywater reuse practices, the Kapiti Coast District Council have produced a document outlining the council requirements and suggestions for the homeowners (KCDC, 2009b). This is a clear and readily available document, that details region specific greywater diversion information. Such documents are not available for all areas, and the requirements for greywater reuse between different regions can be confusing and variable.

This is not unique to a New Zealand context. International legislation surrounding greywater reuse is extremely variable, and complex. Indeed, legislation within countries often varies between regions, states or areas. However, in other countries, such as the United States, Canada and Australia, regions or states are much larger than the regions affected in New Zealand. Often significant geographical and climatic differences require a completely different set of greywater reuse criteria between regions. Although there are geographical variations in New Zealand, this could be taken into account for in any national guideline document for safe greywater management practices.

Complexity and rigidity of greywater legislation is likely to impact on compliance by the homeowner. Exceptionally stringent criteria for greywater reuse, as in California, USA, often results in low compliance (0.01%; Sheikh, 2010). This is also the outcome of unclear or highly variable requirements for greywater reuse. Therefore there is a requirement for a greywater legislation to be clear, available and achievable by homeowners, to increase the rates of compliance, but not too lenient as to allow for any potential public health risk as a result of improper greywater reuse in a domestic setting.

Evidence indicates that a lack of understanding of the requirements for greywater use in New Zealand has contributed towards extensive unregulated and undocumented practices (Siggins et al 2013). The extent of this unregulated greywater reuse is largely undocumented and unknown. It would be useful for the full extent of greywater reuse in New Zealand to be understood and acknowledged, particularly with regard to unregulated greywater diversion in rural and environmentally sensitive areas. This knowledge would assist in assessing and improving compliance with region specific requirements for greywater reuse and/or disposal practices.

5 CONCLUSIONS

- Legislation surrounding greywater reuse criteria should be clear, and readily available to homeowners
- Excessively complex legislation discourages compliance
- Variable requirements within a relatively small geographical area adds to confusion and non-compliance

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