

GREYWATER REUSE PERCEPTIONS FROM STUDENTS AT THE UNIVERSITY OF READING

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STUDY AIM

- The study aim was to investigate whether, if a greywater recycling facilities were installed at the university, would students be prepared to use the recycled water.
- The objectives included:
 - 1) evaluation of the students' social perception towards water reuse and,
 - 2) the circumstances under which they would be prepared to use greywater;
 - 3) compare and contrast results from surveys undertaken in 2014 and 2015, from two separate cohorts of students.



INTRODUCTION

- Accessibility to clean drinking water in urban areas is decreasing.
- Average water usage per capita in the UK is around 150 litres.
- 33% of this water is greywater, that has the potential for reuse. (Lightly loaded)
- However, this greywater resource is not currently used to its full potential.
- The perceived health risks and other factors contribute to the low reuse of this resource.



UNIVERSITY OF READING: CLEAN AND GREEN CAMPAIGN

- The university is committed to reducing its environmental impacts, underlined by its pledge to reduce carbon emissions by 35% by 2015/ 16 and 45% by 2019/ 20, compared with a 2008/ 09 baseline.
- Water reduction is part of this campaign with the university already reducing water usage by 45% based on 2008/ 09 levels.
- The university currently is supplied with around 430,000m³ per year based on figures from June 2014 to 15 which includes halls of residence.
- If the university can reduce its need for water then it can also reduce its carbon footprint.



GREYWATER – PERCEPTIONS AND MISCONCEPTIONS

- Greywater reuse is historically met with distaste Po *et al*(2014).
- Communities have recognised the rationale for greywater reuse however, would feel uncomfortable if they would have to use the recourse themselves.
- What discourages people from greywater reuse?
- Could this be due to the water resource itself, misinformation or perceived misconceptions surrounding water reuse?
- In order to achieve realistic and fair perceptions, at least two elements must work together, that is;
 - firstly, the amelioration of perceived negative risks and barriers;
 - secondly, the promotion of the positive effects and benefits. (Hyde et al 2014.)

GREYWATER – PERCEPTIONS AND MISCONCEPTIONS

- A number of issues identified affecting greywater reuse include: (Kaercher *et al*/2003)
- Health risks associated with greywater reuse;
- Restricted uses for recycled greywater;
- Unavailable or inadequate information about greywater recycling;
- Unknown or unexplained benefits to the environment;
- The cost involved when recycling greywater



GREYWATER – PERCEPTIONS AND MISCONCEPTIONS

- Illembade *et al.*, [8] suggests four main reasons that people perceive greywater reuse to be risky.
- 1. The resource is an unnatural source of water.
- 2. It is sometimes perceived as harmful.
- 3. The decision to use greywater may be irreversible.
- 4. The safety and quality of greywater can be associated with a number of easily detectable factors including colour, smell and particulate matter which may not be within their control.



METHODS

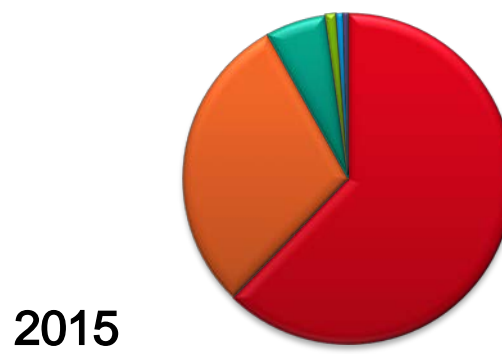
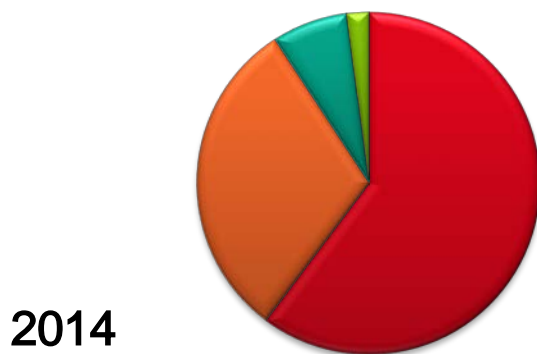
- Electronic questionnaires sent to students in halls of residence between March and May 2014 and 2015.
- Questions were selected to elicit a response to whether students knew about or considered the use of recycled water.
- The responses can help the university understand students' perceptions if it was decided that greywater systems would be installed at the university.
- Limited distribution in respect of age and social status means answers are limited to student perceptions and not of the general population.
- A comparison between the 2 cohorts of students can be drawn and give an indication of whether water reuse or perceptions of greywater are variable between two similar groups of individuals.
- No information about quality or the definition of greywater was given to participants prior to the questionnaire being answered.

RESULTS & DISCUSSION

- 2014- 135 responses
- 2015- 274 responses

	Male	Female
2014	47 (35%)	87 (65%)
2015	82 (30%)	192 (70%)

- In both years 2/3 were females
- Reason unknown could be a higher female population in halls
- Age range is expected, predominant age for the residence in halls are between 18-20.
- Results should be taken as a sub section of societal views



- 16-20 years old
- 21-25 years old
- 26-30 years old
- 31-35 years old
- 36-40 years old
- Above 40 years old

RESULTS & DISCUSSION

Which of the following best describes your opinion of recycled or reused water?	2014	2015
I am in support of it for all uses	20	33
I am in support of it for most uses	26	43
I am in support of it for non-drinking uses only	50	80
I am in support of it if it is safe to use	48	93
I don't support it because of the health risks	2	8
I am not aware that there are any health risks in using recycled water, but I do not like to take chances	3	7
I don't support it	2	2

- Highest proportion of participants, in both years, would use recycled water if it were safe or for non drinking purposes.
- Possible low understanding of what greywater is and the recycling processes from participants that support reuse for all uses.
- No support for the reuse of water was low. Reasons for this were not given but it could be due to religion, health and safety concerns and economics of the technology.

RESULTS & DISCUSSION

Which of the following will encourage you to use recycled water?	2014	2015
If it is colourless	40 (17)	187 (23)
If it is odourless	52 (22)	194 (24)
Easy to access e.g. simply turning on the tap	62 (26)	204 (25)
Being sustainable, helping to conserve the environment	60 (25)	167 (20)
Positive image with peers and friends	12 (5)	56 (7)
Other	10 (4)	15 (2)
Total Selections	236	823

- Participants from 2015 selected attributes that encourages them to reuse recycled water that those in 2014.
- Both years respondents showed a strong feeling towards the water being colourless and odourless as a factor to encourage reuse.
- Easy access to the resource seems key to these participants for encouraging use. Likely through integrated irrigation or toilet systems.
- Only small number are encourage by peer pressure. This is a surprise as peer encouragement for activities such as recycling goods has usually provided a positive result.

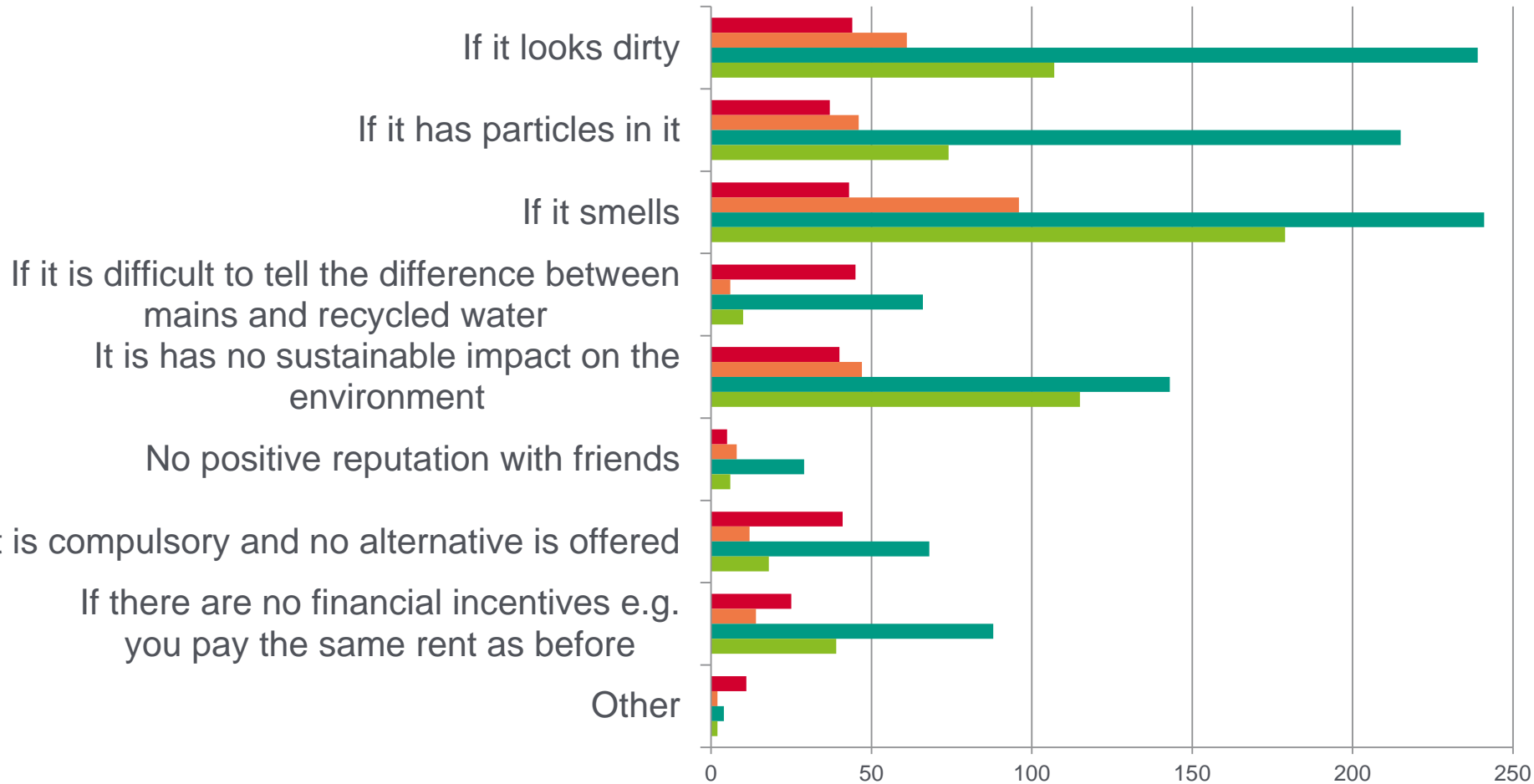
RESULTS & DISCUSSION

■ For all uses 2014

■ For all uses 2015

■ For toilet flushing only 2014

■ For toilet flushing only 2015



- "Actions and properties that would discourage greywater reuse?"

RESULTS & DISCUSSION

- Financial incentives may be important as around 1/3 of students in both 2014 and 2015 would have been discouraged from using recycled greywater if there was no financial incentive.
- Peer interactions was indicated as not being a discouraging factor for the use of greywater.
- The results might suggest that if the recycled water met the criteria that:
 - It does not smell,
 - Look dirty
 - or contain a large amount of particulate matter
- Toilet flushing would be encouraged by participants from both 2014 and 2015. The results support other research that suggest the aesthetics and smell of the recycled water are extremely important.
- Results presented showed the varying importance of the aesthetics of reuse water. For instance students of 2014 indicated that it was more important for the water to look clean and did not smell for toilet flushing rather than all other uses. The students in 2015 had the opposite result.

OBSERVATIONS

- Misconceptions about the smell and colour of recycled greywater could often be addressed in practical ways. It may be possible to provide physical proof to users by using a real time monitoring system.
- Other factors that can hinder how greywater reuse is perceived, relate to the recycling systems themselves. These are; the perceived cost of the system; operation regimes and environmental awareness (Domenech and Sauri, 2010). These factors can be overcome with further water quality data and research into greywater recycling systems and estimated maintenance costings.

CONCLUSIONS

OBJECTIVES 1 ,2 AND 3

- For both year's surveyed, it was noted that the survey participants' age was selective and between the ages of 16-35 with high proportions of participants being at the lower end of this scale.
- Reviewing all of the respondents, it was seen that, 95% fell into four groups; (1) those in support of making domestic greywater available for all uses; (2) those in support of domestic greywater being made available for most uses; (3) those in support of domestic greywater being made available for non-drinking uses only and (4) those in support of it being made available if it is safe to use.
- Most students from both years, suggested they would be happy to use the water for any use, if safe. Toilet flushing was also recommended.
- Both sets of participants from 2014 and 2015 showed a distinct lack of distaste towards the use of recycled greywater.
- This could be interpreted as a reflection on resource and environmental awareness as well as changing attitudes towards water conservation.

CONCLUSIONS

- These observations would need verification if they were to be suggested as representative of the perception of the general population.
- This would help determine whether or not the lack of preconceived dislike towards greywater or recycled water might be demonstrable in day to day domestic water consumption.
- Further work is needed to understand the views of the general population and if greywater reuse could become normal in a domestic setting.
- The public needs increased education into the benefits of water reuse at the same time that perceived fears of water reuse are allayed.



CONCLUSIONS

- This project indicates that a large proportion of our survey population would not be discouraged from using greywater at the university. These results will advise those managing the universities water resources suggesting that students are prepared to adopt water reuse technology and give them confidence that installations for have a high student approval rating.
- Greywater recycling projects will have financial benefits for the university by reducing its water and sewerage bills as well as helping the university meet self regulated climate change targets.

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