

Prioritising community behaviours to improve the quality of  
urban rivers within Christchurch, New Zealand

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Photo credit: West Spreydon School

## Introduction

There is growing local and international interest in protecting and restoring freshwater environments, rivers, streams, wetlands and other freshwater bodies. Freshwater is a significant issue in landscapes under pressure. Aside from ecological benefits, freshwater ecosystems are important for the mental and physical health and wellbeing of communities. The management of natural resources now focus on a more holistic form of environmental management that reflects community values (Rolsten et al. 2017).

In New Zealand, the Department of Conservation (DOC) has a set of “stretch goals,” one of which is for freshwater. It aims to have 50 freshwater ecosystems restored from the mountains to the sea by 2025 <http://www.doc.govt.nz/about-us/our-role/vision-purpose-and-outcomes/>. DOC’s stretch goals suggest that conservation and identity are central to people and to New Zealanders’ wellbeing. It has a Healthy Nature Healthy People strategy, aligning with the Mental Health Foundation for health and wellbeing, linking people and nature. One aim is connecting people with the social, cultural, economic and environmental values of conservation and helping identify the essential relevance of nature to people’s lives <http://www.doc.govt.nz/Documents/about-doc/four-year-plan/doc-four-year-plan-2017.pdf> p.14-15.

Corner *et al.* (2014) suggest in their book *Behaviour Change for Sustainability* that people perceive environmental issues such as freshwater pollution as too big and complex for any individual action to make a significant difference. There is evidence to the contrary that collectively, individual behavioural changes can have a positive environmental impact (McKenzie-Mohr, 2011).

## Research overview

This study uses the Ōpāwaho Heathcote River, one of the three main river networks in Christchurch, New Zealand, to explore McKenzie-Mohr’s hypothesis. Study methods are based on the Community-Based Social Marketing (CBSM) behaviour change frame-work described by McKenzie-Mohr (2011) *Fostering Sustainable Behaviour: An Introduction to Community Based Social Marketing*. Behaviours are assessed for their potential to positively contribute to freshwater conservation, the likelihood of their adoption by communities in Christchurch, and existing participation levels within these Christchurch communities (Kneebone *et al.* 2017). There is an analysis of pro-environmental behaviours, with the aim of identifying which behaviour is the most environmentally beneficial while still being easy to adopt by communities. The report concludes with implications for practitioners.

## Community involvement in urban waterways

People can contribute to freshwater conservation in several ways. These include active participation in which individuals join community groups, river restoration days and community river events. Another is by changing their own behaviours to minimise their negative impact.

The benefits of volunteering and active participation in conservation activities reach far beyond river restoration. Miles *et al.* (1998) comment on the mental health benefits that come with regular voluntary work including personal growth, sense of accomplishment, sense of meaning, increased life satisfaction and ultimately the increase of one's life functioning (Sheila *et al.* 2016). Establishing this connection with nature is particularly important in urban environments where many people have minimal exposure to nature.

Asah and Blahna (2012) suggest that an added benefit of community participation in conservation activities is that it can promote pro-environmental behaviours in one's personal life. Their cross-case analysis revealed that people with a higher perceived connection to their natural environment were more likely to adopt conservation behaviours at home. Restoration of natural areas is beneficial not only to the plant and animal species whose habitat is revived, but also to the individual volunteers who take part in the restoration process.

A range of studies analysed by Evans & Birchenough (2000) show that people are willing to have more involvement in urban water conservation activities, but they want their actions to be meaningful and apparent. Small behavioural changes may not necessarily bring about immediate change, which makes the actions feel unimportant and not worthwhile. They note the importance of regularly communicating to communities about how their actions are benefiting their local environment.

Guiney & Oberhouser (2010) indicate that conservation volunteers' motivation stems from a psychological connection to nature that began in childhood. The desire to teach others and learn more about conservation were key motivators in the decision to take part in voluntary conservation programmes. Other benefits include stress reduction, relaxation, exposure to nature and exercise. The study supports research from Evans & Birchenough (2000) regarding the importance of volunteer programmes communicating the environmental benefits of the volunteers' work to increase the motivations of the volunteer.

Other ways that communities can contribute to urban conservation is through changes in their every-day behaviours (Miles *et al.* 1998). Although volunteering is a highly effective means of connecting individuals to their environment, small behavioural changes can help an individual be more aware and conscious of their impacts, which can also have positive environmental benefits.

In 2010 Environment Canterbury (ECan) ran a programme called Improving Urban Waterway Health with the goal of improving the health of urban rivers through community engagement and education. Participants of a focus group were asked a series of questions to reveal their knowledge and opinions on the health of the local Okeover Stream. Results revealed that many of the participants were unaware of how their everyday behaviour impacted urban rivers and were oblivious to the connection between stormwater runoff and the Okeover Stream. Comments from participants included “I didn’t know water from my driveway would end up in the stream” and “I assumed when water went down the drain that it was going off to something more substantial than Okeover Stream” (ECan, 2010).

The Christchurch City Council (CCC) commissioned a detailed Christchurch Waterway Survey between mid-November to mid-December 2017. The survey aimed to gain a general understanding of Christchurch residents’ attitudes to waterways, how they value them, assess their quality, treat them and what actions they are prepared to take to improve them:

<https://www.ccc.govt.nz/assets/Documents/Environment/Water/2018-Christchurch-Waterways-Survey-Final-report.pdf>

One finding is that “86% of people felt positive about taking some actions that will make rivers and streams healthier. The survey results also showed that 34% and 37% of people didn’t know or got the answer wrong when asked where water that comes from their streets, property and roads ends up, demonstrating a lack of understanding of storm water and where it goes” (CCC, 2018).

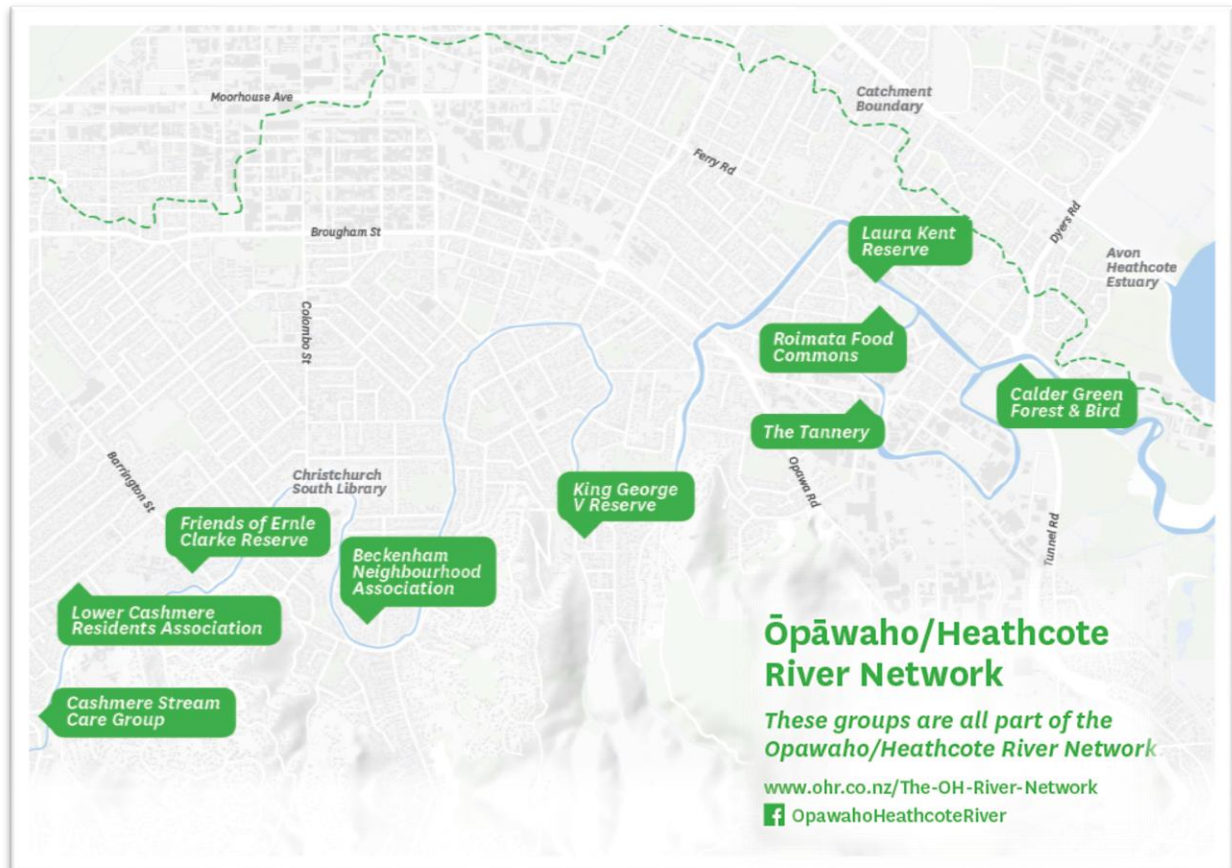
### **Study context: Christchurch waterways**

Christchurch city is built on an extensive network of rivers, streams and stormwater drains. The waterways are an integral part of the city’s ecology, heritage, culture, amenity and offer places for people to walk, cycle, picnic, relax and contemplate. New Zealanders feel a deep connection their local rivers; the 2017/18 Christchurch City Council survey found that 73% of respondents valued rivers as *taonga*, something to be treasured. The same survey also found that 33% of the respondents chose the Ōpāwaho Heathcote River as the river they are most affiliated with.

This report uses the Ōpāwaho Heathcote River as a case-study, with survey data collected from several locations near this river. The river is meandering with tributaries consisting of spring-fed streams, ephemeral streams, hillside waterways and human-made drains. The main tributary entering the river is the Cashmere Stream which has a dedicated group of volunteers, the Cashmere Stream Group <https://www.facebook.com/CashmereStreamCareGroup/>.

There are numerous community groups and organisations that are actively working towards improving the condition of the Ōpāwaho Heathcote River. A proactive group is the Ōpāwaho Heathcote River Network <http://www.ohr.co.nz/> currently representing nine community or conservation groups <http://www.ohr.co.nz/river-network-xidc115414.html>.

The location map below displays the nine groups that are currently part of the river network.



### Community Based Social Marketing

Community-based Social Marketing (Douglas McKenzie -Mohr, 2011) is an increasingly popular alternative to information intensive marketing campaigns and is shown to be highly effective at bringing about behaviour change. The approach consists of five steps described by McKenzie-Mohr (2012).

Step 1 is to carefully select which behaviour is to be promoted, which is the focus of this piece of research. Once the behaviour has been selected, subsequent steps involve identifying the barriers and benefits to that given behaviour, developing strategies using social science 'tools' that are proven to promote behaviour change, creating a pilot study group to ensure the programme will be successful with the final step of broad scale implementation and evaluation of the program

(McKenzie- Mohr, 2011). Determining which behaviour would be the most beneficial to target involves analysing the overall impact of each behaviour, the likelihood that the target audience will engage in that behaviour, and the current level of penetration from that same target audience.

## Methods

Methods were used to identify behaviours that have the greatest environmental impact on urban rivers and streams. Study methods were based on recent international approaches in prioritising community behaviours (Patricia M. Please, Donald W. Hine, Petra Skoien, Keri L. Phillips & Iain Jamieson (2017) Prioritizing community behaviors to improve wild dog management in peri-urban areas, *Human Dimensions of Wildlife*, 23:1, 39-53, DOI: 10.1080/10871209.2017.1385877.)

## Procedure

The Christchurch study identified 10 behaviours that residents could engage in to reduce environmental impacts on urban waterways (i.e. rivers and streams). A community survey was conducted in person, as well as an online survey of “experts.”

Surveyors used a very short (3-5 minute) questionnaire to interview people outside three different shopping malls in Christchurch. Permission was given to survey outside two supermarkets in different suburbs, Woolston New World and St Martins New World, and a shopping area, Barrington Mall.

For the online survey, 15 “experts” were sent the same survey by email. The 15 experts were chosen for their expertise and knowledge of freshwater rivers and streams. They comprised four freshwater ecologists, one planner, two drainage engineers, two stream facilitators, one environment manager, two education specialists, two stream-care coordinators, and one resource management specialist. Ten of the 15 experts completed the survey, and most provided notes to accompany their responses.

**A Behaviour Prioritisation Matrix (BPM)** was then created using:

1. Expert estimates of effectiveness
2. Current adoption levels (penetration) and
3. Likelihood of future adoption.

This involved calculating the TWI (Total Weighted Impact) by knowing the 1. *Effectiveness* 2. *Penetration* and 3. *Likelihood of Adoption* of each of the 10 behaviours.

1. ***Effectiveness*** was calculated by asking the 10 expert respondents to rank each of the 10 behaviours from 1 (not at all effective in reducing impacts on waterways) to 10 (highly effective in reducing impacts on waterways).

2. **Current Penetration** was determined by asking the participants in the community survey whether they had engaged in each of the 10 behaviours within the last month with the options of answering yes, no or don't recall.
3. **Likelihood of Adoption** was determined by asking the participants in the community survey the likelihood that they would engage in that behaviour in the coming month which was on a 5-point scale from (1 = not at all likely, to 5 = totally likely).

## Results

A total of 110 respondents completed the community survey. Surveyors randomly asked shoppers to complete a two-page questionnaire when entering or leaving the shopping complex. Most people approached chose to complete the survey. Surveyors did not pursue anyone who was reluctant.

Ten of the 15 experts responded online and ranked the 10 behaviours.

Results from both the expert and community surveys are presented in Table 1.

**Table 1: Behavioural Prioritisation**

Behaviour	<i>Effectiveness (1-10)</i>	<i>Penetration (0-1)</i>	<i>Likelihood of adoption (0-4)</i>	<i>Total Weighted Impact</i>
Disposed of garden waste away from waterway	7.1	0.99	3.23	0.21
Mowed grass away from waterway edge	7.1	0.96	1.22	0.31
Safely disposed of paint or chemicals (e.g. at Eco-drop waste transfer station)	7.4	0.94	2.70	1.23
Volunteered on a river planting or weeding project	7.5	0.064	1.56	10.98
Washed vehicle on grass or lawn	7.5	0.12	1.78	11.80
Took part in a river clean-up	7.9	0.064	1.66	12.31
Picked up rubbish along waterway	7.1	0.28	2.63	13.40

Fed ducks by the river	6.7	0.25	2.75	13.75
Reported rubbish in river	6	0.12	2.78	14.72
Reported any river pollution to pollution hotline	7.5	0.12	2.77	18.32

The table is a summary of the following information:

1. *Expert evaluation and assessment of perceived effectiveness.* Experts ranked each behaviour on their overall environmental benefit on a scale of 1 (low environmental benefits) to 10 (high environmental benefits). The behaviour with the lowest value (score of 6) was reporting rubbish in the river, and the behaviour with the highest value (score of 7.9) was taking part in a river clean-up. Other behaviours which score highly were volunteering on a river planting/weeding project, reporting any river pollution to an 0800-pollution hotline, and washing car on grass or lawn, all of which had a score of 7.5.
2. *Current penetration rate within the target community:* the current penetration reveals whether participants have engaged in the behaviour within the last 30 days. Participants in the community were asked to answer yes or no as to whether they had engaged in each behaviour. Behaviours that involved more effort and community involvement had the lowest penetration rates. Taking part in a river clean-up and volunteering on a river planting project both had penetration rates of 0.064. Reporting rubbish to a river pollution hot-line, washing a vehicle on grass or lawn and reporting rubbish in the river all had low penetration rates of 0.12. The highest penetration rates were behaviours such as disposal of garden waste away from a river or stream which scored 0.99, mowing grass away from the waterway which scored 0.96 and safely disposing of chemical and paint products with a score of 0.94.
3. *Likelihood of future adoption by community members who were not currently engaged in the behaviour:* participants were asked how likely they would be to participate in each behaviour within the next 30 days. The community involvement behaviours such as volunteering and taking part in a river clean-up proved to have the lowest likelihood of adoption, while disposal of garden waste away from any waterway had the highest likelihood of adoption. This aligned with the penetration question above. Picking up rubbish from along the river scored higher on the likelihood to adopt than the current penetration.

## Total Weighted Impact (TWI)

An algorithm was used to derive Total Weighted Impact (as previously described). This is expressed as effectiveness times maximum possible penetration, minus the observed penetration, times likelihood of adoption.

$$\text{Total Weighted Impact} = (\text{Effectiveness} \times \text{Maximum Possible Penetration} - \text{Observed Penetration}) \times \text{Likelihood of Adoption}$$

Results from the TWI were ranked high, medium and low behaviours as shown below.

Table 2: Summary of ranked behaviours.

<b>High ranked behaviours</b> <ol style="list-style-type: none"><li>1. Reporting river pollution</li><li>2. Reporting rubbish in a river</li><li>3. Not feeding ducks along a river</li><li>4. Picking up rubbish along a river</li></ol>
<b>Medium ranked behaviours</b> <ol style="list-style-type: none"><li>5. Taking part in a river clean-up</li><li>6. Washing car on grass or lawn</li><li>7. Volunteering on a river planting or weeding project</li></ol>
<b>Low ranked behaviours</b> <ol style="list-style-type: none"><li>5. Safely disposing any paint or chemicals</li><li>6. Mowing grass away from the waterway margin</li><li>7. Disposing of garden waste away from the waterway</li></ol>

### High ranked behaviours

1. Reporting river pollution to a pollution hot-line
2. Reporting rubbish in a river
3. Not feeding ducks along a river
4. Picking up rubbish along a river

A high TWI score indicates that the behaviour has a relatively low penetration rate, is adoptable by the community, and is effective in minimising environmental impact.

The highest-ranking behaviour was reporting river pollution to a river pollution hot-line. Experts ranked this behaviour as highly effective with a score of 7.5. This behaviour had a low penetration rate of 0.12 and had the third highest score for likelihood of adoption. The combination of these results indicates that this behaviour has potential for high impact.

The next highest TWI scores were perceived by experts as being less effective than the other behaviours, but their low penetration rates and high likelihood of adoption gave them high TWI scores. Reporting rubbish in a river was rated by experts as the least effective behaviour scoring a 6, with a penetration rate of 0.12 and a likelihood of adoption of 2.78 resulting in a TWI score of 14.72. The desirable behaviour of people not feeding ducks by the river was also deemed one of the least effective behaviours by the experts with a score of 6.7, had a penetration rate of 0.25, and likelihood of adoption of 2.75.

**Medium ranked behaviours:**

5. Taking part in a river clean-up
6. Washing vehicle on grass or lawn
7. Volunteering on a river planting or weeding project

The three mid-ranked behaviours are achievable by community members. Picking up rubbish along the river had a TWI score of 13.40, a likelihood of adoption of 2.63 and a low penetration rate of 0.23. Taking part in a river clean-up was rated by experts as being the most effective behaviour with a score of 7.9. It shared the lowest penetration rate of 0.064, but the relatively low likelihood of adoption score of 1.66 meant the behaviour didn't have a higher TWI score. Taking part in a river planting or weeding project was perceived by experts as being slightly less effective than taking part in a river clean-up. They both shared the penetration rate of 0.064, but volunteering on a planting/weeding project had a lower likelihood of adoption than participating in a river clean-up resulting in a lower TWI score of 10.98.

**Low ranked behaviours:**

8. Safely disposed of any paint or chemicals
9. Mowed grass away from any waterway
10. Disposed of garden waste away from any waterway

The behaviours with the lowest TWI ranking were those that already had a very high penetration rate, indicating that effort in increasing these behaviours would have a potentially low impact. Disposal of garden waste away from waterways, not mowing grass next to waterways and safely disposing paint or chemical products had the penetration scores of 0.99, 0.96 and 0.94 respectively. This indicates

that a large portion of the population are already participating in these behaviours, so they need not be the focus for behaviour change.

## Discussion

The Department of Conservation's engagement and partnerships approach is to focus on building connections between New Zealanders and their environment. The premise is that individuals begin to take personal responsibility for conservation and start contributing towards it. Kollmuss & Agyman (2002) emphasise that people with a greater sense of personal responsibility are more likely to engage in environmentally responsible behaviour. Studies by Asah & Blahna (2009) show that conservation practice is about behavioural change, and motivation is a stronger driver of behavioural change than information or education. It is important to understand, plan and manage for the functions that motivate commitment. The concept of community-based social marketing complements these ideas, emphasising the importance of individual actions and behaviours for conservation (McKenzie-Mohr, 2011).

The highest-ranking behaviours were reporting rubbish and pollution in the river. These behaviours both have a penetration rate of 0.12, so of the 110 participants, 13 have made reports of pollution or rubbish in a river within the last 30 days. On a scale of 1 – 4, they received a 2.87 and 2.77 respectively, falling closest to the 'somewhat likely' to adopt category.

One solution for reporting rubbish and pollution in rivers is to use mobile phone reporting. Christchurch City Council has created a smartphone app, 'Snap, send and solve' which makes reporting incidents easy (e.g. rubbish dumped by rivers). However, it doesn't cater for those that don't have access to the technology. Several comments were made by community survey participants that they would happily report any pollution if they saw it, but they were unsure who the reports should go to, and how their concerns would then be actioned.

Mid-ranking behaviours were those that required more time, effort and community involvement. They had the lowest penetration rates and were the least likely for people to adopt but were viewed by the experts as being the most effective behaviours. Comments from participants in the community survey were lack of time, physical ability and knowledge about community events. These were barriers to becoming more involved. Several commented on their lack of knowledge on how to join the groups and what each group is responsible for. Finding a way to motivate people to participate in community events and regularly volunteer for community groups is challenging and finding a way to maintain their interest and enthusiasm is even more so (Miles *et al.* 1998). Studies by Asah & Blahna (2009) show that people are drawn to volunteerism for its social interactions and its meaningful action. Frequent participation and additional responsibility may enrich the volunteering experience

resulting in higher levels of satisfaction and promoting long-lasting contribution. Extending this study further and drawing on other research such as studies by Asah & Blahna would be useful in examining barriers to being more engaged in community activities and volunteering.

The low-ranking behaviours were those that already had high penetration rates such as not mowing river margins and disposing garden waste away from waterways, as well as safely disposing of paint and chemical products. These behaviours have been the subject of education campaigns by local councils such as Environment Canterbury and Christchurch City Council. Although they were ranked as important by the experts, resources would be better spent on other behaviours.

One notable limitation with surveys is that people often respond with what they perceive to be the 'correct' answer, rather than one that truly reflects their behaviours.

### **Implications for practitioners**

The 10 behaviours selected in this study are examples of environmental behaviours that agencies and councils may want to consider. This study provides a methodology and results that help prioritise behaviours for future marketing and communication campaigns. The Behavioural Prioritisation Methodology (BPM) provides organisations with a better understanding of behaviours that have the greatest impact on urban freshwater conservation.

A key challenge for organisations such as the councils and the Department of Conservation is finding ways to connect with members of the community and encourage a culture of environmental volunteerism. Extending this study further and focusing on community-based behaviours could highlight the main barriers and could provide local government with information on how to further engage communities in environmental volunteering opportunities.

Volunteering is one of the most effective means of bringing communities together, while connecting people to their natural environment. DOC would benefit from doing further research to identify barriers stopping people from becoming more involved in community conservation.

Although behaviours such as safe disposal of paint and chemical products, and the disposal of garden waste away from waterways received a low ranking on the BPM scale because of their high penetration rates, it's important not to discard these behaviours from education campaigns. There is no way of knowing from this study whether the answers respondents gave accurately represent their true behaviours.

The mid-scoring behaviours should also not be discarded. Behaviours such as 'attending river clean-ups' had a low likelihood of adoption, but many commented during the survey that if they had more information on these events, if they were less time consuming, and if they used more of their individual skills they would be more likely to attend future events. Rather than discarding the behaviour because of its seemingly average BPM score, it could be beneficial to extend the study to see why people are less likely to adopt the behaviour, and then decide whether the barriers inhibiting further engagement can be overcome.

Other behaviours are potentially important. Although they have a low TWI score these would benefit from further research.

### **Limitations**

The BPM in this study was calculated according to the methods explained in McKenzie-Mohr's book *Fostering sustainable behaviour: An introduction to Community-Based Social Marketing*. The BPM can be calculated in numerous ways and is not limited to the method used in this study.

The results of the community survey relied on participants being accurate and honest in answering about their behaviours. They might have answered in what the participant considers the 'correct' way to answer. They may not have fully understood what was being asked. Numerous studies have found that people with strong pro-environmental attitudes are found to be more likely to engage in pro-environmental behaviour, yet the relationship between attitudes and actions proved to be weak Kollmuss & Agyeman, (2002). This could lead to participants indicating that they would be likely to adopt the environmental behaviour in the future, but their actions may not reflect their enthusiasm.

This survey also had unavoidable limitations. The research was conducted as a Summer Scholar for the Department of Conservation and Massey University. The survey was run at a busy time of year (December 2017). A much larger sample size and clarifying questions for the respondent would help. For example, some of the participants had not engaged in certain behaviours over the past 30 days due to being away for the summer period. However, they noted that usually they would participate in this certain behaviour. For this reason, the study would benefit from being repeated throughout the year. The analysis was also subject to the 10 expert opinions of which environmental behaviour had the most impact, which could differ depending on area of expertise and knowledge.

Another limitation is perception of pollution in waterways. People may believe that visual pollution (such as an oil slick) is the main form of river pollution. In fact, much pollution won't be visible as it is present as heavy metals such as copper, lead, and hydrocarbons. A significant (and visual) 'pollutant' of Christchurch's Heathcote/ Ōpāwaho River is sedimentation from multiple sources. This includes

sediment runoff after rainfall, especially runoff from Port Hills catchments that lost vegetation cover in recent Christchurch fires. Runoff from land development (residential/industrial), road runoff, and other sources are recognised as degrading the Ōpāwaho Heathcote River.

## **Conclusion**

Community-Based Social Marketing (McKenzie-Mohr, 2011) was the behaviour change framework used in this report to determine which of the 10 selected pro-environmental behaviours would be the most environmentally beneficial while still being adoptable by communities. The results indicated that several of the behaviours including safely disposing of paint and chemical products and ensuring garden waste products are away from waterways had very high penetration rates so received low TWI values. Although the behaviours were ranked as important by experts, resources would be better spent in other areas.

The highest scoring behaviours were reporting pollution and rubbish in the river, not feeding the ducks along the river and picking up rubbish along the river. These behaviours were ranked as important by experts while having a relatively low penetration, and a high likelihood of adoption. The mid-scoring behaviours were those that involved more community involvement such as taking part in a river clean-up and volunteering on a river planting or weeding project. Experts ranked these behaviours as being important, but they had a low likelihood of adoption. A better understanding of the main barriers and benefits to these behaviours could help future education and behaviour change campaigns.

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