Measuring the use of science for collaborative watershed management in New Zealand's Canterbury Region

Liam Coalman, Rebecca Chellberg, Ally Frieden, Ofeli Palacios-Flores, Jack Robinett, Charlotte Shaw

University of Washington Tacoma, TEST 495 with Prof. Tom Koontz

References

Introduction

- The use of scientific information is a crucial element in watershed planning. Prior research indicates that scientific information is rarely discussed in general meetings.
- Collaborative ecological management plans most often cite government/grey literature rather than peer-reviewed scientific information, and social science is scarcely used.
- Besides science, other forms of knowledge such as community support and indigenous knowledge are important and brought into collaborative groups. Following a presentation, audience discussion with presenters is a helpful way to increase understanding and usage of the information.
- This study examines 6 research questions:

1. How many meeting items include science, and does this change over time?
2. What are the most common sources of scientific information presented?
3. Is natural science or social science more frequently presented?
4. Besides science, how much of the presented information is about community support?
5. How much of the presented information is from indigenous knowledge?
6. After a presentation, what is the level of audience discussion and how does this change over time?

Methods

- Our documents are **meeting minutes from local collaborative organizations** called "zone committees", each covering a small watershed in the Canterbury region of New Zealand. We coded 12 meetings from each of 3 zone committees spanning 2010-2013, when the zone committees were getting started. We coded a **total of 36 meetings**.
- Coders coded **blocks of text that described presentations** occurring in meetings, applying categories corresponding to our research questions. These **categories included 24 yes/no items** about each presentation such as: Is it scientific information? Is the topic about status/trends of an issue? Is the topic about community support? Does the presentation include natural science? Does it include indigenous knowledge? Did the audience ask questions?
- Initial intercoder reliability ranged from 54 % to 100 %, and subsequent discussions **reconciled codes to 100 % agreement** for each presentation.
- Across the 36 meetings, we coded a total of **107 presentations**.

7.   NEW BIODIVERSITY PROJECTS

The Committee received a presentation from Robyn Russ, Environment Canterbury updating progress on the approved Immediate Steps projects in Banks Peninsula. Robyn also introduced two new biodiversity projects for the Committee's consideration and future project suggestions (refer **attachment**). The Committee **agreed** to proceed with the Owhetoro Stream project in Port Levy/Koukourarata. Robyn will report back to the Committee with further information regarding Okana River Confluence project.

Example of Presentation identified from meeting minutes

I	J	K	L	M	N	O	P
Title of Presentation	Presenter Name	Home Org	ZC Member?	Science?	Status/Trends	Causal Factors	Priorities
Drinking and Stock Wate	Hugh Blake Ma	Selwyn District Council		1	1		

Example of coding a presentation Yes/no (1/blank) for each category in the spreadsheet
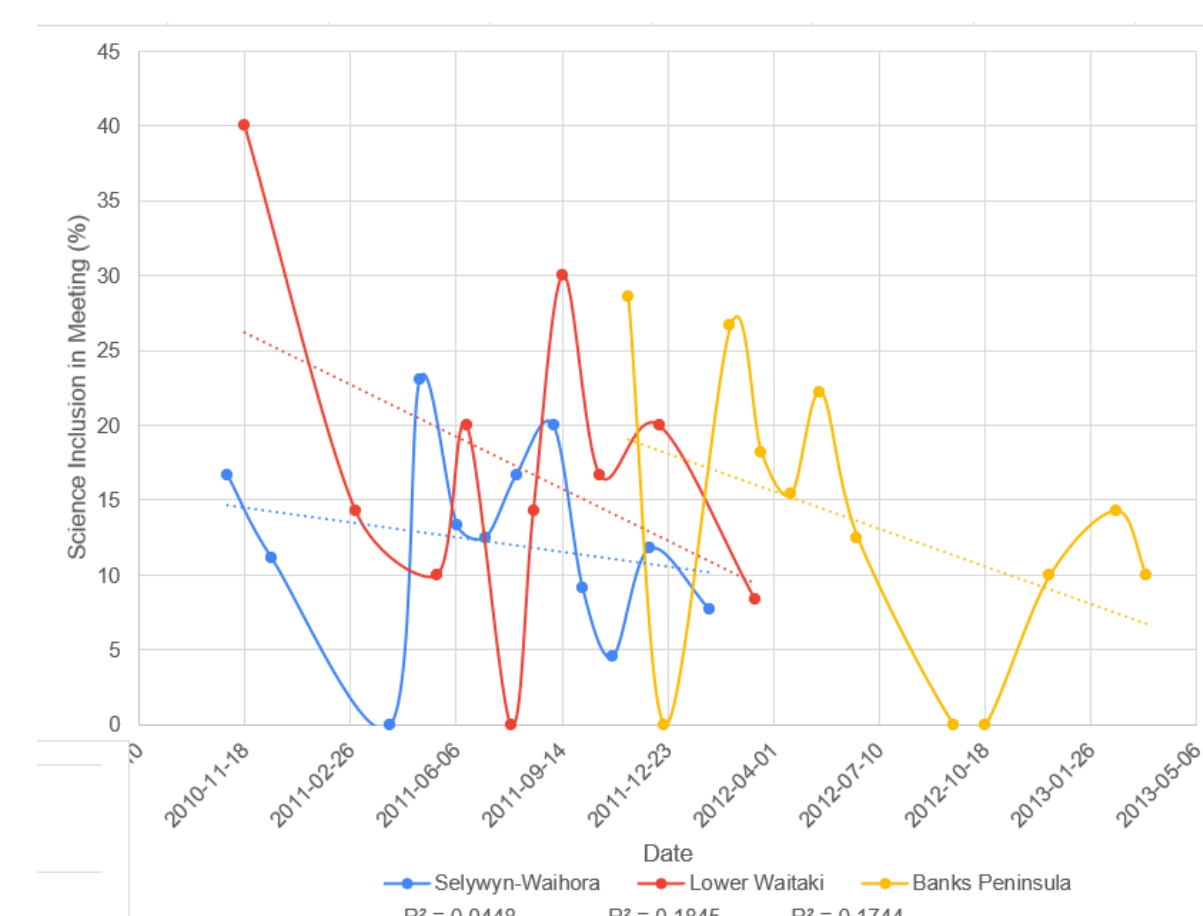
Results

Figure 1a. Scatter Plot of percentage of agenda items that include science as a topic for every meeting in our data over time, for each of the three zone committees
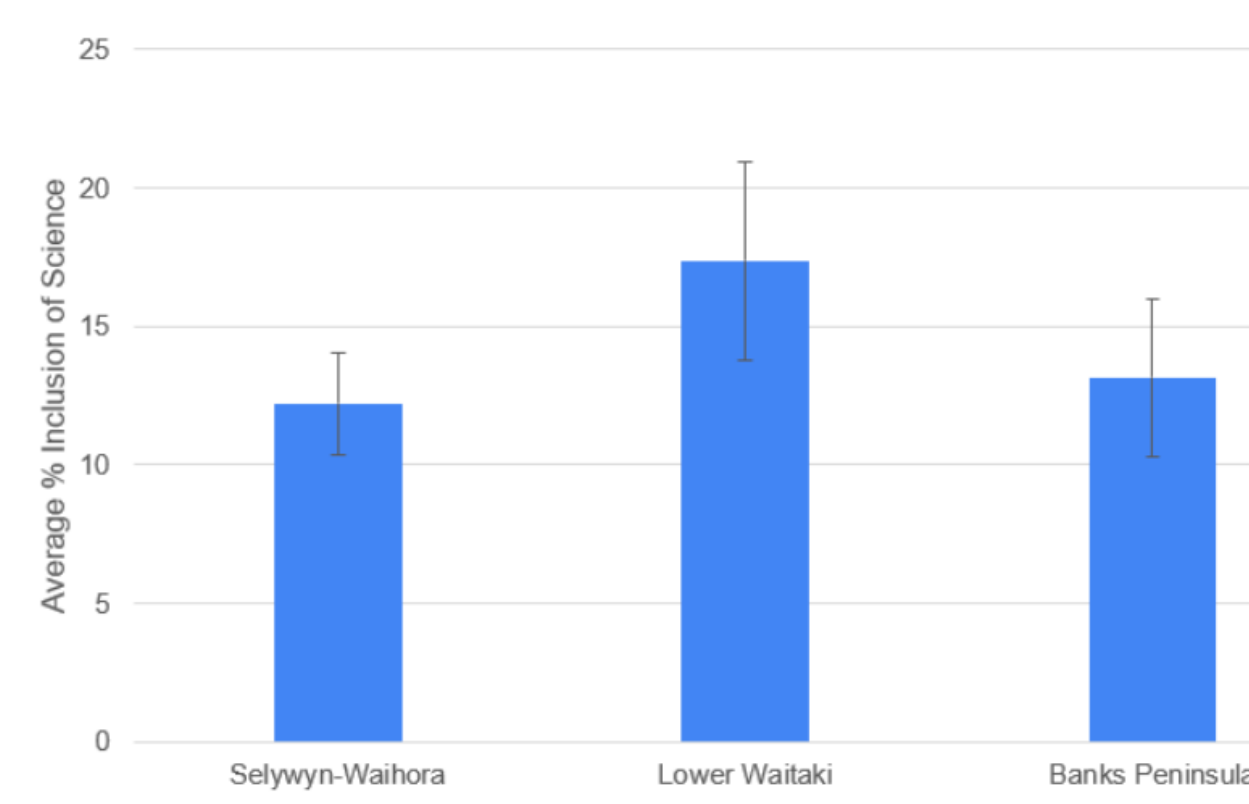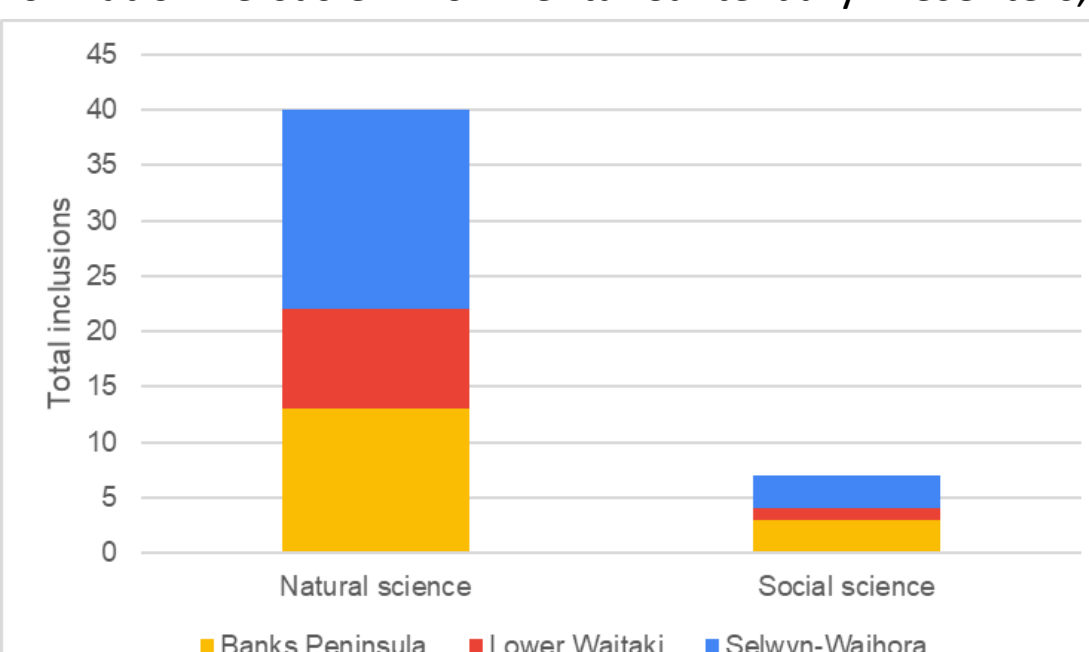
Figure 1b: Average percentage of agenda items that include science as a topic for each of the three zone committees

	Presentations In study	Environmental Canterbury Presentation	Citation: Government report	Citation: Scientific Journal	Citation: Academic book
Science	47	15	5	1	0
Non-science	61	27	2	0	0
Total	108	42	7	1	0

Figure 2. Table showing citation sources for scientific information versus environmental Canterbury Presenters, non-scientific information, and total presentations.

Figure 3. Total inclusions of natural and social science from the three zones committees

Zone Commitee	Community Support/Engagement (number of meetings)	Community Support/Engagement (number of presentations)
Selwyn-Waihora	5 (14%)	18 (17%)
Lower Waitaki	7 (19%)	9 (8%)
Banks Peninsula	8 (22%)	12 (11%)
Total	20 / 36 (55%)	39 / 107 (36%)

Table 4. Table showing percentage and number of meetings and presentations that mention Community Support/Engagement

Zone Committee	Maori Presenters	Environmental Canterbury Presenters	Indigenous Knowledge	Scientific Knowledge
Banks Peninsula	2	15	2	17
Selwyn Waihora	1	12	4	18
Lower Waitaki	0	16	1	11
Totals for all three zone committees	3	43	7	46

Figure 5: Number of presentations from indigenous (Maori) vs governmental (Environment Canterbury) presenters, and representing indigenous vs scientific knowledge
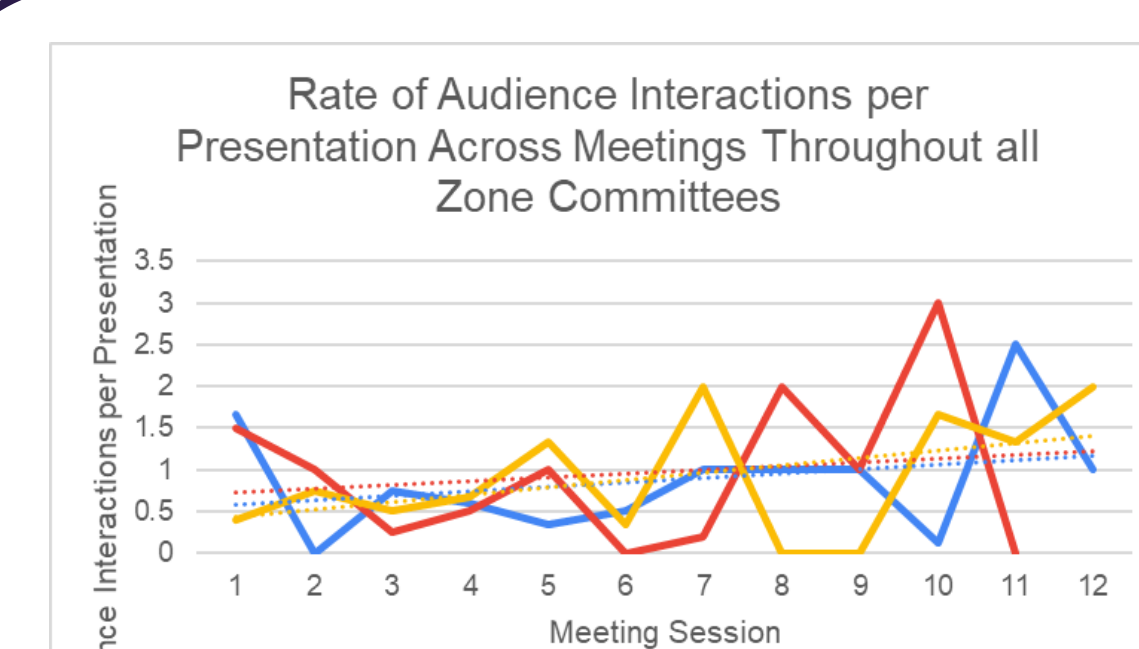

Figure 6a: Rate of audience interactions per presentation across meetings.
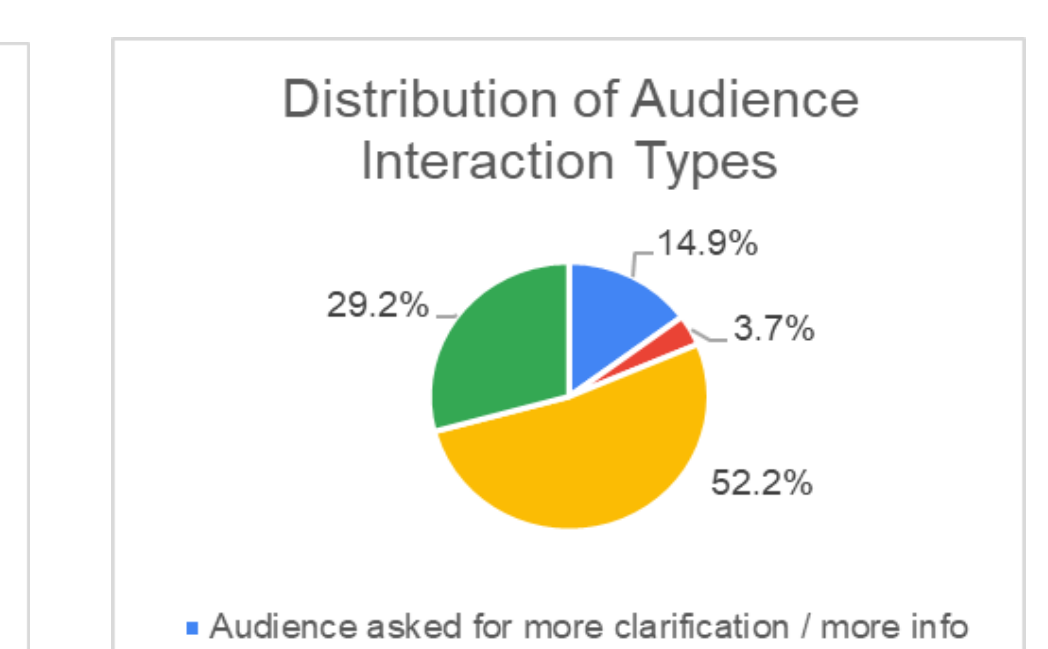
Figure 6b: Distribution of audience interaction types.

Discussion

- Each of the 3 zone committees show a slight tendency of a decline over time in the **proportion of meeting items that include scientific information** (Figure 1a). The proportion increases and decreases in a similar manner across the groups. With only a weak correlation between time and the inclusion of science, other factors not included may be more influential.
- Overall, of the three zone committees, Lower Waitaki appeared to have the highest average **percentage of science integrated into their meeting**s, whilst Selwyn-Waihora appeared to have the lowest (Figure 1b).
- A **wide array of influential factors in meeting dynamics limit its usage and integration** (Lauber et al. 2011, Koontz and Thomas 2018).
- In order to prioritize the sharing of scientific information in meetings, managers should **consider a mix of executive and technical meetings**.
- Further research should **statistically compare which factors have significantly different impacts on percentage of science integrated into their meetings.** Two-way ANOVA tests are a useful statistical test that could compare the influence of two different variables on the percentage of science integrated in each meeting.

- Across the 3 zone committees, **sources of scientific information** are rarely cited. Of those that do, government reports/grey literature is most common. Scientific data was accessed mostly through expert presentations from the government.
- Results suggest managers ought to be selective in finding digestible sources for less science-versed members. It would be beneficial to work with an agency who can assist in information sharing and translation, such as Environment Canterbury.
- **Natural science is presented far more than social science** (Figure 3). Natural science was included in presentations 40 times and social science only 7 times.
- These results match prior studies showing that there is **a lack of social science utilized** for the benefit of environmental management and watershed management (Safford & Norman 2011; Colavito 2017; Koontz & Thomas 2021).
- Results suggest policy makers and managers should consider how social scientists can contribute to understanding how social **behavior affects collaborative processes**.
- Further research should analyze the differences in the committee meetings that included natural science with those that included social science and **how each science affected collaboration efforts in water management**.

- Across the 3 zone committees, topics of community support are included in 36% of the presentations and (55%) of the meetings (Figure 4).
- Our results suggest managers and policy makers should have more **in-depth discussions** about the different ways their actions may impact communities and stakeholders.

- Across the 3 zone committees, **government presenters outnumbered Maori presenters substantially (43 vs. 3).** Indigenous knowledge was introduced 6.5% of the time (7 presentations) while scientific knowledge was introduced 43% of the time (46 presentations) (figure 5).
- Overall, our research found that there is a **gap between the representation of government and Maori people** in presentations and knowledge sharing.
- Results suggest that zone committees should **invite additional Maori presenters and indigenous knowledge** into zone committee meetings.
- Further research should include **text analyses of zone implementation plans** (ZIP) and other government-driven policies to **study the potential gap between the implementation of scientific and indigenous knowledge** in environmental management plans.

- **52% of presentations had audience interaction.** During the first six meetings in each of the zone committees, audience interaction averaged 0.67 interactions per presentation. **This grew to 1.17 interactions per presentation in the second half** (Figure 6a).
- The most frequent kind of audience interaction was **comment and discussion**, which **generated 52.2% of audience interaction** (Figure 6b).
- **48% of presentations featured no audience interaction, which isn't conducive to collaborative governance.**
- To increase collaboration in governance, **collaborative managers should maintain an environment that fosters audience interaction in presentations.**
- **Researchers should study which types of audience interactions are most common in other collaborative processes** and determine what factors contribute to higher frequencies of certain kinds of interactions over others. There remains an opportunity to further our understanding of how collaborative environmental management in Canterbury evolves over time as there is **still yet to be examined publicly accessible meeting documents spanning 15 years.**