

Stakeholders' preferred policy solution: comparing strategies to address degraded levees

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Abstract

The levees along the Portneuf River around Pocatello, ID, have degraded to the point where action is necessary. Stakeholders have identified three potential policy actions that would address the levee issue – remove the existing levees, reinforce the existing levees, or remove and reconstruct new levees that incorporated green areas. While it appears that the strongest support was given to the reconstruction option, it is not clear which of these policy proposals are actually preferred by stakeholders. In short, if stakeholders had their way, which of these policies would be implemented? Using a survey of stakeholders in the Pocatello area, I compare the determinants of stakeholder policy preferences to determine how these preferences differ from one another. The analysis reveals these policy preferences are primarily driven by attitudinal indicators and risk perceptions.

Keywords: Levees; Public policy; River management; Stakeholders

If it keep on rainin', the levee gonna break
If it keep on rainin', the levee gonna break
Some of the people don't know which road to take
~Memphis Minnie & Bob Dylan

The US Army Corps of Engineers restructured the flow of the Portneuf River around Pocatello, ID, between 1965 and 1968. Following decades of serious flooding, various levels of government were finally able to reach an agreement on how to mitigate this threat. This compromise, on the parts of the city and state, resulted in a channelized river with earthen and concrete levees to protect against flooding. With one comparatively minor exception, the Army Corps strategy has protected the city from flooding.

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Unfortunately, these alterations have caused the river to become highly degraded (e.g. Idaho Department of Environmental Quality, 1999, 2010; Hopkins *et al.*, 2011), and have been criticized due to their esthetics since their construction. In addition, after years of improper maintenance by the city, the levees that protect the city have become so degraded that the Army Corps no longer guarantees their safety (US Army Corps of Engineers, 2013). Virtually all parties acknowledge that something must be done, but like the years leading to the city and state giving in to the Army Corps the first time, the relevant parties have been unable to reach an agreement on the proper strategy for the last 5 years.

Problems like this are becoming increasingly common in communities throughout the country as infrastructure, like levees, continue to age (e.g. Doyle *et al.*, 2008). It is estimated that there are more than 25,000 miles of levees within the United States (Johnston Associates, 1989), all in various structural states. Levees were believed to be the most cost-effective and ideal approach to managing the nation's floodplains until the late 1960s (Johnston Associates, 1989), which is why they are found nearly everywhere. However, due to maintenance, design, construction, and planning problems, levee failures are common (see e.g. Mairson, 1994) and predictable (Tobin, 1995).

Owing in part to the disagreements between various governmental institutions, stakeholders around Pocatello have become particularly active. Not surprisingly, as the scope of conflict was expanded to include stakeholder groups, these new participants sided with the various coalitions that were already engaged. Consequently, attitudes began to coalesce around three policy alternatives for addressing the levee situation – (1) reinforce the existing levees, (2) remove the existing levees and reconstruct the levees to include green areas, and (3) completely remove the existing levees.

While knowing what influences a stakeholder to support a given policy is an important step in understanding the policy process, it is simply the tip of the proverbial iceberg. Stakeholders are able to indicate their level of support or opposition without regard for the reality that each of these options are ultimately mutually exclusive. In other words, a stakeholder might respond that they strongly support more than one policy. While the data suggest that the reconstruction option is the most supported policy, it is not clear if stakeholders actually favor this approach over the others. It is possible that stakeholders support a given approach because they believe it is the most feasible strategy, even if it is not the one they prefer.

Using a survey of stakeholders from around the Pocatello area, I examine the differences in levee policy preferences. Stakeholders were asked to rank policy proposals in terms of favorability. This project seeks to explain why stakeholders would prefer one policy approach over the others by directly comparing these policy preferences against one another. In the end, the analysis reveals that various attitudinal and risk indicators predict stakeholder levee policy preferences.

1. The problem

Communities have historically been built along rivers, as they provide various ecosystem services. However, these services come with risks. Under regular threats of flooding, these communities have had to implement strategies that mitigate this risk. Levees, particularly earthen levees, have historically been viewed as the most cost-effective way to manage flood plains (Johnston Associates, 1989).

Without proper maintenance, presuming the levees were properly designed and constructed, levees will become weakened to the point where they can no longer protect against rising river waters. This weakening can be a result of natural erosion or settling processes, much of which can be addressed

through regular maintenance, as maintenance can repair any damage caused by these processes. Furthermore, upland erosion can raise the natural river bed (e.g. Yin & Li, 2001). Considering levees were initially built to heights that could contain a river beyond its historical highs, the raising of the natural river bed places levees at greater risk. As the river bed rises, levees are not modified to reflect this increase. Consequently, the estimates of historical high water levels used to originally construct the levee are no longer relevant. If the river bed increases six inches, so too should the historical highs. When this difference is not accounted for in levee design, a river approaching historical highs will place greater stress on the upper portion of a levee more frequently than the design originally predicted, which will increase the likelihood of overtopping.

Perhaps more difficult to predict, levees can also be weakened by seismic events, which is why the Federal Emergency Management Agency's analysis tool, HAZUS, identifies levees as 'high potential-loss facilities' (Federal Emergency Management Agency, 2008). Nationwide, earthquakes appear to be increasing in occurrence, in part, due to the use of hydraulic fracturing (e.g. Ellsworth, 2013). Seismic activities are of particular concern for the levees along the Portneuf River, as the region experiences more than 1,000 earthquakes with various magnitudes each year (Farrell *et al.*, 2010).

The city appears to accept blame for the current state of the levees (Hancock, 2014), which is consistent with public sentiment that places water policy responsibility squarely in the hands of local government (Stoutenborough & Vedlitz, 2013, 2014). Poor maintenance by the city has resulted in the levees being removed from the Army Corps of Engineer's Restoration and Inspection Plan in 2009 (Hancock, 2014). Combine improper maintenance with unseen weaknesses caused by the regular seismic activity, and it is clear that it is only a matter of time before the levees of this flood-prone region fail. Yet, the pertinent parties are no closer to reaching a decision than they were in 2009, 5 years ago.

Stakeholders, like government decision makers, are equally divided on how to address the levee problem. However, debates have focused around three potential strategies. In the first, stakeholders argue that the city is tempting fate by not addressing this problem. These individuals argue that the quickest, least costly, approach is to simply reinforce the existing levees. This would bring them back to Army Corps standards, and, as intimated during meetings between the city, state, and Army Corps, it is the approach preferred by the Army Corps for addressing these particular levees.

The second option would be to remove the levees all together. Many believe that the levee system has aided in the deterioration of the river, particularly the high concentrations of *Escherichia coli* associated with the concrete channel that runs through the middle of town and almost all of the tributaries (see Idaho Department of Environmental Quality, 1999, 2010; Natural Resources Conservation Service, 2007)¹. Many believe that removing the levees should help restore the river. Others argue that the levees are ugly, and a more natural look would be more esthetically pleasing. These stakeholders also point to the lower overall water flow due to increased demand upstream. However, to ensure that flooding is less of a concern, this approach is often accompanied with the suggestion of creating a series of flood water storage areas that could hold river overflow within larger green areas.

¹ Samples are regularly taken that have geometric mean *E. coli* concentrations greater than 2,000 organisms per 100 mL of sample water (Idaho Department of Environmental Quality, 2010). Regulations concerning *E. coli* concentrations state that there must be less than 126 organisms per 100 mL of sample water for the water to be considered safe. Consequently, the river and its tributaries are unsafe for both primary (e.g. swimming) and secondary (e.g. wading) contact during much of the year. Importantly, sources of *E. coli* are so consistent that elevated levels are commonly found during the winter months throughout the river sub-basin (Idaho Department of Environmental Quality, 2010).

A third option has been suggested as a compromise between the two diametrically opposed sides. This would require the removal of existing levees, and replacement with levees that are more esthetically pleasing and better for the overall river. These new levees would incorporate green areas, which would include parks and trails, while meeting Army Corps standards for safety. Proponents argue that if the levees were consistently used by the public, it would be more likely that the city would maintain the levees. Unfortunately, this proposal is by far the most costly.

As illustrated in Table 1, there is quite a bit of overlap in stakeholder support and opposition to these three policies. This illustrates the limitations of analyzing this type of data since these policy options are mutually exclusive. As the contingency table for reinforce levees and reconstruct levees indicates, 11 (or 15.06%) of the 73 stakeholders chose the same level of support for both policies. The table for reinforce levees and remove levees finds that eight (or 11.11%) of the 72 stakeholders chose the same level of support for both, which is interesting given that these are completely opposite proposals. Finally, the table for reconstruct levees and remove levees finds that 23 (or 30.66%) of the 75 stakeholders chose the same level of support for both policy options.

Like Minnie & Dylan (2006) would say, ‘Some of the people don’t know which road to take.’ This raises questions as to how one should properly interpret support for these policies given the overlap on

Table 1. Contingency tables comparing stakeholder support for the three levee policies.

		Reconstruct levees					
		0	1	2	3	4	Total
Reinforce levees	0	2	2	6	9	13	32
	1	0	1	2	8	12	23
	2	0	0	4	5	2	11
	3	0	0	0	4	3	7
	4	0	0	0	0	0	0
Total		2	3	12	26	30	73
		Remove levees					
		0	1	2	3	4	Total
Reinforce levees	0	1	0	7	9	15	32
	1	1	3	3	11	5	23
	2	1	1	4	3	1	10
	3	1	4	2	0	0	7
	4	0	0	0	0	0	0
Total		4	8	16	23	21	72
		Remove levees					
		0	1	2	3	4	Total
Reconstruct levees	0	0	0	0	0	2	2
	1	0	0	0	1	2	3
	2	1	0	3	4	5	13
	3	2	4	5	11	4	26
	4	1	4	8	9	9	31
Total		4	8	16	25	22	75

Note: all three policy options use a scale from 0 to 4, which represents a scale from 0 = ‘Strongly Oppose’ to 4 = ‘Strongly Support’.

mutually exclusive strategies. This project attempts to dissect these policy preferences to better understand why stakeholders support one policy over the others.

2. Policy attitudes

To understand the policy process, one must first understand how policy attitudes are formed. If this information is to be of use to policymakers, it is important to recognize the potential motivations that drive policy support. Broadly speaking, these motivations are often drawn from four general categories – attitudes, behavior, demographics, and risk.

Early efforts to understand policy attitudes focused on the influence of demographic characteristics on support and opposition. Research consistently finds that there are differences in policy attitudes based upon differences in these demographic characteristics. Although the specifics vary from policy to policy, this research regularly illustrates the policy influence of gender, political ideology, party identification, income, and education (e.g. Lubell, 2002; Leiserowitz, 2006; Lubell *et al.*, 2007; Bies *et al.*, 2013; Mumpower *et al.*, 2013; Stoutenborough *et al.*, 2013, 2014, 2015; McCright *et al.*, 2014).

Attitudes filter responses to complex situations (e.g. Dake, 1991) by acting as heuristics, which simplifies cognitive processing. Attitudes help to identify a suitable response to a given circumstance. These attitudes can act as a motivational factor that influences policy support. For instance, those with stronger ecological values are more likely to support climate change policy (e.g. Lubell *et al.*, 2007; Stoutenborough *et al.*, 2014) because these values provide a motivation to support policies that will mitigate climate change. Similarly, trust is frequently found to be a predictor of policy support (e.g. Bies *et al.*, 2013; Stoutenborough *et al.*, 2013), such that those who trust an institution are more likely to believe the institution will be successful in achieving its policy goals. Broadly, extant literature provides strong support for the proposition that various attitudes predict individual policy support (e.g. Lubell, 2002; Lubell *et al.*, 2007; Stoutenborough *et al.*, 2014, 2015).

Although not examined as often as they should be, mostly because the information is rarely collected, individual behaviors may also influence policy preferences (Sears *et al.*, 1980). If an individual uses a resource, this should directly influence policy attitudes because they have something at stake. In short, self-interest can influence policy support (e.g. Sears *et al.*, 1980). For example, those who ride a bicycle are generally more supportive of government efforts to promote safe bicycle transportation (e.g. Jackson & Ruehr, 1998). In the current situation, those who engage in outdoor recreation, such as fishing, biking, or walking along the river, ought to have stronger policy preferences toward policy strategies that would enhance these activities. However, these influences can be inconsistent (e.g. Kinder & Kiewiet, 1979).

Risk perceptions also influence policy attitudes. Simply, ‘those who perceive the risk associated with something as high should be more likely to oppose policies that would increase that risk, and, conversely, support policies that decrease this risk’ (Stoutenborough *et al.*, 2015, p. 105). This relationship is found because risk perceptions access the part of the brain where dread resides (see e.g. Slovic, 1987), which creates a strong motivation to support or oppose a specific proposal (see Slovic, 2000, 2010). The inclusion of risk perceptions in policy research has been a relatively recent advancement. However, when included, these studies consistently find that risk predicts policy preferences (e.g. Lubell, 2002; Lubell *et al.*, 2007; Stoutenborough *et al.*, 2013, 2014, 2015).

3. Analytical strategy

This project deviates from the traditional examination of policy attitudes. Rarely are respondents asked to rank policy choices in terms of favorability (see e.g. Wilson, 1970; Summers, 1989). As noted above, a surprising number of stakeholders expressed identical levels of support and opposition to mutually exclusive policy options. To understand better the policy preferences of stakeholders, it is essential to ascertain which of these policy options they prefer over the others.

To achieve this, I used a survey of Portneuf River stakeholders around the Pocatello, ID, area. Stakeholders were distinguished through two mechanisms. First, stakeholders were identified through attendance at city council meetings, participation in stakeholder group meetings, and media coverage. Recognizing that this approach inevitably missed many stakeholders, a second round of stakeholders were identified using a snowball sample technique. Previously identified stakeholders were asked to identify the names of other stakeholders to ensure that the stakeholder population was properly populated. In addition, the survey also asked stakeholders to identify other stakeholders. In all, this process identified 157 Portneuf River stakeholders.

All 157 stakeholders were asked to participate in the survey. Prior to the administration of the survey instrument, email addresses were collected for the stakeholder population. The survey was administered through Survey Monkey. Stakeholders who had not completed the survey received at least one email reminder. The survey was in the field from 11 June 2014 through 1 August 2014, and resulted in 85 completed surveys and a 54% response rate.

The dependent variable for this analysis came from a battery of policy questions. Stakeholders received the following prompt, ‘To better understand your policy preferences, we would like you to rank these options from 1 to 8. With 1 being your most favored policy option and 8 being your least favored policy option, please indicate your favorability for each of the policy options.’ Although there were eight policy options ranked, I am only interested in the three policies addressing the levee situation. Specifically, the three policy options examined read, (1) ‘Reinforce and strengthen the existing levees to protect against future floods’; (2) ‘Remove levees to restore the natural water flow’; and (3) ‘Reconstruct the levees and channel to incorporate parts of these structures into green areas (parks or trails) along the river, while maintaining safety protocols to protect the area from the threat of flooding’.

Each variable was initially coded from 1 to 8. To create the dependent variable for this analysis, a categorical variable representing the policy that received the highest ranking, of these three, was created. It was coded as ‘1’ representing those who most preferred the reinforce option, ‘2’ for those who preferred the reconstruct option, and ‘3’ for those who preferred the removal option. The distribution of these preferences is illustrated in Figure 1. As is apparent, stakeholders most prefer the reconstruction policy strategy for dealing with the levee problem.

As the dependent variable is a non-continuous and non-ordered variable, a multinomial logit presents the most appropriate analytical approach. A multinomial logit approach is preferred over three separate analyses of those who most preferred a particular policy because it allows for a direct comparison between the policy options. In other words, instead of simply knowing that stakeholders with characteristic X were more likely to indicate that they prefer the reconstruction policy strategy, this analysis will identify the individual-level characteristics that make a stakeholder more likely to choose one strategy over another. The analysis was estimated using the *mlogit* command in STATA. The default for this analysis is to compare the less frequently occurring categories against the most frequent. This means that the analysis will predict the characteristics that would cause a stakeholder to prefer the reinforce

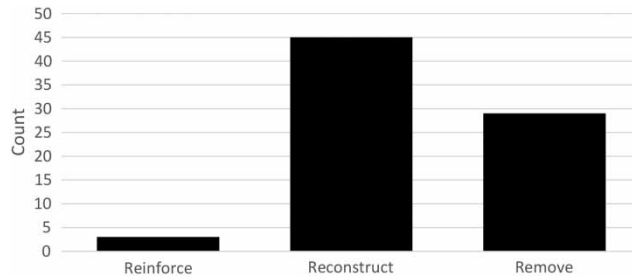


Fig. 1. Stakeholder favorability toward levee policy.

policy option to the reconstruct option, and a second analysis will compare the remove option to the reconstruct option.

As outlined above, examinations of policy attitudes tend to focus on demographic, attitudinal, behavioral, and risk indicators. In this project, I examine three attitudes, one behavior, two risk perceptions, and four demographic indicators².

Issue-specific attitudes, when measured, can directly address specific aspects of an issue that might be important predictors of attitudes toward that issue. One such fundamental attitudinal divide on this issue should concern whether a stakeholder believes that the levees are generally more beneficial to the community than costly. If a stakeholder believes they are beneficial, they should be less likely to prefer the removal of the levees because they generally believe they are good. Conversely, if a stakeholder believes that the levees, for whatever reason, are more costly to the community, they should be more likely to prefer their removal. This is a direct measure of attitudes toward the levees.

Trust is often found to be a predictor of policy support (e.g. Bies *et al.*, 2013). Since the US Army Corps of Engineers would most likely assume the responsibility of implementing whichever strategy the policymakers ultimately adopt, it is important to evaluate how trust in the Army Corps influences policy preferences. Importantly, the Army Corps has already established that it is competent in building levees, as it was the improper maintenance by the city that caused them to be degraded. Consequently, this trust should have the greatest impact on those who support removing the levee, as it would fall upon the Army Corps to determine how to accomplish this without drastically increasing the risk of flooding.

Finally, there are generally two approaches for managing the river system. First, there can be an emphasis toward risk aversion, which is the position of the Army Corps. Second, others suggest the river should be managed with ecologically sound principles stressed. In reality, the strategy can fall anywhere along a continuum between these two approaches. However, those who believe that the ecological perspective should be more prevalent ought to be more likely to prefer the removal of the levees.

Stakeholders were also asked to identify how often they engaged in outdoor recreational activities. Those who recreate more often should have more at stake in this discussion. Of these three policies, the reconstruction policy option provides the clearest opportunity to improve these recreational experiences. Therefore, those who recreate outdoors more often should be more likely to prefer the reconstruction option over the other two.

² Question wording and coding can be found in Appendix A (available in the online version of this paper).

As noted, risk perceptions are strong predictors of policy attitudes. The levees were created to combat flooding concerns. However, as water demands have increased, the amount of water withdrawn upstream has also increased. This has reduced water flow, and, consequently, the risk of flooding. Those who believe the risk of flooding is high should be less likely to support removing the levees. In addition, given the current state of the levees, those who worry about the risk of flooding may also be less likely to support reinforcing the levees in lieu of the construction of new, structurally sound levees. From an ecological perspective, the levees and other flood prevention strategies that were implemented in the late 1960s have caused the Portneuf River to be polluted (e.g. [Idaho Department of Environmental Quality, 2010](#)). Those who worry more about the risk associated with this pollution ought to be more likely to prefer the removal of the levees. While the current levees have contributed to this pollution, it is unclear what the construction of new levees would do to this pollution.

Finally, demographic variables are consistently found to influence policy attitudes, and therefore need to be controlled. These influences differ from issue to issue, even within the same policy domain (e.g. [Stoutenborough et al., 2014](#)). Consequently, it would be difficult to predict the specific nature of these relationships. Instead, I rely upon the general expectation that these indicators may influence policy preferences. Specifically, I will control for the influence of gender, political ideology, party identification, education, and income.

4. Results

The results of the multinomial logit analysis are provided in [Table 2](#). To correct for heteroscedasticity, robust standard errors are estimated. The model fit statistics indicate that the model performs well³. Indeed, the McFadden's R^2 is 0.4616.

I begin with the comparison between those who prefer to reinforce the existing levees against those who prefer to reconstruct the levees to include green spaces. I did not anticipate finding many predictors given that only three stakeholders prefer the reinforce policy strategy over the others. However, the analysis reveals that several indicators predict these differences, which suggests some commonalities amongst these three individuals that distinguish them from those who prefer the reconstruction option. Specifically, stakeholders who view the risk of flooding as being higher and those with more education were less likely to prefer reinforcing the levees over reconstructing the levees. This likely reflects the current degraded state of the levees, where stakeholders would rather start new (i.e. reconstruct the levees) than risk that the reinforcement efforts would be insufficient.

Conversely, stakeholders who support a more ecologically friendly approach to river management, recreate more frequently along the river, and perceive greater pollution risks were more likely to prefer reinforcing the existing levees over reconstructing new levees. In all three instances, it is possible that those who prefer this levee strategy were more concerned about the negative externalities associated with radically altering the current levees. For example, it is inevitable that removing the existing levees to replace them with new levees will result in an increase in water pollution (if nothing else, increased turbidity), may result in a decrease in the number of areas where one could recreate (the loss of a fishing spot), and/or disturbing wildlife habitats that have adapted to their altered environment.

³ The multinomial logit is a simultaneous equation that produces a single set of model fit statistics.

Table 2. Determinants of stakeholder preferences for levee policy.

	Reinforce levee		Remove levee	
	Coefficient	Prob.	Coefficient	Prob.
Attitudinal indicators				
Levees good	0.305 (0.728)	0.675	−1.515 (0.418)	0.000
Trust US Army Corps	−0.112 (0.744)	0.880	1.050 (0.515)	0.041
River management strategy	3.785 (1.121)	0.001	2.018 (0.743)	0.007
Behavioral indicator				
Outdoor recreation	7.996 (2.011)	0.000	−0.042 (0.456)	0.926
Risk perceptions				
Flooding risk	−5.004 (1.245)	0.000	−1.211 (0.643)	0.060
Pollution risk	2.871 (0.802)	0.000	0.407 (0.527)	0.440
Demographic indicators				
Female	1.355 (1.165)	0.245	−0.382 (0.855)	0.655
Political ideology	−1.217 (1.112)	0.274	−0.987 (0.703)	0.161
Party identification	0.478 (1.007)	0.635	1.446 (0.750)	0.054
Education	−1.832 (0.398)	0.000	−0.239 (0.189)	0.205
Income	−0.040 (0.032)	0.204	−0.005 (0.018)	0.745
Constant	−12.055 (7.350)	0.101	−0.832 (5.116)	0.871
Number of cases	65			
Likelihood-ratio χ^2	64.19	0.0000		
McFadden's R^2	0.4616			
Log likelihood	−29.246			

Robust standard errors in parentheses. Two-tailed test. Multinomial logit model.

I now turn my attention to the comparison between those who would prefer to remove the levees against those who prefer to reconstruct. Recall, a little over 30% of the stakeholders offered identical levels of support or opposition for these two policies. Understanding how these differ is important to understanding the policy environment. The results of this analysis are also found in [Table 2](#).

The analysis indicates that all three attitudinal indicators are predictors of the preference of removing the levees against reconstructing. Not surprisingly, stakeholders who believe the levees are more beneficial than costly were less likely to prefer to remove the levees. Those who trust the Army Corps and those who believe that the best river management strategy is to emphasize ecology were more likely to prefer removing the levees.

The analysis failed to find a relationship between outdoor recreation and policy preference. This may reflect a potential conflict inherent to various activities. For instance, those who fish are likely more interested in restoring the river so that it no longer poses health issues due to the pollution, which would suggest a preference for the removal of the levees. On the other hand, those who primarily bike, hike, or walk would be more likely to support the reconstruction of the levees since they would integrate green spaces with trails. Clearly, disaggregation will be needed to better understand behavioral influences on these policy attitudes.

One of the two risk perceptions predicts policy preferences. Those who perceive a higher level of risk associated with flooding were less likely to support the removal of the levees. Conversely, despite the rhetoric regarding the degradation of the river and its health effects, the risk associated with the pollution of the river does not appear to predict policy preferences. Finally, the model reveals that those who are

more Republican were more likely to prefer removal over reconstruction. This may reflect the cost associated with removing and constructing all new levees as opposed to simply removing.

While coefficient estimates, robust standard errors, and *p*-values provide important information, it is not always clear what they mean when modeling multinomial logit. To aid in interpretation, I created a tertiary plot for all three attitudinal indicators and both risks. The tertiary plots are three-way scatter plots of the predicted probabilities of each of the three policy options. Each side of the triangle represents the predicted probability for one of the policies, from 0 to 1, with the sum of all three sides equal to 1 for each stakeholder. The placement of these predicted probabilities does not change from tertiary plot to tertiary plot. However, each plot illustrates where the different levels of each independent variable lie, which illustrates how these variables influence policy preferences. Since most of the respondents preferred either the reconstruction or the removal policy options, the predicted probabilities are clustered along the bottom of the tertiary plot. This indicates that the model does not expect stakeholders to be particularly likely to prefer reinforcement, as all but four stakeholders are expected to have less than a 20% probability of preferring reinforcement. Regardless, close inspection reveals how these variables divide the stakeholders.

I begin with the tertiary plot illustrating policy preferences based upon the belief that the levees are generally beneficial, which is found in Figure 2. As the plot illustrates, those who ‘strongly disagree’ with the idea that the levees are beneficial tend to be clustered toward the higher predicted probability levels for removal (greater than 80% probability) in the bottom left corner of the plot. Conversely, those who ‘strongly agree’ are all clustered at the intersection of 0% reinforce, 0% remove, and 100% reconstruct, and all but one of the stakeholders responding ‘agree’ have predicted probabilities greater than 80% for reconstructing the levees (lower right corner).

The tertiary plot illustrating the predicted probabilities by stakeholder trust in the Army Corps is found in Figure 3. Reflecting the moderate level of statistical significance, the divide based upon trust is not as clear. However, there is a clustering of those who ‘trust’ the Army Corps near the higher likelihood of preferring the removal policy region of the plot. Similarly, the majority of those who have ‘little trust’ tended to be on the upper end of the reconstruct region.

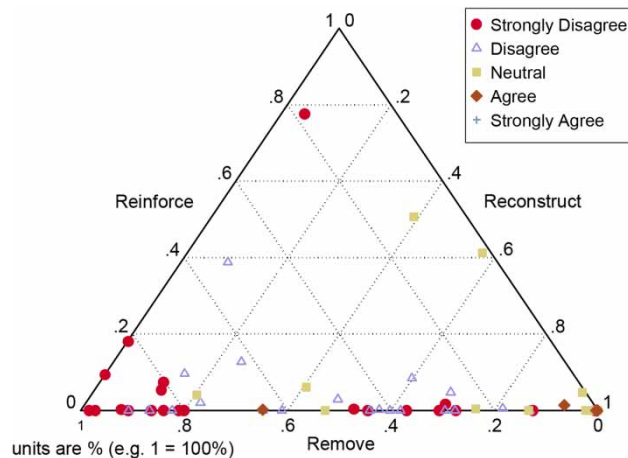


Fig. 2. Estimated preference for levee policy strategy by the belief that levees are good.

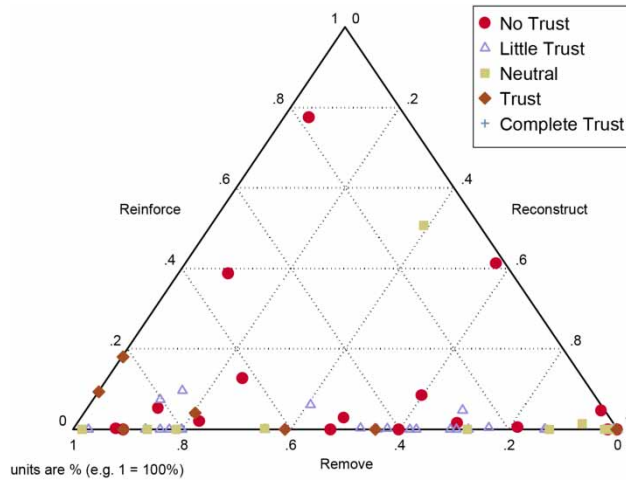


Fig. 3. Estimated preference for levee policy strategy by the level of trust in the US Army Corps of Engineers.

The third tertiary plot examines the relationship between river management strategy and policy preference. As presented in Figure 4, the illustration clearly shows how this approach has divided the stakeholders. Those who support a ‘strong ecology’ perspective were clustered in the upper region of the predicted probabilities for preferring the removal of the levees. Conversely, those who preferred an equal approach or one that leaned more toward risk aversion were clustered in the upper region for reconstructing the levees. Clearly, this represents a fairly strong divide in the debate over how to deal best with the levee situation. Furthermore, the three probabilities greater than 40% for reinforcing the levees are all associated with those who prefer ecology more than risk aversion.

The tertiary plot featuring the influences of concern about the risk of flooding can be found in Figure 5. While the clustering may not be as apparent for those with risk perceptions in the middle range, a division is apparent when risk perceptions were at the two extremes. Those who were ‘not

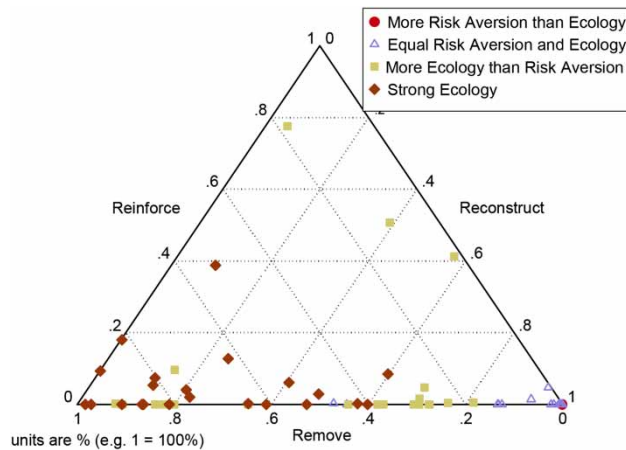


Fig. 4. Estimated preference for levee policy strategy by the preferred river management strategy.

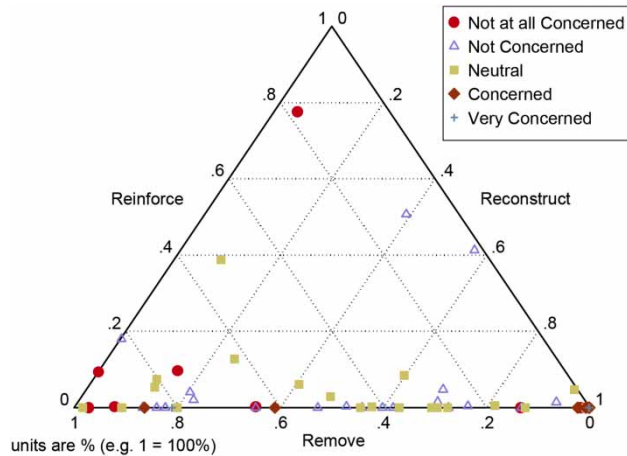


Fig. 5. Estimated preference for levee policy strategy by the perception of flooding risk.

at all concerned’ about the risk of flooding were clustered toward the higher end of the probability predicting preferring the removal policy. Those who were ‘very concerned’, with one exception, were stacked at the intersection of 0 for both the reinforce and remove policies and 1 for reconstruct. Similarly, those who were ‘concerned’ tended to be clustered toward the higher probabilities for reconstruct. The three probabilities greater than 40% for reinforcing the levees were associated with stakeholders who were not particularly concerned.

Finally, a tertiary plot was created for the influence of the concern about the risk of pollution, which is presented in Figure 6. Notice that the predicted probabilities for those who are more likely to prefer either reconstructing new levees or the removal of current levees are an incongruent mess, reflecting the insignificant predictor in their respective comparison. However, all three predicted probabilities greater than 40% for reinforcing the levees were associated with stakeholders who were concerned about the risk of pollution.

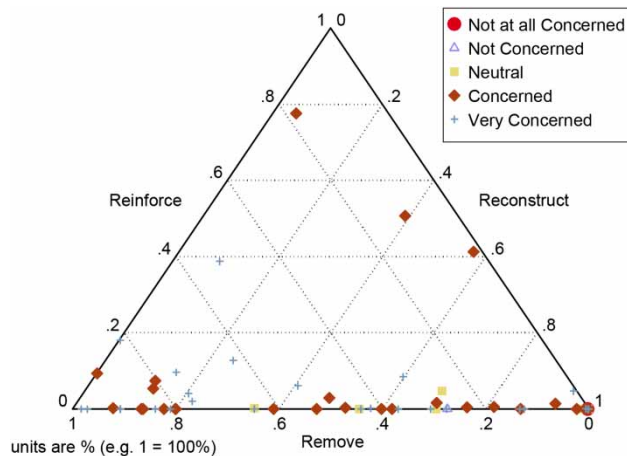


Fig. 6. Estimated preference for levee policy strategy by the perception of pollution risk.

5. Discussion

I began this project with the intent of understanding better the nature of stakeholder policy support for competing strategies to address degraded levees. As illustrated in [Table 1](#), a fairly substantial number of stakeholders expressed levels of support and opposition that were identical for these policy options, despite the inherent mutual exclusivity. Using a multinomial logit analysis, I directly examine the determinants of why a stakeholder would prefer one policy alternative over the others. Several important implications are derived.

First, the results suggest that stakeholders most support the reconstruction of levees to include green spaces over policy alternatives. However, support for the removal of the levees is fairly strong. These results suggest that stakeholders are not necessarily convinced that simply reinforcing already degraded levees will guarantee that these levees are structurally sound. Given the earthquake activity in the region, this is likely a reasonable concern. It appears as though stakeholders will only feel comfortable that the threat of flooding is sufficiently mitigated if the levees are completely reconstructed. This is apparent in the analysis, as those who were more concerned about the risk of flooding were less likely to prefer reinforcement over reconstruction. This distinction is important because the preferred position of the Army Corps is to reinforce existing levees, and in the past the Army Corps held out until the city and state capitulated to their demands. Currently, though, it appears that stakeholders do not believe that the reinforce approach will yield structurally sound levees. This suggests a prolonged fight between the Army Corps and the city until one of the sides caves.

Second, determinants of stakeholder policy preferences appear to be primarily predicted by attitudes and risk perceptions. All five modeled attitudes and risks predicted levee preferences in one of the two analyses, with two (flood risk and river management strategy) predicting in both. While one would hope that some level of expertise and knowledge would distinguish stakeholders from the general public, these results suggest that they are driven by the same general characteristics that typically influence the public's support for policy proposals (e.g. [Lubell, 2002](#); [Lubell et al., 2007](#); [Stoutenborough et al., 2013, 2014, 2015](#)).

While stakeholder policy preference determinants are not particularly dissimilar from what the public policy literature would suggest informs the general public's preferences, the influence of a stakeholder's preferred river management strategy suggests a nuance that is unlikely to be found with the public. This nuance should reflect their better understanding of the issues. Indeed, while the public may have assessments regarding whether they believe the levees are generally good, trust the Army Corps, and perceive high levels of risk associated with flooding or pollution (and extant literature would largely expect similar predictive patterns as found here), they are less likely to have considered whether they prefer a river management strategy that emphasizes either risk aversion or an ecologically friendly approach. Such an assessment should require a better understanding of the ecosystem weighed against various threats. The general public is less likely to have conducted such an assessment because they are not as knowledgeable or engaged on water issues (if they were, they would likely be stakeholders). For there to be a cohesive impact on policy preferences suggests that this measure is capturing a meaningful construct, and it is not clear whether the public has a strong enough understanding of the issues to develop a meaningful position.

Third, although the influence of attitudes and risk mirrors what would be expected with the public, these policy preferences do not appear to be particularly driven by partisan or ideological differences. Importantly, ideology and partisanship tends to dominate policy attitudes of the public on environmental issues (e.g. [Bies et al., 2013](#); [Stoutenborough et al., 2015](#)). While party identification is a slightly

significant predictor of preferring the removal of levees over the reconstruction of levees, neither party identification nor ideology approach a statistically significant influence in the rest of the analysis. In many ways this is surprising, and suggests that the various coalitions are likely quite diverse.

Fourth, the differing influences of the two risk perceptions suggest a hierarchy of risk for stakeholders. The results suggest that the risk of flooding is more important to stakeholders than the risk of pollution. This is interesting because the most vocal stakeholders appear to be emphasizing the river degradation argument. Either this is a very vocal minority (it does predict the difference between reinforcement and reconstruction), or stakeholders are not bothering to discuss the elephant in the room – the risk of flooding. Clearly, this discussion started because the levees were deemed too degraded for the Army Corps to guarantee. However, the direct risk of flooding is not a major issue that is discussed, except when stakeholders are arguing that the risk is not as great as the Army Corps suggests. Regardless, additional research is needed to better understand these differences.

Finally, the results of this analysis are likely relevant to many other regions. The degradation of levees is not unique to Pocatello. Similar debates are likely occurring in communities across the country and around the world. Many additional communities will be forced to confront these issues in the near future. The unfortunate reality is that levee infrastructure is aging, and, like many other public infrastructure projects completed in the middle of the 20th century, we can no longer ignore the need to replace or substantially repair these structures. These results should provide much needed insight into these debates and the motivations that influence stakeholder policy preferences.

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