Water Infrastructure Challenges in Urbanizing Environments: A Case Study of the 2009 Logan Canal Landslide

Kathryn Davis Henderson
Utah State University

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WATER INFRASTRUCTURE CHALLENGES IN URBANIZING ENVIRONMENTS:
A CASE STUDY OF THE 2009 LOGAN CANAL LANDSLIDE

by

Kathryn Davis Henderson

A thesis submitted in partial fulfillment
of the requirements for the degree
of
MASTER OF SCIENCE
in
Human Dimensions of Ecosystem Science and Management

Approved:

Joanna Endter-Wada
Major Professor

Zhao Ma
Committee Member

Josh Runhaar
Committee Member

Mark McLellan
Vice President for Research and
Dean of Graduate Studies

UTAH STATE UNIVERSITY
Logan, Utah
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ABSTRACT

Water Infrastructure Challenges in Urbanizing Environments:
A Case Study of the 2009 Logan Canal Landslide

by

Kathryn Davis Henderson, Master of Science
Utah State University, 2012

Social constructions, or frames, often determine how and to whom benefits and burdens are delivered by public policy. Triggering events often open policy windows in which drastic policy changes can occur. In July of 2009, a wet, steep hillside failed in Logan, Utah, leveling a home below and destroying an irrigation canal that ran along the hill. The resulting policy changes illustrated how social constructions of agricultural producers in terms of deservedness and power shifted, both as a result of urbanization and as a result of the landslide. Policy processes are often path-dependent and decisions can become self-reinforcing. Analyzing the pathway that led up to the landslide provided insights into the importance of proactive management and long-term planning of water infrastructure, especially in urbanizing environments. By using policy and discourse analysis, this thesis highlights water management challenges involved in the urbanizing arid U.S. Intermountain West and how planners and policymakers can use this information to achieve democratic policy solutions.

(82 pages)
PUBLIC ABSTRACT

Water Infrastructure Challenges in Urbanizing Environments:
A Case Study of the 2009 Logan Canal Landslide

Kathryn Davis Henderson

In July, 2009 in Logan, Utah, a wet, steep hillside failed, leveling a home below and destroying an irrigation canal that ran along the hill. Three people were killed. The event and the resulting policy changes present an opportunity to uncover how frames, or social constructions, play into the policy development cycle. This case also uncovers the nuances involved when old infrastructure takes on new social meanings. Planners and policymakers that pay attention to frames and social dimensions may be able to minimize conflict.

The landslide received immediate media attention and spurred state legislation on canal safety. The event had an effect on how agricultural producers like farmers and canal shareholders were perceived. Perception of a group’s deservedness and power often determine how benefits and burdens are delivered to them through policy. The tensions between how farmers are “framed” by others and how they are delivered benefits have been highlighted using newspaper articles, state legislation and code, and the documents prepared as part of the Environmental Impact Study.

This case study is relevant because it is an example of the social challenges involved in infrastructure upgrades. The canal system in Cache Valley is over a century old and in need of repair. Throughout the United States, water infrastructure systems like dams, drainage systems, and treatment facilities are reaching the point where they will need upgrading or replacement. Many of these facilities have social significance, as the old open canals do in Cache Valley. Understanding how the public defines and assigns meaning to these systems is important for finding equitable solutions in planning and policy.
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I would like to thank my spouse, Sam Henderson, who has been an incredible support even while pursuing his own graduate degree.

Kathryn Davis Henderson
DEDICATION

This thesis is dedicated to Jacqueline Leavey and her children, Victor and Abbey.
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CHAPTER I
INTRODUCTION

Interactions between humans and the natural environment is an important focus of human dimensions fields of natural resource management and ecosystem science including environmental economics, sociology, and geography. Humans interact with natural systems directly and indirectly. Even actions that seem unrelated to natural systems have direct and indirect connections to natural systems. The focus of this thesis is the interaction of people with water through infrastructure technology in a specific case study setting.

The importance of technology in human society is often under-emphasized. Bijker (2008) discusses the critical role of technology in shaping human values and interactions, and the role of human values and contexts in shaping technology. Technology is mistakenly viewed as autonomous and value free (Bijker 2008, p. 683) when, in reality, technology is subjective, shaped by social factors, and framed by social and political forces.

Because water is critical for human life, water technology is a critical part of society. In the industrializing United States, centralized water treatment facilities and sewer systems were one of the most important steps in improving health and quality of life in US cities (Cutler and Miller 2004) that had been battling cholera and other water-borne diseases (Lens et al. 2001). Water infrastructure projects installed in the eighteenth and nineteenth century made agricultural production possible in arid regions like the Intermountain West of the United States (Reisner 1986).
After water infrastructure is built, it needs to be maintained and regularly replaced because pipes and cement corrode, walls crumble, and canal banks erode over time. If communities stayed the same in terms of population and water demand, then that regular maintenance would be enough. However, communities change over time. Many places in the U.S. Intermountain West are undergoing changes that researchers characterize as the rural-to-urban shift, or an urbanization of formerly rural areas through population growth and economic development. In this region, many rural areas are becoming urbanized by increased regional in-migration, which some attribute to the amenity values provided by scenic landscapes and open-space (McGranahan 2008), and the lower costs of living and population densities (Henrie and Plane 2008). In these formerly rural areas, water infrastructure like dams and ditches that were constructed for agricultural purposes now have to support more urban uses.

In addition to the infrastructure systems coming under pressure to support more diversified water uses or increased capacities in the Intermountain West, the traditional pro-agricultural approaches used by water managers and decision makers are being questioned by a more urban population. The preference for water allocations for raising crops and for state and federal subsidies to support those activities is no longer a given (Ingram 1982; Wahl 1989). Increased demands for environmental and aesthetic considerations like water quality, aquatic wildlife, and scenic beauty all complicate the public policy and planning decision making spheres. Members of the public can frame events or recipients of policy benefits in ways that support or oppose policy actions. In the public discourse, coalitions and individuals use different frames to compete for desired policy outcomes (Hajer 1995).
Cache County, Utah is an ideal setting to investigate both the challenges of managing and upgrading water infrastructure in an urbanizing environment and the tensions created by controversial discourse about water infrastructure decisions. Cache County is located in the U.S. Intermountain West in the northern part of Utah just south of the Idaho border. It has been an important agricultural production region since its settlement by pioneers of The Church of Jesus Christ of Latter-Day Saints (commonly called the Mormon church) in the 1850s. Over the last forty years, Cache County has seen rapid population growth. The county population has grown at a rate of 23.3% over the last decade alone (U.S. Census Bureau 2010). Towns and cities have grown and expanded, sprawling into farmland, which is disappearing at a rate of 600 acres a year, according to some estimates (Bear River Association of Governments 2012).

In 2009, a wet steep hillside in Logan, known as the Logan Bluff, failed, leveling a home below, killing three people, and destroying a section of an old irrigation canal. The landslide was not the first in the area, but it was the first to ever cause loss of human life. The event sparked a state legislative response and federal funding was provided through the Natural Resources Conservation Service to repair the canal and restore irrigation delivery to canal shareholders including farmers and municipalities. The reconstruction project enabled the privately owned canal company to make upgrades to the canal that will make it more functionally suitable to the current urbanized context. This process is analyzed in Chapter II. The reconstruction project became a source of controversy because many members of the public felt that the canal company did not deserve the federal financial assistance for a variety of reasons. The different “frames” embedded in the public discourse are the subject of Chapter III.
REFERENCES CITED

www.brag.utah.gov/develop_ag.html


http://quickfacts.census.gov/qfd/states/49/49005.html

CHAPTER II

PATH DEPENDENCE AND THE COSTS OF COMPLACENCY:
A CASE STUDY OF THE LOGAN CANAL DISASTER

In the past few decades, cities in the Intermountain West region of the United States have undergone a period of rapid population growth and economic development, which has placed added pressure on the region’s limited water supplies (Anderson and Woolsey, 2005). Two approaches dominate the current strategy to manage urban water supplies in the West: reallocating water among different users, and increasing water use efficiency to prevent waste (Western Governors’ Association, 2006, 2008; Western Water Policy Review Commission, 1998). Reallocation efforts include importing water from other areas, transferring water from agriculture to urban uses, and facilitating trades from lower to higher economic uses through water markets (Anderson et al., 2012; Howe and Easter, 2011; MacDonnell and Rice, 2008; National Research Council, 1992, 2002; Sax 2008). Water reallocation has been controversial in many instances. Most states attempt to improve water use efficiency by promoting human behavioral changes in water use or through upgrading infrastructure by lining or piping canals and installing water technology controls to better monitor and manage water quantity (American Water Works Association, 2006; Clayton and Meyers, 2009; Western Resource Advocates, 2003).

Upgrading water infrastructure has been identified as an important challenge in the United States (American Society of Civil Engineers, 2010; Copeland and Tiemann, 2010). In the latter half of the nineteenth century and first half of the twentieth century, large-scale federally sponsored projects were installed throughout the Intermountain

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1 This manuscript co-authored by Kathryn Davis Henderson and Dr. Joanna Endter-Wada
West in order to facilitate settlement and agricultural production (Ingram, 1982; Reisner, 1986; Wilkinson, 1992). Many water infrastructure facilities like reservoirs and canals, which are vital to agricultural and urban uses in the Intermountain West region, are reaching the end of their designed life expectancy and are in need of repairs, upgrades, or replacements (American Society of Civil Engineers, 2010). Rapid population growth has put added strain on already aging water systems throughout the region. Several factors currently inhibit federal agencies from replacing water infrastructure in the same expedient manner in which it was first installed, including political arguments for reducing government’s role and promoting the private sector, competing demands on government budgets oftentimes in financial deficit, and the requirements of newer environmental laws.

In Utah, the first modern water infrastructure was constructed by Mormon settlers in the mid-nineteenth century (Harvey, 1989; Sadler and Roberts, 1994). The original intent of that infrastructure was to deliver irrigation water to farms and pastures. Now that many areas in Utah are transitioning from rural to urban land uses and political designations, this infrastructure is not only aging, but is functionally inadequate to meet new urban needs (Natural Resources Conservation Service, 2011; Utah Division of Water Resources, 2005).

This paper outlines the events and decisions leading up to a federally-funded reconstruction project of a privately-owned canal system in Logan, Utah after a tragic irrigation canal collapse. On July 11, 2009, a landslide occurred along a section of the Logan Northern (LN) canal that runs along a steep hillside known as the Logan Bluff. The landslide caused the complete breach and failure of the canal. Three people were
killed in the disaster when the house they were living in was destroyed. The failed section of the canal was closed, and irrigation delivery of water to LN shareholders was disrupted.

The landslide inspired state legislation pertaining to canal safety management (Hunsaker, 2011; Water Conveyance Facilities Safety Act of 2010). The Emergency Watershed Protection (EWP) fund, which is administered by the Natural Resources Conservation Service (NRCS), delivered funds to the community to reconstruct the canal and restore water delivery. The LN and the neighboring Logan Hyde Park Smithfield (LHPS) canal companies merged to create a single private canal company, the Cache Highline Water Association, in order to facilitate a project that would combine the two canals in an effort to make a single, more efficient system (Utah Board of Water Resources, 2010). Cache County agreed to be the contracting agency and to coordinate the project, and county officials worked with the NRCS to prepare an Environmental Impact Statement (EIS). The EIS was completed and a Record of Decision (ROD) was filed in October 2011. All of the cities that are serviced by the canals have agreed to finance their share of the project. Construction begins in 2012.

The landslide and subsequent policy responses are embedded in and influenced by the history and context of water management and land-use planning in Cache County. Many of the forces at work in Cache County exist in other communities in the Intermountain West: urban population growth, transfer of water from agriculture to urban uses, and aging and inadequate water infrastructure. The decisions made in response to these forces may have far-reaching effects in the future (Pierson, 2004). The primary objectives in conducting a situational, case study analysis of the Logan Canal disaster are
to: 1) trace the path dependency of changes in water infrastructure management participants, goals, and strategies; pinpoint critical decision points that shaped consequent events; and, interpret the water policy and planning challenges that such changes present for the urbanization of formerly agricultural land.

**THEORETICAL GROUNDING**

Paul Pierson (2000; 2004) analyzes how political processes can be “path dependent,” and characterizes the phenomenon in terms of increasing returns. “Each step along a particular path produces consequences which make that path more attractive for the next round. As such effects begin to accumulate, they generate a powerful virtuous (or vicious) cycle of self-reinforcing activity” (Pierson, 2000, p. 254). Increasing returns describe the rising “costs of switching to some previously plausible alternative” (2004, p. 21). Because switching pathways later in a particular historical trajectory can be difficult, relatively small decisions early on end up having a large effect on the direction of subsequent policies.

Technology development offers many examples of path dependence. If multiple technologies compete to provide similar functions, the technology that can attain “an edge may trigger positive feedback effects that may lock in the technology, excluding competitors,” even if later on, other options may be superior (Pierson, 2004, p. 23; also see Bijker, 2008). In the development of water infrastructure, technology built in the 1800s and early 1900s still provides a large portion of water-related services today (Copeland and Tiemann, 2010), even though other, more efficient technology options currently exist. In technology development, being “first” lends a distinct advantage, even
if “the eventual outcome may not be of maximum possible benefit” (Arthur, 1994, p. 112).

The water policies and management strategies pertaining to the Logan Canal system can be interpreted as path dependent in two ways. First, water laws and policies like prior appropriation, beneficial use, and private-company control over water delivery, which were designed to promote agricultural development in the 1800s, are still in place throughout the West, generally, and in Utah, in particular (Harvey, 1989; Ingram, 1982). Second, the technological infrastructure used to deliver irrigation water in Logan has remained largely unchanged, despite the current existence of more efficient technologies.

Planning strategies employed by decision-makers are often path-dependent as well. Once planning procedures are established, they tend to remain in place (Cortner and Moote, 1999; Henderson 2001). This has led to problematic consequences in natural resources management and planning (Holling, 1978). In recent decades, “adaptive management” has been advocated by scientists and professionals (see Everett et al., 1994; Holling, 1978) as a way to “[plan] for and [adapt] to surprise,” by constantly incorporating new information into planning strategies (Lessard, 1999, p. 87). Planners and decision-makers of the Logan Canal have relied on traditional planning approaches.

The tendency for technology, policy, and planning to be path dependent is problematic when societies undergo rapid changes (Pierson, 2004). Irrigation water infrastructure in Logan, Utah, was built in a very different societal context than the one in which the irrigation system is embedded today, mostly due to rapid urban population growth and urbanization of land (Bear River Association of Governments, 2012; U.S. Census Bureau, 1995) over the last few decades. Path dependence of water management
and infrastructure in a changing societal context forms the underlying framework of our analysis. We focus on the role of important decision points and how they contribute to the historical trajectory, particularly in regards to times when choices about whether or not to upgrade the irrigation delivery technology were addressed.

We also draw upon Endter-Wada and Blahna’s (2011) Linkages to Public Lands (LPL) Framework. The LPL Framework is a tool aimed at helping managers and planners integrate social factors in the analytic processes used for decision-making by mapping various “human linkages” to public land. People can be linked indirectly or directly to public land, and these linkages are part of the environment of public land that agencies need to assess in scientific and NEPA analyses, deal with in on-going management activities, and address because they influence public involvement and planning processes and outcomes. Endter-Wada and Blahna identify five primary linkage categories: tribal, use, neighboring land, interest, and decision-making linkages.

Although the LPL framework was developed for use in public land settings, the canal system in Cache County that transports the publicly-owned resource of water can also be viewed as a public resource people are linked to in similar ways. Since the primary focus of this analysis is on change affecting the management of the Logan canal system over time, we integrate the LPL framework with the dynamics of path dependency, arguing that changes over time in linkages people have to the Logan canal system contributed to dilemmas confronted in the wake of the Logan Bluff landslide.

RESEARCH APPROACH

Several case studies focusing on water management in the U.S. West have explored the effects of urbanization in formerly rural areas. The case studies highlight the
importance of coordination between urban planning and agricultural water policy (Lucero and Tarlock, 2003); the impacts of agriculture-to-urban water transfers on communities (Howe et al., 1990; Natural Resources Council, 1992); and the role of different strategies for improving the efficient delivery, use, and management of water, including engineering solutions (El Chami et al., 2011) and social, educational, and economic programs (Cummings and Nercissiantz, 1992; Roccaro et al., 2011). This case study adds a temporal focus to the analysis of decision-making and policy outcomes in contexts of rural-to-urban transitions in water use.

The case study approach is necessarily context-based and, unlike other approaches that attempt to decontextualize data by using statistical tools to eliminate interaction effects, the case-specific interactions are of special interest (Brady and Collier, 2004; Pierson, 2004; Ragin, 1987). Certain analytic trade-offs are involved in using this approach. By limiting the scope of the analysis to one case, the ability to generalize is limited. However, contextual information is crucial to understanding the policy process and context-based analysis adds “sensitivity to causal complexity and contextual effects with aspirations to draw out implications about social processes that transcend a single setting” (Pierson, 2004, p. 169). Adopting an “explicitly temporal focus” (Pierson, 2004, p. 178) lends more insight to a case than a snapshot or a decontextualized comparative approach. Neumann (2011) notes that the main advantage of the case study approach is to examine the effects of general phenomena on a specific setting. Since the focus of our analysis is on the interacting effects of aging infrastructure, urbanization, and population growth in Logan and how these affected policy decisions, a case study approach is appropriate for helping us trace how linkages to water through the
canal infrastructure changed over time and how path dependencies help explain the canal
disaster and public responses to it.

**Data Gathering**

Data was gathered through observational and ethnographic approaches by
attending and observing public meetings and collecting public documents (See
Appendix). Public meetings included those held in 2010-2011 that specifically addressed
the Environmental Impact Statement (EIS) of the canal reconstruction project and other
meetings and conferences that addressed canal management issues in general and the
Logan canal case specifically, including the 2010, 2011, and 2012 Northern Utah Mini
Water Conferences in Logan, Utah. Various historic, public, planning, legislative, and
policy documents and news reports were gathered to provide insights into the changing
social context and management strategies of the canals and to pinpoint important events.
These documents included the EIS materials published during the NEPA process,
planning meeting notes from public and canal shareholder meetings, and the Water
Conveyance Facilities Safety Act of 2010, a state legislative bill passed in response to the
Logan Bluff landslide. Sources of public discourse included comments submitted during
the NEPA process of producing the EIS and letters-to-the-editor in the local newspaper,
*The Herald Journal*. In addition, presentations given to the Water Law and Policy class at
Utah State University from January to April 2011 by professionals, key citizens, and
legislators involved in the Logan Canal reconstruction EIS process provided some
preliminary data. Personal communications with public officials also informed the
process and provided insights.
Data Analysis

Analysis of the data included content analysis, discourse analysis, and theory guided process-tracing. Content analysis is a research technique that involves a close reading of relevant texts in order to make inferences about a particular phenomenon (Krippendorf, 2004). Rigorous content analysis of secondary documents provided most of the relevant information about decision points that occurred over time in the Logan Canal case. Our goals in using content analysis were to identify the main arguments and rationales used in planning decisions and the contextual details that informed those choices.

Discourse analysis is a form of content analysis that focuses on the social construction of ideas and events through communication (Hajer, 1995; Philips and Hardy, 2002). To gauge public perception of the planning goals and purposes, we analyzed public discourse found in EIS comments, letters-to-the-editor, and field notes from meetings about the canal. Discourse analysis is a widely used approach to identify trends and themes that influence policy or explain phenomena. Hajer’s (1995) approach to discourse analysis seeks to uncover why some explanations of problems gain dominance over others in policy debates.

Process-tracing attempts to establish causal mechanisms between events and outcomes in case studies by examining historical documentation (George and Bennett, 2005). It is useful for explaining historical events and outcomes in a particular case study, and testing or developing theory (George and Bennett, 2005). The theory guiding the process-tracing is Pierson’s treatment of path dependence in policy processes (2004). Specific attention to sequence and timing of decisions affecting the management and use
of the canals helped us interpret how management approaches and decisions were embedded along a historical pathway. These planning decisions are embedded in the larger context of landscape change and urbanization.

1860-1940. AGRICULTURAL PRODUCTION

Cache Valley, which straddles the border between northern Utah and southern Idaho, was settled in the 1860s by pioneers who were members of The Church of Jesus Christ of Latter-Day Saints (commonly referred to as Mormons). Because the valley is blessed with comparatively more water than surrounding areas, it was an important hunting and habitation site for Shoshone and Bannock tribes, and later on trappers and traders, before Mormon settlement (Peterson, 1997).

Agricultural development was part of the religious philosophy and settlement practice of Mormon leaders who taught that the “desert will blossom as the rose” (Arrington and May 1975; Peterson, 1974). In addition, Mormon settlers were encouraged to live in tight-knit, socially coherent groups surrounded by community members (Ellis, 1996; Guth, 2009). Both of these ideas were encapsulated in “The Plat of the City of Zion,” a settlement pattern established by Mormon church leaders and implemented in most Mormon settlements, including Cache Valley (Jackson, 1977). The rigid settlement pattern included residential clusters organized into rectangular blocks with large lots to accommodate family-scale food production, wide roads, open irrigation ditches, and church meetinghouses (Francaviglia, 1978). Farmland surrounded residential clusters, but farmers tended to live in town (Guth, 2009; Peterson, 1997).

Irrigation infrastructure was among the first projects the pioneers built in new settlements (Arrington and May, 1975; Harvey, 1989; Sadler and Roberts, 1994; Wrenn,
In Cache County, the LN and LHPS canals were dug in 1860 using animal-drawn plows and intense human labor (Wrenn, 1973). Earlier irrigation canals had been installed in previous Mormon settlements, lending some experience to the construction (Harvey, 1989), but for the most part, the canals were installed without the benefit of scientific expertise or sophisticated grading techniques (Peterson, 1997; Sadler and Roberts, 1994). The canals diverted water from the Logan River and ran north to farms and villages. Thanks to the accommodating climate and the canals, Cache Valley quickly became a leading agricultural production area within what is now the state of Utah (NRCS, 2011; Utah Irrigation Commission, 1895).

During the first two decades after settling Cache Valley, Mormon settlers managed the canal and other community resources collectively (Wrenn, 1973). Disputes over water were settled by a bishop according to the direction of the Mormon Church leadership in Salt Lake City (Sadler and Roberts, 1994). At the time, territorial government and church authority overlapped, so even though water disputes were settled within a religious organization, the control of water was quasi-governmental (Sadler and Roberts, 1994). During the 1880s when the territory of Utah was trying to acquire statehood status within the U.S., church management transitioned to private and federal management of water resources, including management of irrigation canals. In the 1880s, the LN and LHPS Canal Companies attained control of the canals under a new territorial law that reflected the changing regional trends toward “the free enterprise philosophy” (Sadler and Roberts, 1992, p. 5). Shares to the LN and LHPS water rights were sold to farmers and residents, who paid an annual fee for irrigation delivery. Shareholders held regular meetings to determine fees, prioritize maintenance tasks, and resolve water
distribution issues. Neither the state nor the Mormon Church regulated the operation of the private canal companies.

Throughout the Intermountain West, settlement and western expansion led to the establishment of certain practices to manage natural resources, particularly water. First, was the notion of *first in time, first in right*, which would later be codified into the state water law known as prior appropriation (Getches, 2008). The practice was initiated to protect early water users (who initially were miners, farmers, and settlers) from harm if another user began diverting water upstream (Getches, 2008; Ingram, 1982). Today, Utah water law guarantees the holder of a water right the ability to use a specified amount of water for a certain use in a particular location in perpetuity, according to the priority date based on when the water was first put to beneficial use. In 1903, six years after Utah was granted statehood, water law in Utah was codified and the LN and LHPS canals’ water rights were formalized with priority dates of 1860 (Peterson, 1974).

Canal companies had a single task: to deliver irrigation water to their shareholders. The importance of agriculture to the economy and landscape of Cache Valley meant that the canal companies served a visible and integral role in the community. Agriculture remained Cache County’s dominant economic sector throughout this period, and in 1888, the Utah Agricultural College, which later became Utah State University, was established, further solidifying Cache County’s place as a leader in statewide agricultural development (Utah Irrigation Commission, 1895).

1940-1970. SLOW URBAN GROWTH

From 1940 to 1970, the population of Cache County grew from 30,000 to 42,000 (U.S. Census Bureau, 1995). Throughout the United States, the “baby boomer”
population explosion, the increasing reliance on the automobile, and the expansion of roadways “facilitated the movement further from the town core where land was less expensive” (Guth, 2009, p. 33). This was true in Cache Valley, and in the decades after World War II, residential development sprawled out from the city cores into farmland, and along the canals (see Figure 3). During this period, several homes were built along the Logan Bluff, the site of the 2009 landslide. Cache Valley cities did little to stand in the way of urban development, and canal company managers were not consulted about plans to build along canals.

The increasingly urban population, disconnected from the canal by any official use of its irrigation water delivery, nevertheless took advantage of the canals in two significant, “unofficial” capacities. First, most urban stormwater runoff was diverted into the canals. Second, the canals were increasingly seen as cultural resources, providing recreational and scenic benefits to Cache Valley residents.

Stormwater runoff in the canals was at first seen as a benefit by canal companies which could often use more water so they did not discourage cities from diverting stormwater into their systems during this period (NRCS, 2011). The convenience of using the canals to divert stormwater alleviated cities from the costs of installing separate stormwater systems. Despite increasing stormwater inputs into the canals caused by residential development, cities and canal companies did not officially coordinate the management of the canal, setting a precedent that would later cause dilemmas.

The increase in residential development along canals was accompanied by increased recreational use of the water in the canal and the private maintenance roads that run along the canals (Kennedy and Unhanand, 1974). Common recreational activities of
the water in the canal included swimming, tubing, bird-watching and even fishing (before fish screens were installed). The roads were accessed for jogging and dog-walking. Kennedy and Unhanand (1974) examined the recreational use of Logan canals and recommended these uses be formalized, but discovered that recreation was not a priority to canal company officials who admitted that while efficiency was a goal for future improvements, they “seldom discuss recreation problems at their meetings” (1974, p. 56). The researchers recommended that canal companies analyze future recreation uses as “rationally as they do their irrigation problems” (Kennedy and Unhanand, 1974, p. 56) and that city and county supervision of recreation was a possible solution.

Water storage, conveyance, and irrigation technologies were improving nationwide during this period and federal agencies funded large and sophisticated water projects throughout the U.S. West (Ingram, 1982; Reisner, 1986). Many federally-funded irrigation projects were installed throughout the region during this period, including the large Central Utah Project (Dawdy, 1989). The LHPS and LN canal companies recognized the inefficient design of their unlined and uncovered canals, which lost water to seepage and evaporation (Molina, 2008). In the 1960s the canal companies contemplated combining the two canals and transporting the water in pipes (Kennedy and Unhanand, 1974). However, no canal system redesign or replacement was implemented at that point in time.

1970-2009. PUBLIC USE AND DECISION-MAKING REGARDING CANALS

This period was marked with obvious urban encroachment along the canals (see Figure 3) that diversified the nature of people in neighboring land and decision-making linkages to the canal and the irrigation water that it delivered. The population of Cache
County nearly tripled from 42,000 to almost 113,000 in 40 years. Cities and towns responded to the growing population by expanding into agricultural land. A recent study estimated that farmland in Cache County is being lost at a rate of about 600 acres per year to development (Bear River Association of Governments, 2012).

Rapid urban development and the growing number of impervious surfaces in the valley amplified the volume of stormwater entering the canals, increasing the frequency of flooding and structural damage to the canal and to neighboring homes (Utah Water Research Laboratory, 2006). After a 2005 landslide along the Logan Bluff, several pipes were installed in the hillside to divert naturally occurring water and inputs from uphill sources into the canal (Olsen, 2006). The lack of coordinated management between cities and canal companies over stormwater became an important issue during this period. City approval of residential and commercial development in potentially flood-prone areas near canals in Cache County (see Pitcher, 1999; Stetler, 2000) raised concerns about stormwater conveyance (Wilkins-Wells et al., 2005), safety (Cache County Agricultural Advisory Board, 2003), and liability issues (see Leavitt, 1999; Semerad, 2009). The decision-making responsibilities of municipalities over the management of stormwater became a more visible issue, but the exact nature and terms of their responsibilities over the canals were unclear (Nielson, 2011; Rose, 2012). Many water managers began to see the appeal of a water district or other semi-governmental agency to manage canals that would help them address these concerns (Huppi, 2011). However, the possibility of a publicly-funded water district in Cache Valley remains controversial.

In the 1990s, the LN and LHPS canal companies considered the idea of combining systems and lining or piping their canals to address the continuing problem of
seepage (Molina, 2008), but shareholders voted against these proposals because of costs (Huppi, 2011). Canal officials estimated that an infrastructure upgrade to the scale of the eventual 2012 reconstruction project would have cost approximately $300,000 in the 1990s (Huppi, 2011).

After the 1980s, industry and business sectors displaced agriculture as the leading economic sector in Cache Valley. The top employer in Cache County by the 2000s was Utah State University. However, agriculture remains an important part of the economy and landscape: nearly 80,000 irrigated acres of land produce a variety of crops, and sustain beef and dairy industries (Godfrey et al., 2006). The Cache County Agricultural Advisory Board was formed to help Cache County prioritize agriculture in policy and land-use decisions (Bear River Association of Governments, 2012). Envision Cache Valley (2008), a regional plan, aimed to concentrate growth and development in existing towns in order to preserve agrarian and natural lands.

As agricultural lands in Cache County changed ownership in the process of urban development, municipalities often bought the water used on that land. By the 2000s, the majority shareholders of the LHPS canal were not agricultural producers, but municipalities and Utah State University (NRCS, 2011). As a result, these new shareholders who had more urban concerns exerted a growing influence over the decision-making and management of the canals.

Recreational use of the canal increased during this time period, and became a nuisance for canal owners (NRCS, 2011). Some sections of the canal were fenced and posted to discourage recreational use. Shortly after the 2009 landslide, tubing the canals was prohibited by the county because of safety concerns.
POST 2009: EFFECTS OF LOGAN BLUFF LANDSLIDE

The 2009 Logan Bluff landslide occurred in July, during peak irrigation season. The event resulted in immediate media attention during the initial rescue and clean-up efforts and the subsequent developments. The landslide was the catalyst for a statewide bill on canal safety.

The landslide interrupted irrigation service to LN shareholders. An emergency system through a small canal running through private property near the Logan Bluff was implemented to restore delivery to some shareholders (NRCS, 2011). Immediately, canal owners began to plan for a reconstructed system that would enlarge the LHPS canal’s capacity to accommodate both canals, bypass the hazardous area of the Logan Bluff, line or pipe a significant portion, and restore irrigation delivery to shareholders. This was, in fact, the same design plan considered many times by the canals but never implemented (Huppi, 2011; Kennedy and Unhanand, 1974). The plan was eventually selected through a process mandated by the National Environmental Policy Act (NEPA), a procedural law applicable to all actions funded by the federal government.

The preferred alternative selected in the 2011 Record of Decision will address several issues recognized before the landslide, including stormwater, water conveyance inefficiency, and safety. The reconstructed canal system will transport the water from the point of diversion through a pipe for a certain length, reducing loss from seepage. Stormwater inputs will be kept separate from the piped irrigation water. Piping the canal will reduce safety risks from water-based recreation by eliminating this use completely.

The Utah Legislature passed the Water Conveyance Facilities Safety Act in 2010, just a few months after the landslide. The bill encourages (but does not require) canal
companies to draft management plans that would identify hazards, identify and delineate responsibilities shared between the canal companies and nearby municipalities, and plan emergency responses (Hunsaker, 2011; the Water Conveyance Facilities Safety Act, 2010).

A year after the landslide, the Environmental Impact Statement (EIS) process began to select a construction alternative for the canal. The Natural Resources Conservation Service (NRCS), a federal agency, agreed to provide federal funding through the Emergency Watershed Protection program to cover most of the cost of the canal reconstruction project, managed preparation of the EIS that would examine and compare different alternatives for the canal reconstruction, and made the final decision. Although other alternatives were analyzed, the alternative that was selected was the same one that had been considered since the 1960s, and that had been voted down once in the 1990s.

Stormwater is explicitly addressed in the EIS, but recreation is not. The EIS recognized that recreational use of the canal was an important public concern (see Chapter 3); however, recreation is usually referred to as “unauthorized use.” Recreation does not factor into the Record of Decision (ROD) and will not be addressed by the reconstruction project. Independent citizen groups are in the process of coalescing support for a formalized recreation corridor that would be sponsored by Cache County.

The total cost of the project was estimated in 2012 at around $25 million, 75% of which would be borne by NRCS. The remaining 25% of the cost is shared among canal companies and cities in a 61% to 39% split. Negotiations between the cities and canal companies to draw up a contract that would delineate management and financial
responsibilities are still ongoing as of 2012, but appear to be drawing to a close (Rose, 2012). The contract includes both a cost participation agreement and an operational agreement that addresses current management priorities like stormwater and irrigation (Rose, 2012). This document is the formalization of cooperative stormwater management between cities and canal companies, a need that has been recognized for decades. However, the problem of continued development along canal alignments and public access for recreation are not a part of the negotiations and remain unaddressed.

The 2009 Logan Bluff landslide led to two important outcomes. First, the reconstruction project will address a portion of the linkage changes that have occurred over time, explicitly integrating stormwater in the design and function of the canal system. Second, water managers have legally formalized the coordinated management and financing of the canal system, both for this reconstruction project, and for activities and upgrades in the future (Rose, 2012). In other words, as a result of the landslide and subsequent NEPA process, some of the additional decision-making linkages that emerged over time have been formalized.

**DECISION POINTS AND ALTERNATE PATHS**

Critical decision-points throughout the history of the canal system in Cache County determined the path that eventually led to the 2009 canal disaster, subsequent EIS process, and legislative response. In the early history of Cache County, decisions related to settlement, investment in agriculture, and construction of community water infrastructure that later became privatized were pivotal in obvious ways, setting precedents of water policies and management strategies that served private agricultural uses and established the canals in their physical alignments. In the following period of
slow urban growth from 1940 to 1970, the precedent of canal management uncoordinated with city planning was set, and future problems that would result from urban encroachment and stormwater management were not addressed.

During the period after 1970, when the population began to rapidly increase, three critical decision-points determined the trajectory of canal management. First, the canal companies, in which cities and the state of Utah became majority shareholders, had opportunities to upgrade the system but decided against it. The decisions to delay canal upgrades were made by majority vote among shareholders whose main objection to the project was aversion to increased shareholder fees. Delaying the upgrades increased the cost of the project in the long run and made the shareholders more dependent on external federal funding.

Second, despite urging from Cache County Agricultural Advisory Board and other organizations, municipalities and canal companies did not succeed in negotiating formal agreements about management of stormwater, urban encroachment, or recreational use of the canals. Various decisions resulted in lack of coordinated management of municipal stormwater, urban development, and recreation between the municipalities and canal companies even though such coordination was promoted by many organizations and recognized as an important issue. The failure of these entities to come to formal agreements delayed the process of upgrading the canal system to account for new urban use linkages to the canal water.

Third, the lack of long-term planning for the eventual replacement of a century-old canal system meant that local investments or savings needed to implement upgrades and replace inefficient infrastructure were not available. Most water infrastructure has an
anticipated life expectancy. Proactive investment by shareholders in future upgrades and maintenance of infrastructure is a potential strategy to lower overall costs and reduce future risks. The Cache County canal system is well over a century-old; it is doubtful that anyone believed that the earthen canals would last forever. The failure of canal companies to raise funds over time to re-invest in the canal system in order to implement design changes, upgrades, or repairs resulted in a situation where people’s lives were put at stake.

These three decision opportunities were, in fact, points at which choices were made not to act. Decision points necessarily introduce trade-offs to decision-makers who have to weigh alternatives against each other on various criteria, particularly risk management. Trade-offs made in the Logan Canal case involved primarily cost and safety. The cost of upgrading the canal without federal investment would have fallen on the shoulders of canal shareholders, including municipalities that would have spread that cost among taxpayers. These infrastructure costs were an immediate, short-term financial risk, while safety was a future, ambiguous, less predictable risk. Canal company officials and municipal decision-makers avoided the short-term financial risks and accepted the long-term safety risks. Policy-makers tend to be risk averse in making decisions (Schneider and Ingram, 1997), and, in the face of competing risks, tend to favor decisions that maintain the status quo, reinforcing the path of past decision processes and policies (Pierson, 2004). In this case, this eventually led to the canal companies and municipalities incurring greater financial and safety risks in the long run.
THE COSTS OF COMPLACENCY

As Intermountain West cities continue to experience rapid urban growth, more sophisticated and coordinated efforts between water utilities and land-use planning is essential. In Logan, linkages to water carried through the canal infrastructure changed in nature and number over time. However, the water technology remained static in a changing society and was eventually functionally inadequate for the diverse needs it had to meet. Certain decision-points surfaced that presented managers, planners, and policy-makers with opportunities to change the trajectory of infrastructure management by mitigating risks along the canal and raising capital to upgrade the infrastructure to better meet community needs. However, because financial and political costs were assumed by the canal shareholders, representing just one linkage among a growing and diverse array of human linkages to water carried by the canals, those changes were not made.

Decisions not to act earlier to address aging canal infrastructure had two main consequences. First, it made the canal system more vulnerable to accidents and disasters. Second, it made the entire community more financially dependent on reactive solutions opened up through disasters like the Logan Bluff landslide. This case suggests that a long-term infrastructure planning strategy that includes projections for future needs, financial investment for future upgrades, and a proactive, rather than reactive decision-making approach would have been much more efficient and socially responsible than standing by until an emergency necessitated a response.

Although it is easy to insist on long-term planning and call for increased up-front costs and taxes to upgrade and maintain water infrastructure, this case study also illuminated the difficulty that planners will likely encounter depending on the political
context within which they work. Increasing taxes or fees is a risky decision for policy-makers (Schneider and Ingram, 1997), as is exerting government regulations on a private business, especially in conservative political climates such as the one in Utah. Raising taxes will continue to be a barrier in implementing long-term planning and infrastructure upgrades in urbanizing communities. However, in some senses, the future trajectory of the Logan Canal systems seems to be transitioning to more public use and public control. If the canals are managed by a public utility, additional options would be available for resolving issues concerning liability and the use of public funds. In some ways, the canal system could come full circle; from its beginnings as a communal water system through years of being a privately owned and regulated canal system, to once again becoming a more public water system. The reconstruction project that is slated to begin in 2012 could be the critical decision point that sets a new pathway for canal management in Logan well into the future.

This case study illustrates the importance of management decisions about water infrastructure over time. The temporal element of each of the events that preceded the 2009 landslide is crucial to understanding the “how” and the “why” of the policy process after the landslide. Planners who face expensive infrastructure upgrades or redesign projects should encourage the coordination of managers, investment in the maintenance and future needs of water infrastructure, and early adoption of improvements when possible.
REFERENCES CITED


Figure 1: Timeline of Context Changes and Events of the Logan Canal System
Figure 2: Population Growth in Cache County 1900-2010. Source: U.S. Census Bureau
Figure 3. Urban Encroachment along Logan Canals, 1966 to 2009 Comparison
Figure 4. Preferred Alternative of the Logan Canal Reconstruction Environmental Impact Statement. Source: NRCS Logan Northern Canal Reconstruction EIS (Chapter 3.)
CHAPTER III
TRIGGER EVENTS AND FRAMING DYNAMICS:
A CASE STUDY OF THE LOGAN BLUFF LANDSLIDE

In Logan, Utah, on July 11 2009, a steep hillside known as the Logan Bluff failed, leveling a home below and destroying a section of the Logan Northern (LN) irrigation canal that ran along the hill. The landslide crushed a home that sat at the bottom of the hill, and killed a woman and her two children who lived there. At the time, the canal was running at high capacity to transport irrigation water to shareholders, including farmers and municipalities.

The landslide sparked legislative response on canal safety at the state level (Henetz 2010), and federal funding for the reconstruction of the canal was secured through the Emergency Watershed Protection Fund administered by the Natural Resources Conservation Service (NRCS) with the help of U.S. Senator Bob Bennett (Carlisle 2009). The Logan Northern (LN) Canal Company, which owned the damaged canal, merged with the adjacent Logan, Hyde Park, and Smithfield (LHPS) Canal Company to create the Cache Highline Water Users Association to facilitate a project that would combine the two systems (see Timeline, Fig. 7). The reconstructed canal system will bypass the Logan Bluff by increasing the capacity of the LHPS canal to accommodate both canals’ water shares (see Map 1). In 2010, NRCS, the canal companies, Cache County, and affected municipalities began preparing an Environmental Impact Statement in compliance with requirements of the National Environmental Policy Act (NEPA).

2 This chapter co-authored by Kathryn Davis Henderson and Dr. Joanna Endter-Wada
The Logan Bluff landslide functioned as a trigger event, bringing attention to the issues of aging water infrastructure, canal safety, and private property rights in land and water. It brought to the surface changes in values and social needs brought about by an expanding urban population in a traditionally rural area. The loss of life separated the 2009 Logan Bluff landslide from others that occurred in this same area in the past (NRCS 2011) and attracted immediate media coverage and public scrutiny of subsequent events and policy responses.

An important aspect of NEPA is the requirement for public involvement during the preparation of an Environmental Impact Statement (EIS) used to inform the decision making process. The procedures and documentation required by NEPA present an opportunity to examine public discourse within the NEPA process and trace how concerns raised by members of the public can influence federal decision making outcomes. During an EIS process, public discourse also occurs outside NEPA procedural boundaries in media and other public outlets. Groups and individuals generate support or opposition for policy changes or alternatives by creating storylines in public discourse (Hajer 1995, 2005) that frame target populations as either deserving or undeserving of policy benefits (Schneider and Ingram 1997). Public input, in and out of the NEPA process, provides insights into the framing dynamics and storylines employed by individuals and stakeholder groups.

Trigger events often enable policy changes that would otherwise have been difficult by bringing visibility to issues that were overlooked or considered minor until the event. The increased public attention and discourse around an issue can prompt policy responses. In the Logan Bluff landslide case, a trigger event instigated a federal response
and the preparation of an EIS, as well as state legislative action. The motivation to analyze the discourse surrounding a single controversial EIS process stems from the need for a more detailed understanding of the importance of frames and their potential fragility following a significant trigger event. This case study analyzes the influence trigger events have on framing dynamics found in public discourse both inside and outside the EIS process, and what public discourse in the wake of the landslide revealed about challenges in water management in urbanizing communities of the western United States.

CASE STUDY CONTEXT

Logan, Utah is the small but growing county seat of Cache County in northern Utah, nestled in eastern Cache Valley along the Bear River Mountains. It was settled in the early 1860s by Mormon pioneers (early members of The Church of Jesus Christ of Latter-Day Saints, or LDS church) who were commissioned by their leader Brigham Young to move to the area (Peterson 1997). Among the first infrastructure projects the settlers implemented in the valley were irrigation canals, which were dug across public domain land. Like most areas in the arid United States West, agriculture in Cache Valley only survives because of water infrastructure: dams store water draining from mountain snowmelt during the spring-time runoff and canals divert it during the hot, dry summer months to farms and ranches with rights or shares to irrigation water. Although the canals were first managed by LDS church-run cooperative organizations, over time they fell under the management of privately run non-profit canal corporations (Harvey 1989; Sadler and Roberts 1994).

Two canals are the focus of this paper. The Logan Northern (LN) and the Logan Hyde Park Smithfield (LHPS) canals, both constructed in 1860 by Mormon pioneers,
divert water from the Logan River and transport the water north along parallel alignments for approximately 9 miles (Utah Board of Water Resources 2010). As of 2010, the two canals had a combined total of 5,286 shares to water rights that totaled up to approximately 125 cubic feet per second (Logan Northern Irrigation Company 2010). Water rights are managed by the state according to the prior appropriation doctrine, which allocates water based on priority dates. Both the LN and LHPS canal companies’ water rights have priority dates of 1860 (Utah Division of Water Rights 2012), which are senior to other water rights in the area. The LHPS point of diversion is upstream from the LN point of diversion on the Logan River (see Map 1).

The LHPS and LN canals are 150 years old. Both canals are aging, and allow some water to seep through the unlined bottoms (Molina 2008). Over time, some sections of Cache Valley canals were lined with concrete, but most still remain unlined, and nearly all have remained uncovered since their construction (Logan Northern Irrigation Company 2010). The canals have not been redesigned or reconstructed in any major way since their construction. Instead, canal owners have made repairs as needed.

The canals deliver irrigation water to shareholders in Cache Valley. Over time, the character and makeup of the shareholders have changed. Early shareholders were exclusively farmers and ranchers. Today, a growing number of shares, including nearly two-thirds of LHPS shares, are owned by municipalities and Utah State University (NRCS 2011), which use the irrigation water for public parks and schools, secondary irrigation water for urban residents, and university grounds.

Besides delivering water, the canals have adopted additional uses since their construction, primarily stormwater collection and recreation. As cities grew along the
canals, the canals became the default receptacle for stormwater runoff, saving the cities from having to construct their own stormwater systems. Formal agreements were never negotiated between cities and private canal companies to manage stormwater in the canals. Instead Logan and other cities traversed by the canals took advantage of the presence of ready-made water conveyance infrastructure and diverted runoff from parking lots and streets through gutters that emptied into the canals. Over time, the amount of stormwater entering the canal system has increased because of urbanization, exacerbating the risk of flooding and structural damage to the canals and adjacent properties (LaPlante and Carlisle 2009; Utah Water Research Laboratory 2006).

Recreational use of the LN and LHPS canals has increased along with population growth (Kennedy and Unhanand 1974). Seepage from the canals feeds groundwater sources and vegetation and wildlife along the canal corridors (Molina 2008), making the canals attractive “green corridors” that traverse the valley. Runners, dog-walkers, and cyclists have used the private maintenance trails along the canals, and tubers and swimmers have recreated in the canal water (Kennedy and Unhanand 1974).

In recent decades, increasing population and urbanization in Cache Valley has introduced friction between urban and rural land uses in planning (Envision Cache Valley 2008). Rural landowners are under considerable economic pressure to sell or develop farmland to accommodate the growing population, and that trend is further enabled by the prevailing conservative political climate that opposes regulation of private property. However, despite losing approximately 600 acres of farmland to urban development each year (Bear River Association of Governments 2012), agriculture remains an important economic and cultural part of Cache Valley (Cache County Agricultural Advisory Board
The loss of farmland is a cause of concern for policymakers and area residents (Cache County Agricultural Advisory Board 2003). Despite a recent regional visioning plan that set goals to concentrate development in urban clusters, (Envision Cache Valley 2008), agricultural lands continue to disappear and are replaced with new housing and commercial developments. As a result, the canals are located in the same physical alignments in which they were constructed in the nineteenth century, but they now flow through a very different land use context.

RESEARCH APPROACH AND METHODS

**Case Study: Content and Discourse Analysis**

The main benefits of utilizing a qualitative case study are the richness of detail and attention to context in the analysis. The primary goal of the case study approach is to trace the influence of general forces on a particular setting (Neumann 2011; Vaughan 1992). This particular case aims to examine the social construction and framing dynamics of a specific target population in local public and policy discourse.

This paper builds on case studies that have illuminated the significance of public discourse in policy setting and implementation, including the use of storylines to interpret policy (Gelcich et al. 2005); how divergent definitions of ideas or concepts shape perception of surroundings (Hull et al. 2001); and how the framing of ideas affect public participation and trust (Borowski 2010). Using discourse analysis, Lee and Roth (2006, p. 430) showed that conflicting use of language created “a cultural impasse” between residents and town council members through different storylines and frames. Social construction and meaning in discourse, or framing dynamics, is an important component in policy setting.
Theoretical Foundation in Policy Analysis

Individuals and stakeholder groups communicate their positions in public discourse by crafting storylines that advocate for certain policy actions. Storylines contain culturally meaningful language to justify or call for specific actions in policy development (Hajer 1995). Multiple storylines often exist that offer divergent explanations for the same events, advocate different policy actions, and frame individuals or groups in contradictory ways. These storylines compete in the arena of public discourse to gain legitimacy through a policy response (Hajer 1995).

To discuss the dynamics of social construction, or framing, in the policy-making process, we rely heavily on the work of Schneider and Ingram (1993, 1997, 2005). They show how in the policy-making process, benefits and burdens are delivered to target populations based on framing dynamics through which events, groups, knowledge and social conditions are socially constructed and interpreted. Target populations are those groups who are specifically allocated benefits and burdens through policy mechanisms. Schneider and Ingram (1997) have found that target populations can be defined along two dimensions: deservedness and power. Four groups can be identified on continuums of deservedness and power (see Fig. 5): Advantaged (deserving, political powerful); Disadvantaged (deserving, not politically powerful); Contenders (undeserving, politically powerful); and Deviants (undeserving, not politically powerful). The framing of target populations into these four basic categorical groups makes delivering benefits and burdens to certain groups more palatable to the public and therefore less risky for policy-makers (see Fig. 6).
Before policies can direct benefits or burdens to anyone, the issue at the heart of the policy has to gain considerable momentum to reach the decision agenda. One important mechanism to propel an issue forward is trigger events, which can focus attention on a certain issue. When the issue attracts enough political will (in the political stream) and there are potential policy solutions (in the policy stream), a window of opportunity opens for policy formulation (Kingdon 1984). Sabatier and Wiebe (2007, p. 199) add that external shocks like disasters “can shift agendas, focus public attention, and attract the attention of key decision making sovereigns.” The Logan Bluff landslide was a trigger event that set off two simultaneous policy responses, the federal EIS process and the state legislative response. The policy responses addressed two issues that had existed previously at local and national levels, but were not on the formal agenda of decision makers until after the landslide: the needs for canal safety and water infrastructure upgrades (American Society of Civil Engineers 2010; Cache County Agricultural Advisory Board 2003; Hsiao et al. 2007; Jury and Vaux 2005).

**Discourse Analysis**

Discourse analysis, or “the study of recorded communication,” (Babbie 2010, p. 333) cannot be used to “determine the truthfulness of an assertion,” but rather to reveal messages or themes that might not be obvious to a casual observer (Neumann 2011, p. 363). We relied on discourse contained in secondary documents to identify how the canal companies were framed and how these frames may have been changing. The discourse we analyzed included newspaper articles, letters to the editor, blog posts, personal communications, and some presentations given in classroom and conference settings. Policy materials were comprised of EIS documents (including public comments),
legislative debates, and the Utah Code. These texts were analyzed to identify the social constructions implied in each communication and to identify the storylines embedded therein. Because the canal companies were the main beneficiaries of the reconstruction project, this analysis focuses on the framing dynamics regarding the canal shareholders and leaders.

From January to May 2010, several presentations given to a Utah State University water law and policy class by professionals, canal company representatives, and resident activists highlighted some of the competing narratives surrounding the Logan Bluff landslide. These presentations provided us with preliminary guidance for the rest of the analysis.

The public discourse analysis relied on two main sources of public debate: the EIS scoping comments and media reports. The policy discourse analysis focused on the debate and official language of the state legislative response and the EIS documents.

EIS Scoping Comments

Comments submitted during the EIS process, available on public record, were the primary data source to analyze how local residents and canal shareholders framed the canal company and municipalities. It cannot be assumed that these comments are proportionally representative of the views of the general public, but they provide insight into the different concerns held by community members and the range of points-of-view. In reading the public comments, our two primary questions were: How does each commenter frame the canal company in terms of deservedness and power? And if the landslide is addressed, how is it tied to the commenters’ frame of the canal company and proposed alternatives, i.e. what is the storyline presented?
Media Discourse

The local paper, the Herald Journal, was our main source for media-related discourse about the Logan Bluff landslide, both in news articles and letters to the editor. These materials were probed in much the same way as the EIS comments. Typically in news articles, points-of-view were rarely explicitly stated so we identified themes, or culturally symbolic language (Hajer 1995), when referring to different target populations to identify frames embedded in the media discourse. Media reports were a rich source of data for identifying storylines, because many articles contained a summary that traced and interpreted the events chronologically.

To trace how storylines and frames in the public discourse were translated or addressed in policy, we analyzed the EIS documents (public notices, public meeting transcriptions, draft and final EIS, and the ROD) and the state legislative response, a bill entitled The Water Conveyance Facility Safety Act. The Logan Bluff landslide was cited as the impetus for creating this bill (Hartvigsen 2010; Henetz 2010; Raymond 2010). A presentation to the Water Law and Policy class at Utah State University by the bill’s sponsor, Representative Fred B. Hunsaker, provided insight into the reasons and rationales behind the bill’s provisions (Hunsaker 2011). The policy responses were analyzed primarily to trace to what extent storylines and frames from the public discourse influenced the delivery of burdens and benefits to the canal companies.
RESULTS

Framing Dynamics in EIS Discourse

The canal companies were framed as both deserving and undeserving of benefits in several different storylines contained in public discourse. Deservedness is conceived in terms of the benefit of federal financial assistance, or the burden of regulation. The canal companies appeared to be framed as powerful in all storylines, although the power dimension was more explicitly described in some storylines than in others. The frames place the canal companies in two of the four quadrants: Contenders, and Advantaged. Table 1 summarizes the five storylines, of which three contained primarily negative (Contender) frames of the canal company, and two contained positive (Advantaged) frames. The canal companies are framed as Advantaged in storylines that associated them with agricultural producers and highlighted the need for efficient water delivery. The canal companies are framed as Contenders in three ways: in discussions over whether federal funding was deserved; in discussions about the hazards remaining on the hillside where the landslide occurred; and in discussions about covering and piping the canal.

Storyline 1: Inappropriate Use of Federal Funding (Contender)

Many people viewed the Logan Bluff landslide to be at least partly due to lax maintenance of the LN canal by the canal company. This storyline framed the LN Canal Company as a Contender, therefore delivering the benefit of federal emergency funding to the LNCC was seen as inappropriate (see Fig. 5). Examples of these storylines are expressed in the following excerpts from two letters to the editor: “In Logan, life is cheap, accountability absent, police investigations conclude before they begin and property is more important than lives (Graham 2009);” and “What great ‘bailout’ for a
private company that neglected to maintain and update their … delivery system” (Watkins 2011).

A number of residents believe the Logan Bluff section of LN canal is not dangerous and wish to see the canal restored to its former state. Approximately 15% of the nearly 100 comments submitted during the scoping period expressed a desire to reconstruct the canal in its current alignment (NRCS 2010, p. 11). The option to restore the canal in its former alignment along the Logan Bluff was rejected during the EIS because of liability issues.

While the LN Canal Company was being framed as a culprit, the LHPS Canal Company was framed as taking advantage of a tragic situation for their financial benefit. The preferred alternative would upgrade a major section of the LHPS Canal, which was not affected by the Logan Bluff landslide, the event that led to receipt of the federal funding. The LHPS Canal Company was framed as opportunistic for taking emergency funding provided after the landslide to upgrade their outdated but still functioning system. One LN shareholder commented, “It is against the law to steal water from one canal and put it into another canal.” The frame of the LHPS Canal Company as opportunistic was reinforced when a LHPS Canal Company official exclaimed during a meeting, “We’ll get a gold-plated canal at a real discount price, it does not get any better than the situation we have” (Patrick and Burgess 2009). Many residents felt that the canal companies were so enthusiastic about the LHPS reconstruction solution that the process was inherently biased against other alternatives (Keller 2011). Another letter alleged that NRCS was fraudulently administering Emergency Watershed Protection funds and “subsidizing benefits unrelated to the landslide” (Watkins 2010).
Storyline 2: Hazardous Hillside Canal (Contender)

Another negative frame is embedded in discourse surrounding the landslide zone around the Logan Bluff, which experts say still poses a danger to nearby homes (Fotheringham 2011). In this storyline, the landslide was a tragic consequence of the canal’s placement along a dangerous hillside and the Logan Bluff presents a continuing hazard for the residents that live nearby. Many public scoping comments insist that the emergency funding should go to remediating the hazardous site where the disaster occurred. Running through this storyline is concern about future landslides along the Logan Bluff: “There is not a day that I don’t fear for our neighbors left behind on Canyon Road, and wonder what will happen” (NRCS 2010, p. S-64). The canal company is seen as irresponsible for retaining the canal along a hillside known to be prone to landslides, failing to mitigate known dangers or warn neighbors of the risks, and abandoning the collapsed canal for a new solution without addressing the continuing dangers posed to nearby residents (Huenemann 2010). Like Storyline 1, the canal company is framed as a Contender in this storyline, but in a contradictory way; In Storyline 1, the landslide was attributed not to the natural hazards of the hillside but to the neglectful management of the canal. Essentially these two storylines describe the landslide and hillside canal in opposite ways, but both frame the canal companies as Contenders.

Storyline 3: Lining and Piping of the Canals (Contender)

The third topic that highlighted a Contender frame of the canal companies was the proposed piping of a large portion of the canal system. Recreational use, although never formally authorized, was a common use of the open canals (Kennedy and Unhanand 1974). Additionally, many area residents value the running water, the waterfowl and
other wildlife that utilize the canal water, and the aesthetic and scenic amenities the open
canal provides. The storyline here depicts the open canal system as a longtime
community benefit, providing recreational, environmental, aesthetic, and cultural value
beyond its official uses of transporting irrigation water. The canal company is framed as
belligerent for ignoring public values and unfairly depriving the community of continued
enjoyment of these benefits. This was pointed out by some people submitting comments
as disingenuous considering the use of public funds to reconstruct the canal. As one
resident said, “I would argue that given the large public expenditure on this project, the
balance should tip towards benefiting the tax payer rather than the irrigator” (NRCS

**Storyline 4: Efficiency and future water needs (Advantaged)**

In public comments, some residents and shareholders expressed concern for
improving efficiency of water delivery in light of projected population growth. Indeed,
population is expected to boom over the next few decades, and many people anticipate
greater pressure on the area’s limited water resources. For this reason, a better designed
delivery system that eliminates seepage and monitors flow effectively is seen as a
community benefit. Many commenters mentioned the need for long-term water planning
in the valley and support the reconstruction project because it upgrades an aging system
for one that delivers irrigation water and diverts stormwater more effectively than the
current system. The framing of the canal companies in this storyline is less explicit; they
are simply the managers of important water infrastructure that need upgrading. Because
they are not framed negatively, and the storyline advocates for the reconstruction of the
preferred alternative (delivering significant benefits to the canal companies), it is a positive framing.

Some confusion existed on where the water savings will go. Many commenters mentioned that the water formerly lost to seepage could be captured and applied to more acreage. At one public meeting a small group of shareholders discussed how saving and selling that captured water will help alleviate the cost share required by the canal company (Draft EIS Public Meeting Notes March 31, 2011). However, according to Utah water law, any water that is saved by increasing the efficiency of the canal will remain in the Logan River and is available to downstream appropriators. A water right holder, like the canal company, cannot apply water saved through improving efficiency to irrigate more acreage, because that would illegally enlarge the water right. Instead, any unused portion of a water right is subject to forfeiture to the state to be reallocated elsewhere (see Utah Code Title 73-1-4). One commenter suspected that had canal shareholders been better informed about water law regarding saved (or unused) water, they might not have voted to approve the project (NRCS 2010, p. S-93).

Storyline 5: Agricultural Needs of Shareholders (Advantaged)

This storyline is a manifestation of the powerful positive view most residents have of agriculture. Many comments connected the private needs of the irrigation company shareholders to farming and other agricultural practices, which are highly valued in the region, and therefore framed the canal companies as deserving of the federal assistance and an upgraded water delivery system. One shareholder that supported the reconstruction design to combine and upgrade the two canals commented: “The money to repair the upper [LHPS] canal and replace the LN canal would be the best investment.
The purpose of the canal is to deliver water to the shareholders. It is critical to farmers/agricultural users” (NRCS 2010, p. S-5). Certain public comments reveal that some people see the canal as bringing community-wide benefits. One resident explained in a scoping comment: “The use of public dollars for private irrigation companies, though criticized by some, if used for the improvements that will serve agricultural users and municipalities will benefit either directly or indirectly every citizen” (NRCS 2010, p. S-20). The need to move quickly to restore irrigation service to shareholders is also expressed in several public comments: “The reconstruction needs to be expedited so that for irrigators not now receiving adequate water, their needs are met sooner than later. Family livelihoods and the ability to maintain agriculture land in agriculture are threatened by further delay” (NRCS 2010, p. S-20).

**Framing Dynamics in the Media Accounts**

Positive and negative frames appeared in narratives presented in media and news reports; however, the language is generally less direct in assigning blame or asserting opinions. Negative frames are implied in a media storyline about the public safety problems presented by canals. In many articles, the canal companies are seen as needing more oversight and management from government agencies. The Herald Journal published an article shortly after the disaster that supported the actions of Lieutenant Governor Herbert to establish a task force to look into canal safety issues. “Herbert directed task force members – made up of engineers, lawmakers, and canal owners – to determine the state’s role in overseeing and identifying ‘high-hazard’ canals. ‘I had the opportunity to observe the canal and mudslide that occurred in Logan, and it caused me to have concern when it comes to oversight and the care and maintenance of our
waterways,’ Herbert said” (Patrick and Burgess 2009). These early articles probably contributed to public perceptions that the canal company was at least partly to blame for the disaster. Frames are also embedded in the news in more subtle ways. Consider the following excerpt from a Herald Journal article, “Almost a No-Man’s Land” by Jay Patrick: “While Logan voted to support the company in its efforts pursuing the 3100 North option, officials last week wondered how it is that none of the so-called emergency money is planned to go toward stabilizing the Canyon Road Slope. ‘Is it right to solve the ills of the upper canal with emergency money?’ [A councilman asked.]” (Patrick 2010a). The article continues to quote other officials on how the EWP funding should also sponsor efforts to stabilize the landslide zone, an effort not included in the EIS preferred alternative. The idea of addressing the landslide zone was mentioned several times in the following months in Herald Journal articles related to the canal reconstruction project, reflecting Storyline 2 above (Geraci 2010a, 2010b, 2010c; 2011; Patrick 2010). Negative frames about the canal companies are revealed in the media by the continued publication of these types of articles that feature opinions questioning the canal company’s deservedness to receive public funding.

The canal companies and the reconstruction plan are framed positively in some media reports as well. Most of the positive frames occur in discussion about the need for water use efficiency and future water needs of the growing valley, and about farmers and their need for water to support their agricultural practices. “[The reconstruction] project is in the works to restore irrigation water to users impacted by a canal breach in Logan more than two years ago… [An NRCS official] concluded that he hopes ‘we can begin to move
forward and restore the water delivery to those people who really need it, which are the farmers who haven’t had the full dose of water for the last two years” (Geraci 2011).

The emphasis is often placed on the impact the landslide had on shareholders. The farmers who own shares and are reliant on water delivered from the LN canal are framed herein as a victim, not a culprit, of the disaster. This is a contrast to the frame of the canal company itself, which is owned by the shareholders, as the culprit (see Storyline 1). The individual shareholders may be more positively seen than their corporate group.

Framing Dynamics in Policy Documents and Legislation

The EIS documents and The Water Conveyance Facilities Safety Act (2010) are the primary sources for analyzing framing dynamics in policy documents and legislation. These documents were analyzed to trace how storylines and frames influenced the delivery of benefits and burdens to the canal companies.

The EIS documents frame the canal companies in positive ways and contradicts the frames embedded in the public discourse storylines. Storyline 1 (that the canal contributed to the landslide) is countered in the EIS in which the shareholders are framed as victims, not a cause of the landslide. “During the summer of 2009, the slope of a hillside in Logan failed. As a result of this failure (landslide), a section of the LN Canal broke away. Three people were killed by the landslide, and the Logan & Northern Irrigation Company, the canal company that operates and maintains the LN Canal, has not been able to use the canal to distribute water since the failure” (NRCS 2011:2-1, emphasis added).

The landslide and breach of the canal are described as separate events, the former causing the latter, not the other way around. The EIS counters the claims of the
commenters who believed that the landslide was the fault of the canal company: “Based on the long history of landslides in this area and the hydrology and geologic conditions of the Logan Bluff, future landslides are likely to occur in the area…” (NRCS 2011, p. S-14). Repairing the canal to its former state along the hillside without making significant changes to stabilize the hillside would therefore be irresponsible.

Storyline 2, which advocates for remediation of the Logan Bluff to prevent future landslides, is addressed in the ROD, which includes purchasing fourteen homes within the 2009 landslide zone. This was an addition made to the Final EIS (absent from the Draft EIS) due to public concerns. However, outside of condemning and removing the fourteen structures, the ROD includes no additional effort to stabilize the hillside or purchase other structures near but outside of the 2009 landslide zone. NRCS and the cooperating agencies maintained that stabilizing the entire hillside was outside of the scope of the reconstruction project (NRCS 2011).

Storyline 3, which focuses on the cultural and recreational value of the open canal, is addressed in the EIS, but the idea of the open canal is re-framed in terms of safety. The idea of safety is stated as the primary driver of the project consistently and often: “[The purpose and need for the reconstruction is] to design and construct an irrigation system that will safely restore irrigation water delivery to LN shareholders (NRCS 2011, p. S-11, emphasis added).” Safety is an important theme embedded in the EIS and a justification for covering and piping a significant section of the canal and for avoiding any option that would repair the existing canal along the landslide zone.

The EIS also employs distancing language to delegitimize the concerns regarding the environmental and cultural values associated with open canals central in Storyline 3.
Consider the following statements: “People who do not live along the canals but who use them for recreation also perceive the canals as an important resource that adds to their overall quality of life” (NRCS 2011, p. S-26); “The quality of life of people living along the canals is based on perceptions of the canals as a benefit that enhances their properties and/or experiences” (NRCS 2011, p. S-26); and, “Some people who live along the LN and LHPS Canals in the study area value the appearance and presence of the canal system. These landowners feel that the canals’ appearance and the water conveyed through the canals are amenities that contribute to their quality of life” (NRCS 2011, p. 2-6). Use of the words “perceive,” “perception,” and “feel” is significant because it implies that this view is not a fact, but merely a perception; the residents feel the canal is an amenity, rather than the canal is an amenity. This language works to distance the official position from those of the residents who think this way, devaluing Storyline 3. The use of canals for recreation is referred to in the rest of the EIS as unauthorized or illegal.

“People have historically waded and floated in the canals, even though the canals are generally posted for no trespassing and are not safe or legal recreational features” (NRCS 2011, p. 3-10). To bolster support for enclosing the canal, the EIS points to all the advantages the closed system would have in terms of operation and maintenance:

“Enclosing the canal would prevent debris from accumulating along the canal alignments, which would help improve water quality and eliminate operational problems such as clogged headgates and local flooding associated with buildup of debris. Enclosing the canal would also enable separation of irrigation water and stormwater, which would also protect the quality of water in the canals” (NRCS 2011, p. 3-10).
Storyline 4, which highlights the need to improve efficiency for long-term water delivery needs, is a central storyline embedded in the EIS. Piping the canal will “conserve about 7,500 acre-feet of water per year by repairing leaks in the Logan Canyon section of the LHPS Canal, a segment that currently loses a substantial percentage of water that is diverted from the Logan River” (NRCS 2011, p. 3-54). An important aspect of the reconstructed canal system that was mostly absent from the public discourse was stormwater, a “new” use of the canal. The EIS states that stormwater inputs were seen in the past as beneficial, however, “as the area has become more urbanized, the amount of municipal stormwater entering the canal system often exceeds the system’s capacity, which causes flooding” (NRCS 2011, p. 2-3). The preferred alternative includes design elements to accommodate stormwater runoff from the cities the canals bisect. This function was viewed by cities and canal managers as essential, but it was not a salient issue in the public comments. The reason for this could be that stormwater diversion is “invisible” to residents in the area. The dual functioning upgraded canal system is touted in the EIS as better equipped to handle future water delivery and disposal needs and improve overall operational efficiency.

Storyline 5, which emphasizes restoring water for shareholders, particularly agricultural producers, is embedded in the “Purpose and Need” for the reconstruction project. Delivering irrigation water to shareholders was the underlying justification for the entire project: “[The 2009] landslide and breach have prevented the canal from distributing water and has required the indefinite closure of a section of the canal. This closure affects other parts of the local irrigation water delivery system, with the result that the canal is not delivering all water allocated to local water shareholders. The
[purpose of the proposed action is] to restore safe water delivery capability to the LN Canal” (NRCS 2011a).

The Water Conveyance Facilities Safety Act of 2010 contains frames contained in Storylines 1 and 5, which are positive and negative. The law authorizes grant and loan assistance to canal owners and operators for repairs and improvements contingent on them adopting a management plan. The plan requires canal companies to prepare an emergency response strategy with local emergency response officials (Water Conveyance Facilities Safety Act 2010 § 73-10-33); address stormwater management with municipalities; and communicate to cities, municipalities, and planning and zoning departments with information about potential risk locations along their canals. There are two controversial points to this law. First, the management plans are optional, and second, canal management plans that are submitted to the state are protected from public access (Water Conveyance Facilities Safety Act 2010 § 63G-2-305). These two elements of the bill are indicative of the state legislature’s pro-agricultural stance, i.e. Storyline 5.

The law itself contained generally positive frames of the canal companies, but delivered some lenient burdens, or “hollowed sanctions” (Schneider and Ingram 1997; see Fig. 5, p. 113). The bill itself can be interpreted as a tacit suggestion that more oversight of the canal is justified because of previous lax management of potential hazardous areas, a nod to Storyline 1, but it stops short of instituting enforceable regulations. The safety management plan is burdensome, but not mandatory. Understanding the framing of the canal companies as “Advantaged” and “Contenders” in the public discourse helps explain the language of the bill.
Summary

In summary, certain storylines and frames from the public discourse were embedded in policy response and formulation. Storyline 1 (that the canal companies were failing to mitigate risk) was embedded in H.B. 60, but not in the EIS where the canal companies were framed as victim, not cause of the landslide. Storyline 2, which advocated for using the federal funding to stabilizing the hillside was addressed partially in the EIS through the stipulation that fourteen structures within the 2009 landslide zone will be condemned and removed using some of the federal funding. Storyline 3, which describes the open canals as a historic, environmental, and cultural amenity was addressed but reframed in the EIS as unsafe. Storylines 4 and 5, which contain the two positive frames are embedded in both H.B 60 and the EIS. The legislative response delivered only mild burdens, and the EIS will deliver an upgraded canal system at a highly subsidized cost. The ways in which these storylines competed and contradicted each other in the public discourse is reflected in the bundle of burdens and benefits delivered to the canal companies through the policy responses.

CONCLUSION

The purpose of this interpretive analysis was to examine the framing dynamics after a dramatic trigger event, and how those framing dynamics influenced the policy response to that trigger event. The proliferation of alternate storylines that framed the canal companies in multiple and competing ways suggests that the frames were destabilized by the trigger event itself. Before the 2009 landslide, issues relating to canal management were not extremely controversial. After the landslide, canal managers were seen as lazy and innocent of canal disrepair, victims and cause of the landslide, and
deserving and undeserving of policy benefits. The competing storylines were presented in newspaper reports, blogs, and the policy responses themselves. We suggest that trigger events can shock the prevailing system of frames, destabilizing them and introducing new frames. Since the frames were in a state of flux after the landslide, at least temporarily, the decision making process was controversial and added the potential for conflict.

Frames are utilized to generate support for certain policy actions. During the EIS process and legislative response, frames were articulated by policy-makers to justify the delivery of benefits and burdens to target populations. The EIS embodied mostly positive frames of the canal companies, delivering exclusively benefits, while the state legislative response incorporated multiple frames and delivered a mixed policy response with both benefits and burdens. There are several possible explanations for this difference, including the possibility that the EIS was generally favorable to the canal companies because the managing agency, NRCS, is an agricultural agency. The state legislature may positively view agriculture as well, but they are also answerable to the voting public, and the competing frames of the canal companies in the public discourse are reflected in the legislative response. Trigger events, therefore, can act as frame destabilizers that can quickly change the social context in which decision makers have to operate.
REFERENCES


Fotheringham, B. 2011. Canal Landslide Tour and Presentation. Presentation given to the Water Law and Policy class at Utah State University, Logan, Utah, 21 April.


Henetz, P. 2010, March 2. Canal bills advance to full senate *Salt Lake Tribune*.


Table 1. Frames and Storylines Embedded in Public Discourse

<table>
<thead>
<tr>
<th>Storyline</th>
<th>Frame</th>
<th>Examples from Public Discourse</th>
</tr>
</thead>
</table>
| 1. The LN canal company was the culprit behind the landslides that killed 3 people. They do not deserve federal financial assistance. The LHPS Canal Company is greedily taking advantage of funding to do upgrades they should pay for themselves. | Undeserving and Powerful (LN canal co. is Culprit, Lazy Manager, LHPS canal co. is greedy) | "Until responsibility for deaths that occurred at time of canal failure is determined, everyone associated with the canal has a potential liability. And depending on who is liable, and which alternative is selected, public funding for improvements may, or may not be appropriate." (EIS Scoping Comment)  
"What great 'luck' for a private company that neglected to maintain and update their Canyon Road delivery system (Herald Journal 11/18/2011)."  
"There is a strong case that the hill didn't fail, the canal failed. Now the federal funds give them the opportunity to take advantage of the money to repair and build new." (In-class presentation by the former Mayor of North Logan)  
"I cannot understand how a task that was known about, discussed and ignored can be deemed 'An Act of God.'" (EIS Scoping Comment S-67)  
"As to the massive and costly plan to enclose and pipe the canal: What a foolhardy, spendthrift scheme." (EIS Scoping Comment S-93)  
"I am extremely concerned about the safety of our home and even our lives if nothing is done to prevent another tragic event such as the one happening on July 11, 2009... what is being done or is proposed to be done to rectify the safety for which said $19.35 million was allocated?" (EIS Scoping Comment)  
"There is not a day that I don't fret for our neighbors left behind on Canyon Road, and wonder what will happen." (EIS Scoping Comment S-64)  
"So we Logan city have to ask ourselves why would we ever promote, finance, and sanction a project that would fail to consider the overall best interests of the entire community, with no apparent indifference to the following EWP Program mandates to remove threats to life and property." (EIS Scoping Comment, Logan City Light & Power, S-95)  
"The general public has well over a hundred years of peaceful use of the canal for recreation. Many miles of trees and other riparian vegetation support both diversity with values that go beyond our valley. Open canals enhance habitat for everything from soil organisms to large mammals and birds." (EIS Scoping Comment)  
"Open, flowing water in the and west should be considered a public treasure. Not a day goes by that I do not see several walkers enjoying the tranquility provided by the canal." (EIS Scoping Comment) |
| 2. The canal broke as a result of the instability of the hillside, which continues to pose a threat. Funding should go to fixing the hillside, not ignoring it to fix up the undamaged upper canal. | Undeserving and Powerful (LN canal co. is irresponsible) | |
| 3. The canal company is unfairly depriving the community of recreational, environmental, and aesthetic benefits that the open canal has provided for over a century. The project should not cover and line the canal especially considering the use of public funds. | Undeserving and Powerful (Canal companies ignore public values) | "Yes, I have the open water and all it does for surroundings, but a pipe is a necessity. We worked hard all those years trying to slow leaks and prevent breakage. It is obvious it must be repaired. Secured." (EIS Scoping Comment S-70)  
"USU has determined that the preferred alternative will best meet the present and future needs of the University and surrounding communities. By choosing that option sewage losses in both canals are reduced substantially." (EIS Scoping Comment, USU Facilities, S-91)  
"I think whatever is done should be done with the long-term future in mind. Specifically, this is probably a great time to develop a pressurized irrigation system for the Logan-Richmond area... Given the growth of the valley and the inevitable demand for water, this seems to be the most prudent thing to do. As long as we are spending money, we might as well be upgrading things, rather than just patching the breaks in the canal." (EIS Scoping Comment S-21) |
| 4. The canal is old and in need of upgrading to increase efficiency and better control over water resources. Better water management is needed because of future needs. | Deserving and Powerful (Canal company is a water managing agency that we depend on) | |
| 5. The canal needs to be fixed and start delivering water as soon as possible for the benefit of the agricultural producers that depend on it. | Deserving and Not Powerful (Canal company is equated with agricultural producers) | "Reconstruction needs to be expedited so that irrigators not now receiving adequate water, these needs are met sooner than later. Family livelihoods and the ability to maintain agriculture land in agriculture are threatened by further delay." (EIS Scoping Comment, S-20)  
"The use of public dollars for private irrigation companies, though criticized by some, if used for the improvements that will serve agricultural users and municipalities will benefit others directly or indirectly every citizen." (EIS Scoping Comment)  
"The money to repair the upper canal and replace the LN canal would be the best investment. The purpose of the canal is to deliver water to the shareholders. It is critical to farmers' livelihoods." (EIS Scoping Comment S-5)  
"There is no other management entity today that would manage water more than the LNSD-it's an irrigator's cooperative." (EIS Scoping Comment S-5)  
"The stability of the canal is not the issue. The future of the irrigation district is the issue." (EIS Scoping Comment S-5)  
"The issue of the canals is not whether the LN system should be kept, but rather whether the LHPS system should replace it." (EIS Scoping Comment S-5)  
"The need to receive the water is not the issue, only the future of the irrigation district is the issue." (EIS Scoping Comment S-5) |
Figure 5. Deservedness and Power of target populations.

Fig. 6 Risk to Policymakers in delivering benefits to target groups

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008 UGS and USU report that study demonstrated hazards of landslides and canal breaching. City officials receive the report, results are published in the Herald Journal, but no formal “warning” was delivered to Canyon Rd. residents.</td>
<td>November 2009</td>
<td>Landslide and canal breach on Canyon Rd. 3 deaths.</td>
</tr>
<tr>
<td>2006-2008 UGS and USU begin a 2-year study to assess the potential for landslides along Canyon Rd.</td>
<td>January 2010</td>
<td>Victims’ father files claim against Logan City, UDOT, and USU.</td>
</tr>
<tr>
<td>July 2010 Another Canyon Rd. resident whose home was damaged in 2009 landslide files suit against Logan City and UDOT.</td>
<td>February 2010</td>
<td>NRS publishes a Notice of Intent to prepare an EIS.</td>
</tr>
<tr>
<td>April-May Draft EIS published. Final comment period opens.</td>
<td>August 2011</td>
<td>Logan City settles out of suit with victims’ family.</td>
</tr>
<tr>
<td>November Cache County and cooperating cities agree to plan.</td>
<td>October 2011</td>
<td>Record of Decision is submitted and approved.</td>
</tr>
</tbody>
</table>

**Figure 7. Timeline of Events before and during Environmental Impact Study**
Map 1. Logan Northern and LHPS Canals near Logan River.
CHAPTER IV

CONCLUSION

The challenges facing planners and policy-makers in Logan, Utah, are not unique. The factors that made this particular case the focus for study was the intersection of several relevant policy issues. Aging infrastructure, private and public control of water, rural and urban land use and water issues, population growth in the U.S. West, and public influence on the policy process are all important dimensions of the Logan Canal case study. Each of these dimensions adds complexity to the decision making process. The analysis of the Logan Canal case study, conducted through a content-based situational, interpretive approach, illuminated several key dimensions of policy processes.

First, this analysis illustrated the crucial path dependent role that water infrastructure plays in defining the decision making process and outcomes about water management. The canal system in Logan, Utah, although aging and outdated, physically limited the possible outcomes that managers could consider. The physical water infrastructure also forced the multiple decision makers to cooperate. The lack of coordination during the transitional period of the canal system (when it began to accumulate new urban uses) could not last. The landslide probably hastened cooperation between the cities and canal companies, but such cooperation was inevitable to align formal decision making about the infrastructure with the uses that it had come to serve.

Second, social construction of groups has a large impact on policy-making, affecting policy processes and outcomes, as well as their perceived acceptability. Though the socially constructed storylines were contradictory, most of them framed the primary target population – the private canal companies – as undeserving of the benefits of federal
financial assistance, so the level of acceptability of the final decision to reconstruct the canal with federal assistance was low. The fact that these storylines were not embedded in the policy response made it seem like the process was biased in favor of the target population, whether or not this was actually the case.

Third, trigger events can destabilize frames that may have been stable, or at least changing slowly before the trigger event. This can make policy decision making processes more complicated with regards to addressing public concerns. The landslide event was presented in early media reports as a possible result of the breach of the canal, and subsequent storylines in the public discourse framed the canal companies as culprits. Before the landslide, widely recognizable frames of the canal companies were absent from the public discourse, although farmers and agricultural producers generally were seen positively within the context of Cache Valley and its history. Understanding that the new negative frame became prevalent after the landslide, it was predictable that the reconstruction project would be controversial. Being met with public resistance surprised some policy-makers who were used to widespread support for agricultural-related improvements. This response emphasizes the importance of storylines and frames in influencing public acceptance of policy decisions.

Policy-makers and planners who are faced with decisions about water management in a changing societal context should therefore: 1) conduct social assessment on the various ways people are linked to water and the infrastructure through which it is delivered to end users; 2) pursue cooperative management with other decision making linkage groups early on; 3) attempt to understand and address the public frames
and storylines that influence the policy process; and, 4) after a trigger event, pay close attention to the way the trigger event affects the social environment.
APPENDICES
APPENDIX A: LIST OF PUBLIC DOCUMENTS


APPENDIX B: LIST OF NEWS ARTICLES


Henetz, P. 2010, March 2. Canal bills advance to full senate Salt Lake Tribune.


