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Abstract

Using the Institutional Grammar Tool to Understand Brownfield Action Situations

State and Federal laws lay down a formal institutional structure for policy implementation. Analyzing these formal institutions is one step in the process of understanding the drivers of public manager decisions when implementing brownfield projects. Understanding how the federal and state laws act on those responsible to clean up the brownfield sites may provide insight into the decisions that they make on whether or not to include outside groups in this process. Are there ways to systematically map out the action situation for public managers? Are there other factors that shape this action situation through the language of the law? This paper will use the Institutional Grammar Tool from Crawford and Ostrom (2005) to examine the action situations for brownfields at the federal and state levels. It will also seek to understand how we can systematically deal with principal agent relationships that may be defined within the law.

Kelly Maul is a regulatory compliance specialist with Maul Foster Alongi, Inc.. Many thanks to Kelly Maul for providing coding skills and insight into how to interpret both federal and state laws.

Introduction

Pressman and Wildavsky (1973) introduced us to the idea that implementation is a complex 'experience.' They highlight that policy is not finished when the law is written, that the true effects are seen long beyond that point. With a focus on the complexity of government interactions at many levels, Pressman and Wildavsky describe a federally driven policy implementation. Over the years, many have tried to introduce different theories of implementation (for example, Mazmanian and Sabatier 1981; Van Meter and Van Horn 1979) which focus on the role of government in this process. But, should the focus just be on government in understanding policy implementation success? Elinor Ostrom (1990) introduced the idea that under certain situations (for example, common pool resources) institutions develop to manage resources, such as fisheries and forests and water resources, without the coercive role of governmental policies. In addition, Ostrom developed a framework called the Institutional Analysis and Design (IAD) framework to study these institutions. Such institutions may include government, but government may not be the primary actor nor decision maker. Much research has followed in the footsteps of Ostrom that focuses on governance with the idea that government may just be one of the players that is involved in managing resources.

What happens when the underlying assumptions from the Institutional Analysis and Design (IAD) Framework are not strictly met (e.g., common pool resources, weak or no governmental role)? Do institutions still develop? Can the ideas encompassed within the IAD framework still be applied to understand the implementation of policies? How do rules imposed by governmental regulation shape the action situation? Are there formal rules that govern who is included and excluded within a process of implementing a policy?

Brownfields may provide one case where we can examine these types of rules. Brownfields are real estate properties which are impacted by toxic environmental contamination. Cleanup and redevelopment are seen as the remedy to deal with the contamination. Brownfields bring two problems to the community: 1) an impaired environment with potential human and health impacts and 2) an impaired economy, when revenue generating land no longer provides revenue and may in fact become a huge cost to the community. The brownfield site can be thought of as either a common property or a private good – depending on the ownership and the management of the site. But the resources within the site may also be considered to be a common-pool good, in that environment and economic development are goods that can be shared and enjoyed across many within the community.

Brownfield policies exist at the state and federal levels. Due to the costs and risks involved, local government often plays a leading role in the brownfield process. There are questions of whether to and to what extent the community or other groups will be involved in the process. There are also questions of how to partner with other governmental agencies at the local, state and federal levels. Can the ideas embodied within the IAD framework help us to understand the decision-making process of public managers when they take on this leading role?

Ostrom's (1990, 2005, 2011) concept of the Action Situation may provide one way to understand these decisions. Do public managers act as rational actors when including, or not including, outside groups in their decisions? Are there external rules (in the form of legislation) that impact these decisions? Can these rules be formally and systematically extracted from the legislation in the policy

area to provide understanding of these decisions? This research will use the Institutional Grammar Tool (IGT) as a method to systematically explore the rules to construct the action situation.

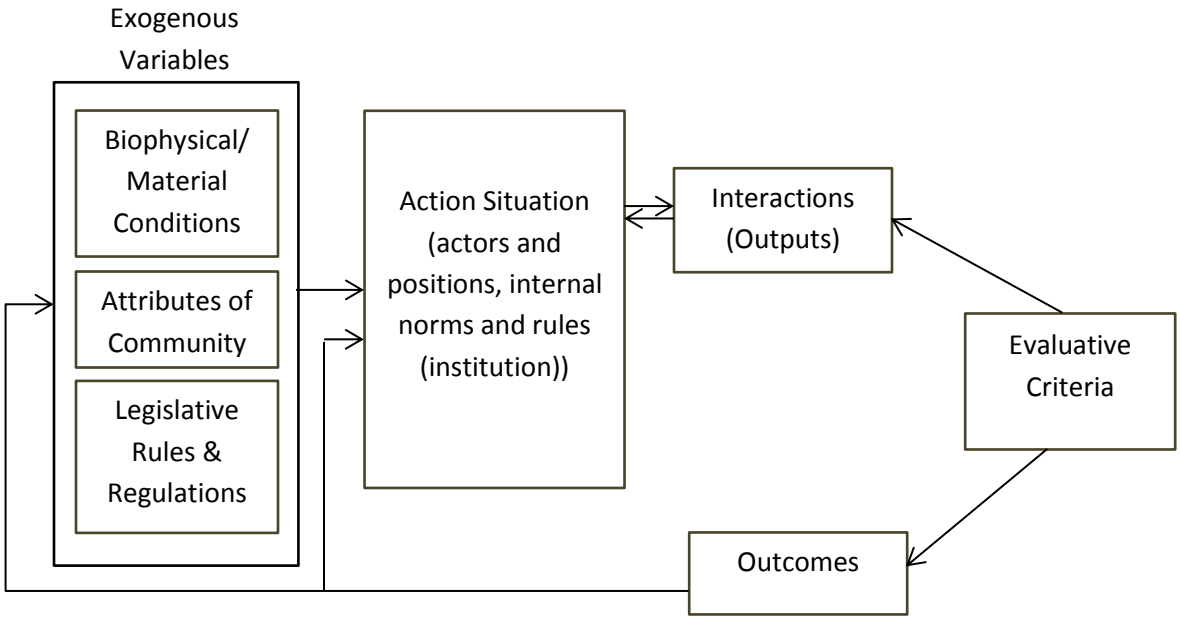
My goals for this research are twofold. First, I am proposing to test this method on a different type of regulation, namely one that deals with environmental cleanups of toxic contamination. The contaminated site may be considered a resource that can take many different forms based on location, size and ownership. Second, I propose that the IGT can provide useful data to understand the exogenous rules that shape the Action Situation. I propose to focus on one core set of actors, namely those performing brownfield cleanups at the operational level, but attempt to understand how the legislative rules at the collective choice level will shape and constrain the implementation decisions at the operational level.

Theoretical Overview

Elinor Ostrom (2005) defines institutions as "the prescriptions that humans use to organize all forms of repetitive and structured interactions including those within families, neighborhoods, markets, firms, sports leagues, churches, private associations, and governments at all scales" (2005, 3). Individual decisions will be constrained by both the institutional structure as well as the rules that develop within the institutions. Ostrom's framework provides a number of different dimensions to thinking about the interactions of individuals when they operate in interdependence with other groups and individuals. This framework was originally developed to describe an alternative solution to the 'Tragedy of the Commons' (Hardin 1968), as a collective, community approach to distribute common property resources. It has recently been argued (Bushouse 2011; Oakerson and Parks 2011) that this approach might be suitable for other types of resources such as club goods (excludable public goods) or local public economies (metropolitan political economies).

Ostrom developed the Institutional Analysis and Design (IAD) as a broad framework to understand how the institution functions in order to guide decisions and behaviors of actors, especially related to how resources are shared and distributed (Crawford and Ostrom 1995, 2005; Ostrom 1990, 2007). This framework (Figure 1) provides a roadmap of the components and their interactions. It defines the key sets of variables such as the actors, their roles, and internal and exogenous variables that will impact the decisions of the actors. The following will discuss features of the IAD framework for understanding institutional decision processes.

Figure 1: IAD Framework for Institutional Analysis (Source: Adapted from E. Ostrom 2005)



Key Components

The Exogenous Variables describe the environmental characteristics surrounding the institutional arrangements. These variables focus on the nature of the goods and services being shared in the interactions. For example, Biophysical/Material Conditions describe whether public, private or common property goods are being managed within the institutions. This distinction is important to shape the types of interactions and the different roles that will be played by the actors. Originally the IAD was developed to understand the management of common pool resources, but use of this model has been extended to other types of public goods which may not exhibit the same characteristics (Bushouse 2011; Oakerson and Parks 2011). The community attributes describe the community setting, or the capacity of the community to deal with issues. These variables focus on concepts like the level of social capital in the community or the ability of the community to evolve in its interactions. Rules and regulations examine the externally imposed rules which constrain the institution. There are multiple types of rules and regulations that can be understood to be both formal and informal and that impact the action arena from the outside. Examples of formal external rules might be the federal or state level constitutions or statutes which constrain the actions of all actors similarly. Informal external rules might include norms of behavior based on social constructions. Rules can be classified as both formal/informal as well as based on the type of behaviors that they regulate.

The Action Situation is the unit of analysis for the study of institutions. The action situation is composed of two key sets of variables. 'Participants' can be defined in terms of the actual individuals/groups and the positions/roles that they play and the actions that the different positions can take. We can think of participants in terms of functional roles such as service provider, information provider, decision maker, etc. The 'institution' is the other key variable. It is composed of the rules, incentives, and information that are available to the participants. The participants will make decisions and take actions constrained by the information and rules within the institution. The decisions and the

actions that the participants take will lead to outputs (which will include interactions). Broadly, I am interested in examining these factors to understand the different types interactions that occur (Ostrom 2011). Although Figure 1 shows only one action situation, it may be useful to think of multiple action situations, which exist simultaneously and have the potential to interact and impact other action situations (McGinnis 2011).

Interactions are the result of decisions made by actors (within the action situation) based on the constraints imposed by the rules and incentives of the institution. These interactions might be thought of as one type of output from the decision processes undertaken by the actors. In terms of the institution itself, an example of an interaction might be the decision to work cooperatively with other members of the community to craft a solution to a problem. Outcomes would be the measurable results of the interactions themselves. One outcome might be to enact policy change by changing the structure or rules of either the external environment or the action arena (Ostrom 2011). Another outcome might be the problem solution itself.

Evaluative criteria are described by Ostrom (2011) as the different measures that can be used by institutional and policy analysts to evaluate the different interactions and outcomes from the action arena. Examples of these might be "economic efficiency, fiscal equivalence, redistributional equity, accountability, conformance to values of local actors, and sustainability" (Ostrom 2011, 16). The evaluative criteria are typically applied by analysts to evaluate outputs and outcomes that could be achieved under differnet circumstances. The feedback loop demonstrates potential avenues for institutional change. Based on negative or positive evaluations, there are potentials for the institutional structure to evolve over time.

This framework helps to understand how the institutions function and evolve over time. Figure 1 shows how the interactions and outcomes may work to change the rules and incentives both external to and internal to the institution. For the purposes of this research, we will be examining the exogenous rules that shape the action situation, thus we will treat the action situation as a black box.

Examining Rules: Formal and Informal

One component of the Exogenous Variables in Figure 1 is the rules and regulations that form the decision environment within the institution. Rules are defined as "shared understandings among those involved that refer to enforced prescriptions about what actions (or states of the world) are required, prohibited, or permitted" (Ostrom 2011, 17). Rules can be considered to be common foundation for action based on how they are understood by those participating in a process. They can provide the incentives or the disincentives for action. Understanding of the foundational rules of the institutions allows us to understand the actions that are taken by those within an institution. Rules can be understood to be both formal and informal. Rules can be both internal to an action situation as well as imposed by external institutions as exogenous variables.

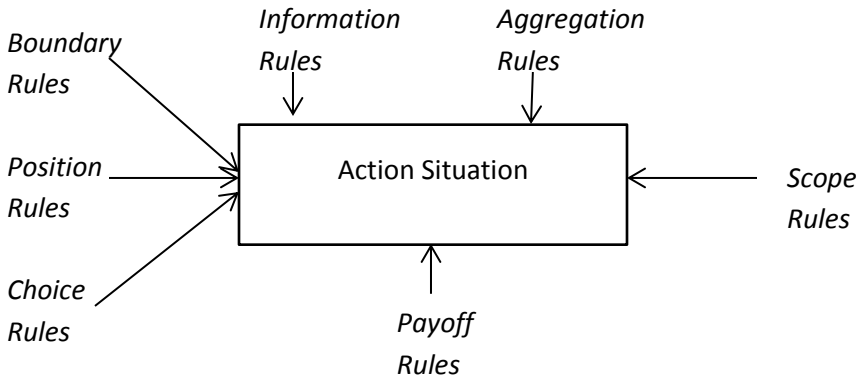
Formal rules will be typically written and codified within some type of legal document. For example, constitutions, laws and regulations will communicate the formal rules which will constrain an organization. Crawford and Ostrom (1995, 2005) have developed a tool for analyzing formal institutional rules (The Institutional Grammar Tool (IGT)). Their method consists of coding the individual action statements of written rules into the various grammatical components, such as the subject of the

rule (the attribute), the type of prescription (the deontic), the prescribed action (the aim), the conditions under which the rule must be followed (conditions) and the consequences (or else) (Basurto et al. 2010; Crawford and Ostrom 2005; Siddiki et al. 2011). For more information on the IGT, see the Methods Section of this paper. Once this legislation has been coded, it is then possible to analyze the data to understand upon whom, and how, the rules of the legislation accomplish their ends. This tool provides one method to gather data about the different rules that exist within an institution. But there is also a distinction between the formal rules, which may not be enforced equally as the rule of law, and the informal rules which also play a strong role in regulating and constraining actions.

Informal rules are much more difficult to understand and decipher. These rules are developed over time through the interactions of multiple actors to solve problems and accomplish ends. These informal rules still impact decisions and actions. They are often considered to be 'rules in use', heuristics or guidelines that structure interactions. They can support or enhance the formal rules that are laid down by the laws that structure the institution, but they can also contradict the formal rules.

Figure 2 shows the different types of rules which will act from outside to constrain the action situation (as Exogenous Variables). There are six different types of rules that have been defined that can impact the variables within the action situation. Boundary rules define who can and cannot participate within the action situation. Various categories can be used to define these groups based on demographic characteristics as well membership, certification and other ways to distinguish groups. Position rules describe how members can navigate the different positions within the institution. Scope rules define the jurisdiction of the institution and how far it reaches. Choice rules help to determine how decisions are made within the institution. Aggregation rules determine how actions and benefits of the institution will accumulate. Information rules govern the availability of information to different participants, whether it is freely available and public or if it is held in secret. Finally, payoff rules determine the consequences of winning and losing within the action situation. For example, payoff rules will determine the costs of non-compliance within the system.

Figure 2: Rules as Exogenous Variables Directly Affecting the Elements of an Action Situation. (Source: Adapted from Ostrom 2005 in Ostrom 2011, page 189)



Multiple Levels of Analysis

One interesting feature of the IAD framework is the concept of levels of analysis and the idea that insitutions develop at different levels and that the different levels are interconnected (Ostrom 1990, 2007). Thus, we can examine institutions at a very high level, called the constitutional level or even the meta-constitutional level. This type of analysis examines national and supra-national constitutions. The next level is what Ostrom describes as the collective choice level, for example the legislative level of government. At this level we can examine the laws and legislation produced to understand the rules. The lowest level of analysis is the operational level. The key to understanding institutions is in the understanding that there are multiple levels of analysis and that these levels influence and interact. Rules devised at the constitutional level will impact the actions taken at the collective choice level. Similarly, rules at the collective choice level will impact the actions taken at the operational level, etc.

This paper seeks to begin to construct the action situation for public administrators who are implementing brownfield cleanups through an understanding of the formal rules. The primary focus is on identifying the formal rules which are laid out in brownfields legislation (at the collective choice level) and to understand how the collective choice level will influence decisions at the operational level (as exogenous rules and regulations). The research focuses on two cases of brownfield legislation, at the federal and the state level, to examine the legislative impact on the resulting action situations. It also will synthesize the models to provide a more comprehensive view of the formal action situation.

Literature Review

The IAD framework lays out a very interesting approach to study resource management issues. William Blomquist and Peter deLeon (2011) point out that while there is a substantial body of literature on the IAD, it has not been distributed and applied as widely as it could be. One challenge may lie in the idea that the framework on its own is not a testable theory, but more a framework or approach to use to generate research questions. Another challenge lies in the long enduring nature of the institutions identified by Ostrom. At what point do the regularized interactions become institutions? Can institutional ideas be applied to other areas of inquiry that do not meet these requirements? Recognizing and studying institutions that are developed during policy implementation may prove empirically and methodologically challenging, but it may also provide more insight into understanding policy implementation in multiple domains.

One challenge in institutional analysis lies in identifying the many rules that guide action. Crawford and Ostrom (in Ostrom 1995, 2005) lay out a basic framework for using the Institutional Grammar Tool (IGT) to map out the rules within the action situation of an institution. They define different uses for this process and one reason is that it allows us to understand the formal action situation in order to be able to recommend reforms. Crawford and Ostrom (2005) also provide mechanisms to characterize the different types of rules which can result using the IGT. The core of this analysis is to provide an empirical method to understand formal rules by understanding their component, grammatical parts.

Basurto, et al (2010) and Siddiki, et al (2011) attempt to operationalize and formalize the use of the IGT and apply this method to analyze different forms of legislation. Basurto, et al (2010) makes the

first attempt to apply the IGT to methodically analyze legislation. Siddiki, et al (2011) further refine Basurto's method and introduce additional grammatical components to improve precision in applying the tool. In addition, Siddiki et al (2011) use the results of the data to begin to map out the interactions of the different actors within an water management network. In a later work, Siddiki et al (2012) compare the results of the tool with individual regulatory compliance and how it is shaped by the formal, legal environment. The work presented here seeks to continue in this vein to apply the method on a broader basis.

To understand cross-scale linkages between action situations, Heikkilla, Schlager and Davis (2011) examine interstate water compacts. They capture the cross scale linkages embodied in the compacts by identifying the conformity of the compacts with Ostrom's design principles for enduring common pool resource (CPR) management (Ostrom 1990). The design principles seem closely related to the types of rules that can comprise an institutional setting. This research (Heikkila, Schlager, and Davis 2011) provides one systematic approach to identifying the different types of rules and conceptualizing the resulting institutions at the constitutional and the collective choice levels.

Bushouse (2011) expands the scope of institutional study beyond the study of common property resources. Bushouse applies the IAD framework to the study of childcare service provision. Bushouse's analysis identifies childcare as a toll good. The author argues that although access to the facilities is limited by paying tuition, once access is gained then the services are jointly consumed.

Blomquist and deLeon (2011) argue that the IAD framework deserves further consideration beyond its current use on common pool resources. They argue that institutions develop around a plethora of different resource configurations, and that the IAD may enable better understanding of many different types of interactions. Further, they point out that application of the framework to understand connections between governmental and nongovernmental actors may also be and under studied area. As governance is more and more common in many areas of public policy implementation, this framework has the potential to explain actors and actions through the implementation process.

Research Case – Brownfields

Brownfields are real estate sites which are impacted by the presence or perceived presence of toxic chemical contamination (US EPA 2011). Most brownfields are the result of historical industrial or agricultural activities which occurred under a prior, less stringent, regulatory regime. Thus, the contamination comes as a result of companies that may have followed the standard operating procedures and norms of the time. Brownfield contamination is mostly considered to have lower levels of contaminants than Superfund[1] sites, but the problem still needs to be addressed. The impact of this contamination has potential impacts for the community and its economy as well as the environment and human health.

Brownfields can be considered a hybrid type of policy. They contain a regulatory backbone which is used to ensure that liable parties contribute or participate if possible and to ensure that certain

[1] The Superfund Program, or Comprehensive Environmental Response Compensation and Liability Act (CERCLA), was a federal program established in 1980 in order to clean up severely contaminated sites around the country using a federal response and approach.

standards for cleanups are met. But, brownfields also involve distributive and redistributive elements which may act as incentives. As the goal of the policy is to clean up contaminated sites to ensure that they can be returned to economic use, they can be considered to provide a benefit to a community which will have a cleaned up site at the end of the process. In some instances they are considered as redistributive, if the funding for the cleanups comes from a specialized tax, as is the case in Washington State. In other situations, the funding for brownfields may come from the general fund of the state or federal government, making brownfields more distributive. In either case, it should be recognized that at the end of the process, there will be a public benefit conveyed to a community through the process of a publicly funded environmental cleanup.

As a policy area brownfields have roots in Superfund legislation. In the 1980s, as a result of serious levels of contamination discovered in sites like Love Canal, NY, the Comprehensive Environmental Response, Compensation and Liability Act (US EPA 1980) (CERCLA) or Superfund was created. Superfund was developed in order to create a process and a funding mechanism to restore the most critically contaminated real estate sites around the country. Superfund works by first characterizing these sites, litigating for all potentially liable parties and then following a federally managed cleanup process (Moore 2000). Superfund policy is generally characterized as a command and control regulatory response to environmental contamination. Brownfields were recognized at the federal level through the Brownfield Program developed by the EPA in 1995 (US EPA 2011). Brownfields were then codified into federal law through the Small Business Liability Relief and Brownfields Revitalization Act of 2002 (SBLR-BRA) (US EPA 2002). This law was passed as a series of amendments to the CERCLA legislation. This research examines Title II of the SBLR-BRA which is entitled Brownfields Revitalization and Environmental Restoration.

Brownfield sites have been impacted by the Superfund legislation through a trickle down process, whereby the strict command and control approach of Superfund (and its liability structure), has the result of sterilizing or inhibiting redevelopment of the brownfield sites. In the interim period between the creation of Superfund and the passing of the Federal brownfield laws, many states have come up with environmental policy approaches to deal with the impacts of uncertainty and liability. Many states have developed voluntary programs whereby they will relieve property owners of some liabilities and uncertainties in exchange for their cooperation in the cleanup and redevelopment of the site. These approaches have combined both incentives and market based mechanisms with a regulatory foundation in order to foster the redevelopment process (Dana 2005). Most states also offer technical and process assistance as well as funding to aid in cleaning up the contamination.

Washington State created the Model Toxics Control Act in 1988 as an initiative to fund toxic cleanups in the state. This law codifies funding, standards, and assistance for cleanups within the state (Washington State Department of Ecology 2011). As has been seen in other cases of environmental policies, often the states will step up and develop policies when a gap exists in the federal law. In the case of brownfields, this gap resulted from sites which were not large and hazardous enough to qualify for federal funding, yet they still posed a challenge to human and environmental health. Federal brownfields legislation was enacted in 2002 with amendments to the Superfund legislation. These amendments within the Small Business Liability Relief and Brownfields Revitalization Act clarify the federal role in brownfield cleanups.

Research Questions

This research is part of a broader project which examines the drivers of public administrator decisions to pursue (or not) cooperative implementations for brownfield cleanups at the local level. The research examines and juxtaposes structure and agency as drivers of these decisions. This current research seeks to examine the formal structural components which lay the foundation for these decisions. Using Institutional Analysis broadly, and the Institutional Grammar Tool (IGT) more specifically, it will focus on what the structural drivers of public administrator behaviors. Specifically it will look at federal and state laws that regulate cleanups in Washington State. The primary question that guides this research is to better understand the following:

1) How does the IGT allow researchers to map out the action situation for brownfield cleanups?

The goal for this research is to apply the IGT as a practitioner and to understand how it can provide a method and guide to understanding formal rules. Following preliminary inquiry, we find that many of the rules are directed primarily at the state and federal agencies (such as the Washington State Department of Ecology and the United States Environmental Protection Agency), but act indirectly on other actors, such as those performing the cleanups. Thus, the second question that this research seeks to understand follows:

2) How does the IGT handle principal-agent types of relationships which are encoded into legislation?

Similarly, to the addition of the Object to the IGT analysis (proposed by Siddiki et al. (2011)), this research seeks to explore if there may be other important information which is still locked within the coding scheme and if usability of the tool may be improved by recognizing these types of relationships which exist within the legislation.

Methods – The Institutional Grammar Tool

Elinor Ostrom conceptualizes institutions as a framework which enables us to understand the incentives that structure individual decisions and their behaviors. In order to describe institutions as a framework, Ostrom created the Institutional Analysis and Design (IAD) framework, which lays out the interaction between structures, actors and rules (Ostrom 1990, 2005, 2007). Sue Crawford and Elinor Ostrom (1995, 2005) propose that one way to understand the action situation using the IAD framework is through examining the formal rules that are codified in legislation. They argue that there are regular patterns that appear in the legislation which can be understood as patterns for behavior. The legislation can be considered as a precursor to the norms and the rules that will be in use within an institutional arrangement. They lay out a grammatical structure where different components of legislative statements can be understood to describe different types of interactions that will occur.

Xavier Basurto, et al. (2010) and Saba Sidikki, et al. (2011) expand on our understanding of how to implement this method. Both authors further clarified the use and the distinctions between different grammatical components defined by Crawford and Ostrom(2005). Using the method of the IGT, words and phrases are characterized as Attributes, Deontics, Aims, Conditions, and Or Else statements. Additionally, Siddiki et al. (2011) define an additional grammatical component, the Object (B), which is the receiver of the action defined in the statement. They argue that this component helps to clarify the actor in the statement from what is being are acting upon. Each of these components is used in the following manner (Table 1):

Table 1: Grammatical Component Characteristics

Attribute(A)	The subject of the statement, e.g., the Environmental Protection Agency, The Administrator
Deontic (D)	Defines how the action should be performed, e.g., shall, must, or may
Aim (I)	The actions or outcomes that are expected
Object (B)	The receiver of the action of the statement
Conditions (C)	Descriptors of when, where and how the statement must be performed
Or Else (O)	The statement of what happens if the Aim or Condition is not met.

(Source: Crawford and Ostrom 2005; Siddiki et al. 2011)

In order to code the different components we followed the methods as specified in Siddiki et al (2011). For specific directions, please see Siddiki et al (2011). First, the legislation was divided into individual statements as a primary unit of analysis. Headings, definitions, and notes were discarded. Statements were then separated out to indicate individual units of observation based on the occurrence of certain indicators, e.g., heading, subheadings, semicolons, and other outline indicators. We followed the guidelines for parsing the statements with the exception that a colon (:) was not treated as an 'outline indicator'. Within the legislation we examined, a colon was typically used to indicate a continuance of a phrase, and not the end of a phrase. Second, the individual grammatical components were coded following the guidelines. Third, once the different components are coded, then the patterns of the components can be coded. For example, a statement that contains all components (ADICO/ ABDICO) indicates a regulatory rule. A statement with the format ADIC/ABDIC indicates a norm. AIC/ABIC statements indicate shared strategies.

A second coder was employed as a test of intercoder reliability. The secondary coder was very familiar with the structures of environmental laws. Both coders trained using the method on other environmental laws before coding the actual laws. The second coder coded about 10% of the statements in each law in order to test for the reliability of the method. Results were then compared to ensure that the method is repeatable.

By analyzing all of the statements within a particular piece of legislation, we can begin to understand the legislation and how it is intended to regulate activity within a particular realm. For example, we can determine which actors are most commonly regulated. For example, does that law

seek to change the behavior of a particular agency or a private sector actor? We can also examine the deontic to determine the strength or stringency of the statement and whether it is required or optional.

Further analysis allows us to begin to visualize the actual statements contained within the law. We can first focus on the actors that are pertinent to the implementation of the cleanup process. Then by adding in additional components like the Aim, Object, Deontic and Condition we can begin to recognize patterns. Performing this nested analysis will allow us to generalize about the rules that apply to the various actors within the law.

Finally, Crawford and Ostrom (2005) propose that the type of rule can be classified based on the content of the Aim statement. Thus, the following guidelines (Table 2) are used to help to distinguish between the types of rules that are in use in the statements.

Table 2: The Aim component of each type of rule

Type of Rule	**Basic Aim Verb**
Position	Be
Boundary	Enter or leave
Choice	Do
Aggregation	Jointly affect
Information	Send or receive
Payoff	Pay or receive
Scope	Occur

(Source: Adapted from Crawford and Ostrom (2005), page 191)

As has been mentioned previously, brownfields present themselves as a different type of policy from other regulatory environmental policies. Brownfields typically have a regulatory backbone but at the same time normally provide incentives to enable cleanup and redevelopment of sites. Thus, we would expect brownfields policies to be less stringent than other policies. But there are still some regulatory standards that need to be set by the law. Thus, we might expect brownfield laws to be structured in different ways to encourage partnership in accomplishing cleanup.

Findings and Results

Summary findings

The first step of the process was to code all of the grammatical components. Coders followed the approach set out by Siddiki et al (2011) in order to parse out statements and identify the individual components within each legislative statement. Siddiki et al (2011) introduced the idea of the Object as an inanimate or animate subject of the Aim as an improvement over the method of Basurto et al (2010), which creates a very complex and potentially ambiguous Aim statement.

Intercoder reliability was measured between the two coders. The primary coder parsed out 100% of the federal and state laws. The secondary coder parsed out about 10% of the two laws. Coding between the two coders was compared and allowed for full (100%) and partial (50%) agreement between the results. Intercoder reliability data is presented in Table 3.

Table 3: Intercoder reliability for state and federal brownfield laws.

Component	Average Agreement between Coders for Washington State Brownfields Law (%) (n=30)	Average Agreement between Coders for Federal Brownfields Law (%) (n=35)
Attribute (A)	87	97
Deontic (D)	87	100
Aim (I)	77	94
Object (B)	70	82
Condition (C)	72	70
Or Else (O)	87	100

Intercoder reliability numbers are generally lower for the state level law as compared with the federal level. This may be due to the type of language used by state laws. We find that the lowest measures of intercoder reliability appear between the coding of the Aim, the Object and the Condition, while there was less difficulty in the coding of the Attribute, the Deontic and the Or Else statements. Generally we find acceptable levels of intercoder reliability in the coding which indicates that the method is repeatable and systematic.

The first step of the analysis is to examine the summary data for the laws. This information is presented in Table 4. From this information we find that these laws are primarily written as a series of norms of behavior, versus regulatory rules or shared strategies. In the state law we also identified a statement form which we call a 'legal statement'. These statements were generally statements which acted to establish liability for contamination among parties, and generally came in the form of Attribute-Deontic-Condition. This form of statement may be more specific to this type of legislation.

From examining the modal attributes we find that these laws primarily are written to regulate the behavior of the different agencies charged with the implementation of the state/federal program. Less frequent are the statements which are meant to direct the actions of the regulated community such as the persons, the owners of facilities, local governments, etc. This information will prove interesting in later parts of this analysis.

Table 4: Summarizing institutional statements

Legislation	Washington State Brownfields Law	Federal Brownfields Law
Number of shared strategies (AIC/ABIC)	0	0
Number of 'legal statements' (ADC/ABDC)	28	0
Number of norms (ADIC/ABDIC)	248	138
Number of regulatory rules (ADICO/ABDICO)	0	0

Total Institutional Statements	276	138
Modal Attributes (number of occurrences in policy)	The Department of Ecology (144) Persons (28) The Treasurer (25) The Operator of a Facility (24)	The Administrator of the EPA (51) The President (24) Persons (17) State or Indian Tribe (15)
Modal Deontics	shall (112) may (63) must (26) may only(15)	may (60) shall (49) shall not (18) may not (6)

Given that the primary Attributes within the laws are the implementing agencies, and given that the intercoder reliability is substantially lower for the combination of the Aim, Object and Condition, it leads me to wonder if there is not more information to be mined out of these institutional statements. Often, the Conditions became long, concatenated statements which seemed to become a catch-all of the 'long-winded legalese' which is often found in legislation. For example, these policies are meant to encourage certain behaviors (cleaning up hazardous waste), yet the laws primarily seem to address the federal and the state agencies which will guide the process. Are there components of the laws which act indirectly to influence the behaviors of the owners, operators and persons responsible? Are the components to be found within the Conditions and if so, is there a way to continue to parse them out in a systematic fashion?

Nested Analysis

While the analysis of the individual components and their modalities provides insight into the most common statements in the laws provides insight into the most common subjects of the laws, Basurto et al (2010) explain that a nested analysis can be done of the data (coded statements) in order to focus on the statements that apply to a specific attribute (person or group). Basurto, et al. (2010) propose a multi-step process of building an analysis which starts with an analysis of the Attributes. By selecting first one Attribute (such as a specific department), additional layers of insight can be obtained by examining the Attribute and the Aim. Then the Object (see Sidikki, et al. (2011)) and Deontic can be layered into the analysis. The resulting analysis allows you to get a more straightforward clear vision of the rules of the law which apply to the different groups. Table 5, below, shows the nested analysis for the Department of Ecology within the Washington State Model Toxics Control Account Legislation (1988). This shows the nesting of Attribute (The Department), Aim (Allocate), Object (moneys deposited…), and Deontic (shall).

Table 5: Sample nested analysis for the Department of Ecology

The Department (Attribute)
Allocate (Aim)
moneys deposited into the state and local toxics control accounts (Object)
Shall (Deontic)
Apply (Aim)

industrial clean-up standards (Object)
may not (Deontic)
etc.

Condition and Or Else statements can be added to the analysis to understand the circumstances under which the statement will be true as well as the consequences of performing the action. These statements add additional complexity to the rules and regulations within the law and provide more context for understanding how these statements will develop into the Action Arena for the different actors.

Mapping the Action Situation

The Action Situation consists of the different actors and their positions and the rules and norms that guide their decisions and behaviors within the institution. Within the IAD framework, the Action Situation is shaped by the external rules which arise due to the regulations defined within the law. This analysis proposes to analyze the outputs of the Institutional Grammar Tool (IGT) using nested analysis to understand the external rules that structure the environment of the Action Situation.

This analysis begins with determining which Attribute (or Actor/Position) will be the subject of the analysis. By examining the all of the Attributes within the Washington State MTCA law, we can classify the Attributes into a few different categories which include citizens, facility operators, implementing agencies (local and special purpose) and agency and other formal state actors (Department of Ecology, Attorney General, Auditor, Legislature). We can focus on the Attributes that apply to the agencies or organizations that are implementing the brownfield cleanup projects, specifically the implementing agencies and the owners and operators of the facilities. By examining the nested analysis (Table 6 and 7), we find the following rules that guide the actions of these specific actors. The following tables show the resulting rules. The columns of the table indicate the types of grammatical component and the rule types. The rows indicate the content of the laws. Empty cells indicate repetition of the component data above. Components that are implied (during the coding process) within the statement appear in brackets [].

Table 6: Nested analysis for facility owners and operators

Attribute	**Aim**	**Object**	**Deontic**	**Rule Type**
any owner or operator of a facility	[from meeting]	any other notification or reporting requirements	is not exempt	Position
	[from meeting]	notification requirements	Is exempt	Position
	Include	a description of any remedial actions planned, completed or underway	Shall	Choice
	Issue	a notice to the department	Shall	Choice
	Post	the notice	Must	Information
	post and mail	an appropriate translation	Must	Information

	Provide	the address of the facility	Shall	Information
		the cause and date of the release	Shall	Information
		the common name of any hazardous substances and the chemical abstract registry number	Shall	Information
		the date	Shall	Information
		the name, address and telephone number of a contact person	Shall	Information
		the potential health and environmental effects	Shall	Information
		the remedial actions being taken or planned to address the release	Shall	Information
	to reimburse the department	for the actual costs	is responsible	Payoff

These rules establish notification and reporting responsibility for the owner or operator of a facility where a cleanup or a spill has taken place. The Deontic in this case is 'must' or 'shall' which indicate that these are strict rules to which the actor must adhere. There are no Or Else statements in these laws. It is interesting to note that these rules give little information or guidance about how the actual implementation should be structured.

By examining the Aim of the statements, we can also determine the types of rules which are in use by the legislation. By mapping this information, we find that this legislation utilizes Choice, Information, Payoff and Position rules to structure the action situation.

On the other hand, the statements impacting implementing agencies give even less information. The following table contains the rule which applies to implementing agencies.

Table 7: Nested analysis for implementing agencies

Attribute	**Aim**	**Object**	**Deontic**	**Rule Type**
implementing agencies	Charge	a fee	May	Payoff

At least at the state level, examination directly of the rules that apply to either owners and operators or implementing agencies does not seem to provide any guidance on decision making within agencies related to brownfield cleanups.

The same analysis can be performed at the federal level. First, we examine the coded data for Attributes (actors or positions) which will be related to brownfield cleanups. In this case, due to the federal nature of the statute, we find statements that relate to citizens, grant and loan recipients, state and local governments, and federal level agencies and actors. By focusing in on the grant and loan recipients we get the following statements in the nested analysis (Table 8).

Table 8: Nested analysis for federal brownfields law

Attribute	**Aim**	**Object**	**Deontic**	**Rule Type**
[A recipient of a grant or loan]	Use	a part of a grant or loan	may not	Choice
	Use	a part of a grant or loan	may not	Choice
[a recipient of a grant]	Perform	a site characterization and assessment	Shall	Choice
[The recipient of revolving loan funds]	Use	revolving loan funds	May	Choice
[the State or Tribe receiving financial assistance]	identify in the public record	the institutional controls	Shall	Information
		whether or not the site will be suitable for unrestricted use	Shall	Information
	maintain and make available to the public	a record of sites	Shall	Information
a recipient of a grant or loan	Use	a portion of the grant or loan	May	Choice
an eligible entity	Submit	an application for a grant	May	Choice
	Use	the grant funds	May	Choice
	Use	the grant funds	Shall	Choice
a local government	Use	the grant funds	May	Choice

Similar to the state law, we find that the federal law primarily uses choice and information rules to accomplish its policy goals. The main focus is on the activities that can be funded by the use of grant funds by the entity.

What we find is that there is little direct regulation of organizations that are actually doing the cleanups when we examine the laws that relate to them directly as the Attribute. Most of the regulations deal with reporting and public notification requirements for the recipients of federal funding, which is expected under our federal system of government.

Principal Agent Relationships via the Condition Clause

While the above statements actually seem quite spartan to construct the Action Situation, the addition of the Condition into the analysis adds much more insight into how the actual activities are regulated. Table 9 shows data using the Department Attribute with the addition of the Condition clause. The addition of the Condition into the analysis introduces the idea that these legal statements may act to create indirect incentives which will impact the Action Situation of different actors within the brownfield cleanups. Given that the summary information shows that the Department of Ecology and the EPA are the most common Attributes used in the two laws, there is the possibility that there will be many indirect regulations upon the brownfield projects, which are imposed via the state and federal departments.

Table 9: Nested analysis including the Condition

[the department] (Attribute)
Allocate (Aim) moneys deposited into the state and local toxics control accounts (Object) Shall (Deontic) except during the 2009 -2011 fiscal biennium, one percent, only for public participation grants to persons who may be adversely affected by a release of threatened release of a hazardous substance and to not-for-profit public interest organizations. (Condition) Apply (Aim) industrial clean-up standards (Object) may not (Deontic) to industrial properties where hazardous substances remaining at the property after remedial action pose a threat to human health or the environment in adjacent nonindustrial areas (Condition)

The above two statements show that substantial additional information that is gained by adding the Condition. In the first statement, there is a possible indirect attribute that may be identified (persons adversely affected, not-for-profit public interest organizations). The second statement does not indicate an indirect attribute.

Table 10 shows an example of a nested analysis where the condition may impose more incentives and conditions upon actors who are not mentioned in the Attribute, Aim and Object (underlined).

Table 10: Nested analysis with a potential indirect Attribute

the attorney general and the department (Attribute)
Give (Aim) Priority (Object) May (Deontic) to settlements that will provide a substantial public benefit, including, but not limited to the reuse of a vacant or abandoned manufacturing or industrial facility, or the development of a

facility by a governmental entity to address an important public purpose (Condition)

In this case, the Attributes (the Attorney General and the Department) are able to give priority funding to those entities running the cleanups that can prove that the project provides a substantial public benefit. This condition changes the action situation rules by changing the project objectives in order to receive funding. This may be considered a Choice rule based on the Aim verb (give).

Table 11 shows another example where the Department is directed to adopt and enforce rules which will change the behavior of their target community.

Table 11: Nested analysis with a potential indirect Attribute

The Department (Attribute) adopt and thereafter enforce rules to provide for (Aim) requiring the reporting (Object) Shall (Deontic) under chapter 34.05 RCW, by an owner or operator of releases of hazardous substances to the environment that may be a threat to human health or the environment within ninety days of discover, including such exemptions from reporting as the department deems appropriate, however this requirement shall not modify any existing requirements provided for under other laws. (Condition) adopt and thereafter enforce rules to provide for or require (Aim) public participation (Object) Shall (Deontic) under 34.05 RCW, including at least (i) public notice of the development of investigative plans or remedial plans for releases or threatened releases and (ii) concurrent public notice of all compliance orders, agreed orders, enforcement orders or notices of violation. (Implies the implementing agency of the brownfield) (Condition)

In Tables 10 and 11, the Director of the Department of Ecology (DOE) is charged with developing rules to require certain actions on the part of those cleaning up the brownfield site. This might be considered a Principal-Agent relationship where the law regulates the Principal, and via the principal, the actions of the Agent. Thus, these statements create an 'indirect' regulation for the administrators in charge of the site, via the discretion of the Director of the DOE. Another example is provided in Table 12.

Table 12: Nested analysis demonstrating an indirect Attribute

the director (Attribute) Alter (Aim) grant-matching requirements (Object) May (Deontic) to create incentives for local government to expedite cleanups when one of the

following conditions exists, funding would prevent or mitigate unfair economic hardship imposed by the cleanup liability. (Condition)

to create incentives for local government to expedite cleanups when one of the following conditions exists, funding would create substantial economic development, public recreational or habitat restoration opportunities that would not otherwise occur.

Similarly, these statements demonstrate that the Director of the DOE has the ability to create incentives which will encourage certain types of project designs (e.g., economic development, public recreation or habitat restoration) for local governments. These statements are shown in table 12 with a double underline, and also act as indirect regulations.

The Federal Brownfields Law also contains similar types of indirect regulations. Many of these indirect regulations work to provide incentives to perform certain behaviors in order to receive funding.

Table 13: Nested analysis of the federal brownfield law

The Administrator (Attribute)
Award (Aim)
a grant (Object)
May (Deontic)
-to a state or Indian tribe that has a response program that includes each of the elements or is taking reasonable steps to include each of the elements, listed in paragraph (2) (Condition)
-to a State or Indian tribe that is a party to a memorandum of agreement with the Administrator for voluntary response programs. (Condition)
award (Aim)
Grants (Object)
Shall (Deontic)
under this subsection to eligible entities that the administrator determines have the highest rankings under the ranking criteria established under subparagraph (C) (Conditon)
Make (Aim)
a grant (Object)
May (Deontic)
to the eligible entity, to be used for programs to inventory, characterize, assess, and conduct planning related to one or more brownfield sites (Condition)

The statements shown in Table 13 above show how the conditions will alter the incentives for the state or Indian tribes or those responsible to conduct cleanups. For example, the first statement will impose requirements for the cleanup programs of the state or tribes to accomplish the aims stated

earlier in the law. Similarly, the latter set of statements will be used to shape the incentives for eligible entities to craft the program according to the federal standards.

New Grammatical Component Needed?

The above analysis demonstrates that ambiguity may be one potential weakness in the application of the IGT. If the goal of the approach is to provide a systematic way to parse out and understand the rules of legislation and how they structure the institutional environment for different actors, then further analysis may be needed in the case of legislation which primarily cites federal and state governmental agencies. Potentially, it will require a further step of deciphering the Condition statements to understand if there are any indirect attributes named within the statement.

The question that arises is how to address this potential ambiguity as the original coding also demonstrates a condition being imposed upon the principal? Yet, further reading of the condition demonstrates that there is another actor upon whom incentives are being placed. Thus, we might wonder (1) if it is possible to codify rules for running a secondary coding and also (2) how to handle the data that arises from the secondary coding (if its use constitutes a double counting within the coded data).

From the standpoint of understanding the Action Situation and the rules and incentives that guide behavior, this seems to be a necessary step to take. These rules will be key to understanding the actions of the organizations implementing the brownfield cleanup. For example, if receiving grant funding is based on conformance of your project to federally defined end-uses, that may conflict with the wishes and desires of the community, this becomes a key incentive to structure behavior. If these rules are not directly laid out in the federal law, then it is important to be able to incorporate them into our Action Situation Analysis.

As Siddiki, et al. (2011) have extended the original grammar with the addition of the Object, we might consider identifying either another type of rule or a further refinement of the grammatical components, e.g., Indirect Attribute. An additional approach would be to add another step in the process to identify and code the pertinent statements from the standpoint of the agent or the indirect subject and include them in addition to the first statement.

The difficulty in systematizing this type of relationship is that this information is based on the content of the analysis. It further complicates a process that is attempting to codify and analyze institutional statements in a systematic fashion. There is a balance that needs to be reached between ease of use and precision when implementing this method.

Conclusions

The original purpose of this research was to use the IGT to understand how the state and federal laws serve to structure the Action Situation of those charged with implementing brownfield legislation at the operational level. It is one part of a broader research project to understand the different factors that shape implementation decisions by public managers acting at the local level. In trying to map out the rules that impact the Action Situation, we find that there are actually few components of the law that act directly on the implementing actors of the brownfield project. Instead, we find that the law functions primarily through structuring the actions of the federal and state actors, and via these actors, imposes incentives upon the implementing actors. This is a very interesting finding in itself.

This finding also highlights that further refinement of the IGT may be necessary if it is to have broader applicability to more government-centered types of regulations. While brownfield programs generally have the approach to incentivize actors to do the cleanups through the management of liability, we find that they additionally work through grants and funding that seek to control and structure the cleanup activities. Thus, they result in a type of principal-agent relationship that we need to be able to identify in the coding process. The ability to codify these types of rules will provide invaluable information to understand the incentives that structure decisions in the implementation process.

Expanding the breadth of the application of the IAD framework and the IGT is very useful in understanding the rules within the decision-making environment. Rules can be used to understand both the exogenous and internal rules of the action situation. The IGT provides a systematic approach to understand the key information within legislation. This research demonstrates that the IGT has the potential to help to codify institutional rules, but that principal agent relationships might pose a complication to this understanding. Further refinement of the IGT may help to sharpen these tools to deal with principal-agent types of relationships, allowing us a better view of the rules and incentives that structure the behaviors of local implementing agencies.

Works Cited

Basurto, Xavier et al. 2010. "A Systematic Approach to Institutional Analysis: Applying Crawford and Ostrom's Grammar." *Political Research Quarterly* 63(3): 523 –537.

Blomquist, William, and Peter deLeon. 2011. "The Design and Promise of the Institutional Analysis and Development Framework." *Policy Studies Journal* 39(1): 1–6.

Bushouse, Brenda K. 2011. "Governance Structures: Using IAD to Understand Variation in Service Delivery for Club Goods with Information Asymmetry." *Policy Studies Journal* 39(1): 105 – 120.

Crawford, Sue E. S., and Elinor Ostrom. 1995. "A Grammar of Institutions." *The American Political Science Review* 89(3): 582–600.

———. 2005. "Chapter Five: A Grammar of Institutions." In *Understanding Institutional Diversity*, Princeton: Princeton University Press, p. 137 – 174.

Hardin, Garrett. 1968. "The Tragedy of the Commons." *Science 162*: 1243 – 1248.

Heikkila, Tanya, Edella Schlager, and Mark W. Davis. 2011. "The Role of Cross-Scale Institutional Linkages in Common Pool Resource Management: Assessing Interstate River Compacts*." *Policy Studies Journal* 39(1): 121–145.

Mazmanian, Daniel A., and Paul A. Sabatier. 1981. *Effective Policy Implementation*. Lexington, MA: Lexington Books.

McGinnis, Michael D. 2011. "Networks of Adjacent Action Situations in Polycentric Governance." *Policy Studies Journal* 39(1): 51–78.

Van Meter, Donald S., and Carl E. Van Horn. 1979. "The Policy Implementation Process: A Conceptual Framework." *Administration and Society* 6: 445–488.

Moore, Emmett B. 2000. *An Introduction to the Management and Regulation of Hazardous Waste*. Columbus OH: Battelle Press.

Oakerson, Ronald J., and Roger B. Parks. 2011. "The Study of Local Public Economies: Multi-organizational, Multi-level Institutional Analysis and Development." *Policy Studies Journal* 39(1): 147–167.

Ostrom, Elinor. 2011. "Background on the Institutional Analysis and Development Framework." *Policy Studies Journal* 39(1): 7–27.

———. 1990. *Governing the Commons, The Evolution of Institutions for Collective Action*. Cambridge, MA: Cambridge University Press.

———. 2007. "Institutional Rational Choice: An Assessment of the Institutional Analysis and Development Framework." In *Theories of the Policy Process, second edition*, Cambridge, MA: Westview Press, p. 21 – 64.

———. 2005. *Understanding Institutional Diversity*. Princeton, NJ: Princeton University Press.

Pressman, Jeffrey L., and Aaron Wildavsky. 1973. *Implementation, How Great Expectations in Washington Are Dashed in Oakland; Or, Why It's Amazing that Federal Programs Work at All, This Being a Saga of the Economic Development Administration as Told by Two Sympathetic Observers Who Seek to Build Morals on a Foundation of Ruined Hopes*. Third, Expanded. Berkeley, CA: University of California Press.

Siddiki, Saba et al. 2011. "Dissecting Policy Designs: An Application of the Institutional Grammar Tool." *Policy Studies Journal* 39(1): 79–103.

Siddiki, Saba, Xavier Basurto, and Christopher M. Weible. 2012. "Using the institutional grammar tool to understand regulatory compliance: The case of Colorado aquaculture." *Regulation & Governance* 6(2): 167–188.

US EPA. 2011. "About Brownfields | Brownfields and Land Revitalization | US EPA." http://www.epa.gov/brownfields/about.htm (Accessed March 20, 2011).

———. 1980. "CERCLA."

———. 2002. "Small Business Liability Relief and Brownfields Revitalization Act | Brownfields and Land Revitalization | US EPA." http://epa.gov/brownfields/laws/sblrbra.htm (Accessed September 9, 2011).

Washington State Department of Ecology. 2011. "Hazardous Substance Tax | Model Toxics Control Act (MTCA) | Washington State Department of Ecology." http://www.ecy.wa.gov/programs/tcp/tax/2011/hazsubstancetax.html (Accessed March 5, 2012).