


PERCEPTIONS OF LEGITIMACY OF MAPS AND MAPPING IN CONFLICT
RESOLUTION

by

Julie Minde
A Dissertation
Submitted to the
Graduate Faculty
of
George Mason University
in Partial Fulfillment of
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of
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Conflict Analysis and Resolution

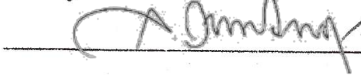
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School for Conflict Analysis and Resolution

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DEDICATION

This dissertation is dedicated to my daughter, Sophie, who is the best writing companion ever...

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I would like to thank my research participants, who kindly and wholeheartedly shared with me their time, energy, knowledge and insights. I am profoundly grateful to my dissertation committee. Thank you, Dr. Susan Allen, Dr. Susan Hirsch, and Dr. Sven Fuhrmann, for your brilliantly expert, insightful and patient guidance on this project. Any shortcomings in this research are entirely mine.

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LIST OF ABBREVIATIONS

CBF	Chesapeake Bay Foundation
DDT	Dichlorodiphenyltrichloroethane
DE	Delaware
Delmarva.....	Del(aware)-Mar(yland)-V(irgini)a
DLLC	Delmarva Land and Litter Challenge
DOA	Department of Agriculture
DPI	Delmarva Poultry Industry
EPA	Environmental Protection Agency
FIV	Fertility Index Value
GIS	Geographic Information System
GPS	Global Positioning System
LRN.....	Lynnhaven River Now
Maps/Mapping	Maps and Mapping
MD	Maryland
N.....	Nitrogen
NIMBY	Not in My Backyard
NOAA.....	National Oceanic and Atmospheric Administration
NSM.....	New Spatial Media
NGO.....	Non-governmental Organization
P	Phosphorus
PDF	Portable Document Format
PGIS	Participatory Geographic Information System
PPGIS.....	Public Participation Geographic Information System
PVC.....	Polyvinyl Chloride
SAV.....	Submerged Aquatic Vegetation
USACE	United States Army Corps of Engineers
USDA.....	United States Department of Agriculture
USGS	United States Geological Survey
VA.....	Virginia
VIMS.....	Virginia Institute of Marine Studies
VMRC.....	Virginia Marine Resources Commission
WoK.....	Ways of Knowing

ABSTRACT

PERCEPTIONS OF LEGITIMACY OF MAPS AND MAPPING IN CONFLICT RESOLUTION

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George Mason University, 2020

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This research examined the relationship between stakeholder perception of legitimacy of maps/mapping and conflict resolution. Evaluation of perceptions of legitimacy in maps/mapping as part of conflict resolution can manifest as questions or judgments about who has the authority or right to map, what information sources and ways of knowing are legitimate, and what map products and methods are legitimate. A theoretical framework was developed that focused on three areas of legitimacy determined to be fundamental: legitimacy of stakeholder, legitimacy of information, and legitimacy of representation. Two water-related environmental resource case studies, each involving multiple types of stakeholders (e.g., citizen, government, agriculture, environment) involved in conflict resolution working groups, were investigated and comparatively analyzed. The Delmarva case focused on a chicken litter management conflict. The Lynnhaven case dealt with a conflict concerning oyster cultivation. Research results include findings about the

importance of social considerations, framing, and abundant participant input concerning their opinions, experiences, and recommendations concerning maps/mapping in conflict resolution. A particularly significant discovery was the central and defining role legitimacy of stakeholder played in both case studies. Lastly, it is hoped that this research might be useful to conflict resolution practitioners in their attempts to “level the playing field” for stakeholders in conflict resolution activities. Therefore, potential implications and recommendations are provided that might be used to guide efforts to ensure appropriate, positive perception of legitimacy of maps/mapping among stakeholders, thereby encouraging constructive engagement, key to conflict resolution success.

1. INTRODUCTION

Although some research has been done on the use of maps and mapping as they relate to conflict and conflict resolution, one significant area that has not received adequate attention is perception of legitimacy. Perception of legitimacy in maps and mapping (hereafter written as “maps/mapping”) as part of conflict resolution may manifest in several ways. Some ways may include stakeholders’ questions or judgments about who has the authority or right to map, which information sources and ways of knowing are valid, and what mapping processes and methods are appropriate.

An example, one which served as a primordial motivation for this research, originates from an experience with a mediation project in the Caucasus in which I was participating a few years ago. During these informal water talks, maps were not used, despite what seemed to me, as a geographer, a clear need to use them. The discussions involved frequent references to specific geographic features, e.g., particular rivers, streams, dams, borders, towns, and topography. When I asked why there did not seem to be any maps used, I was told that maps were not trusted. They were too political. Additionally, they were “wrong.” The maps to which they were referring were old Soviet military topographic maps maintained by the government. These maps were considered inappropriate, both because of their political heritage (problematic for both sides, albeit

for different reasons) and also because by the time of these water talks, these maps were quite outdated and inaccurate.

From my perspective, the avoidance of map use appeared to hamper the process. However, I also noticed two water specialists, one from each side of the conflict, who would occasionally draw a cartoon map on a napkin or scrap of paper. It appeared to me as if between the two of them, their maps, even though not-to-scale, not geographically correct, barely comprehensible even, nevertheless were more appropriate, more legitimate, than what would be considered official maps, i.e. those Soviet maps. I found this both fascinating and problematic. Map disuse or under-use in water conflicts implied to me a loss of geographic precision and geospatial awareness that could potentially lead to significant misunderstandings in a type of conflict resolution effort that is often both acutely geospatial and highly emotionally charged. Thus, understanding how conflict parties perceive maps/mapping legitimacy appeared to be important.

I submit that, broadly speaking, adequate perception of legitimacy concerning maps/mapping among stakeholders (e.g., conflict parties, mediators, facilitators, other third parties) can contribute to maps effectively supporting a conflict resolution effort. However, for this to occur, the relevant voices, narratives, and framings must be allowed. These voices, narratives, and framings must be able to be effectively mapped. Lastly, such maps must be appropriately employed within the conflict resolution process. Conversely, inadequate legitimacy perception can hamper optimal map use in conflict resolution, e.g., by disallowing or marginalizing certain voices, information, methods or approaches to mapping. Possible impacts can include the inability to gain and maintain

situational awareness because of inadequate visualization, the failure to appropriately address issues because they have not been sufficiently included in the geospatial framing of the conflict, and potential continuance or introduction of negative peace by supporting privileged voices.

Therefore, this research studied the relationship between perceptions of legitimacy and maps/mapping in conflict resolution. It did so through investigating two case studies. The Delmarva case study focused on a conflict concerning chicken litter management. The Lynnhaven case study dealt with a conflict over oyster cultivation. As discussed below in the methodology section, these case studies constituted conflict resolution efforts involving multiple stakeholders, various stages and methods of conflict resolution activities or processes (e.g., early warning, mediation, problem-solving), and involved maps and mapping.

In order to conceptualize legitimacy of maps/mapping in conflict resolution, as well as to guide operationalization of studying perceptions of this type of legitimacy, I created a theoretical framework. I consider these aspects to be essential: legitimacy of stakeholder, legitimacy of information, and legitimacy of representation. Below is a diagram, followed by a brief explanation, intended to demonstrate how these aspects are linked and some of the ways they may manifest.

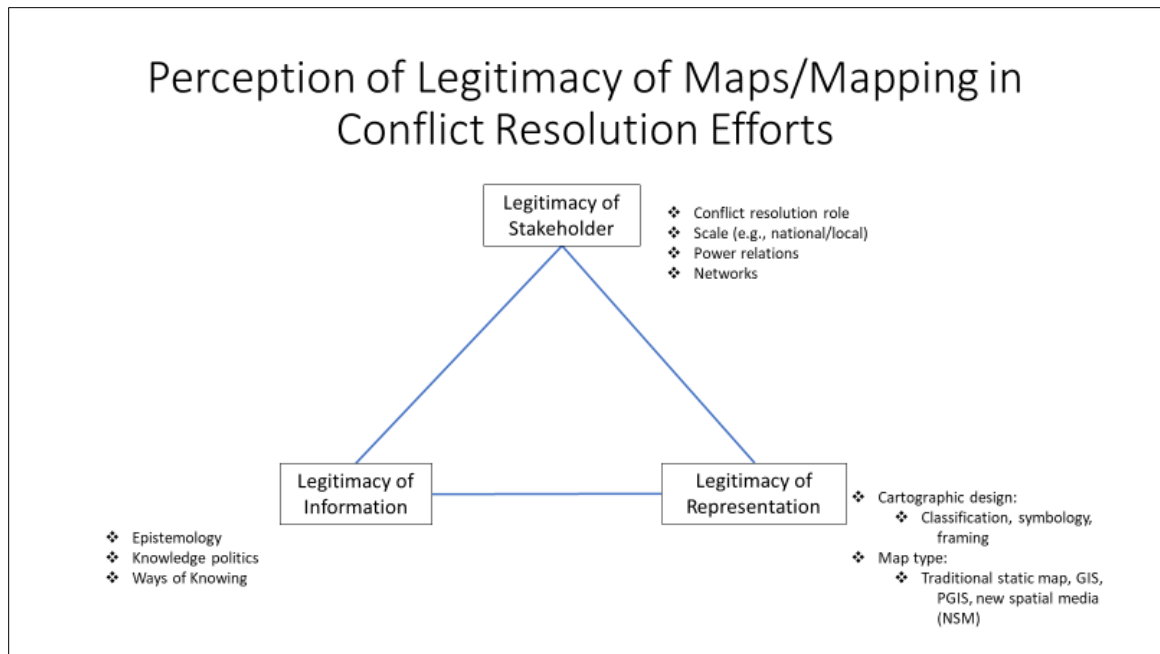


Figure 1: Perceptions of Legitimacy of Maps/Mapping in Conflict Resolution

“Legitimacy of stakeholder” focuses on the stakeholders and their relations to maps/mapping in conflict resolution. This category addresses issues such as the role the stakeholder plays in the conflict resolution effort, e.g., conflict party, mediator, third party. “Scale” relates to the stakeholder’s social level or political echelon, such as local, regional, national, international government. These two factors tie into the heart of this category and the most significant topic in terms of relevance and ramifications for conflict resolution: power relations.

There is considerable capacity for power relations to manifest themselves in maps/mapping (e.g., Harley 1989, Wood 1992, Monmonier 1996, Neocleous 2003), and, therefore, to have significant impact on perceptions of legitimacy in conflict resolution. A stakeholder considered to be the more legitimate source of map products stands a better

chance of more effectively socializing their perspective (e.g., Pfeffer et al. 2012). For example, in a water rights conflict, a government resource management office that provides maps following international geospatial information standards and norms may see its products preferentially treated by international mediators and specialists simply because of said products' perceived legitimacy over those (if any exist) of a contending citizen party. Thus, networks become critical as stakeholders attempt to gain geospatial legitimacy through connections that can provide mapping expertise, technical support, or, most importantly, sources of information (e.g., Ghose 2007, Palmer 2009), the focus of the next subcategory of the theoretical framework.

“Legitimacy of information” focuses on the perceived legitimacy of the information conflict stakeholders include – or do not include – in their geospatial products. As above with legitimacy of stakeholder, perception of legitimacy here is also related to the relevant players in a specific conflict resolution effort, including the conflict parties and their representatives, mediators and other professionals (e.g., cartographers), and third party or other relevant stakeholders who might exert influence in the process. Various perspectives on epistemology and ways of knowing may be challenged. For example, an indigenous group may more abstractly identify and delineate their sacred grounds locations, which might conflict with state topographic requirements for geospatially precise locations and land use classifications. Another example is a case where mapping of the security status of a neighborhood becomes a clash between residents who gauge safety based on how well sidewalks are lit at night versus city staff cartographers who evaluate safety based on police incident reports.

Therefore, conflict stakeholders engage in various strategies and tactics to gain legitimacy for their information. One example is knowledge politics, which Elwood and Leszczynski (2013, 544) define as, "... the use of particular information content, forms of representation or ways of analyzing and manipulating information to try to establish the authority or legitimacy of knowledge claims." Two other, related, means include scalar politics and network politics (Ghose 2007). Through these types of politics, stakeholders leverage relationships and opportunities with others in different positions and at different political levels in order to gain information, advantageously contextualize their own information, or otherwise boost their legitimacy with other key stakeholders.

This ties into the third category, "legitimacy of representation," which relates to the actual geospatial product (e.g., map) as artefact in conflict resolution and focuses on how information is framed and conveyed. Consciously or not, map makers and map users communicate values, interests, opinions, stories, narratives, through maps (e.g., Harley 1989, Wood 1992). What is included on the map, what features are displayed, how these features are displayed, how text is presented, etc., all influence the interpretation of the map.

Skillful map makers successfully imbue maps with the messages they want to communicate. Less skilled mapmakers may or may not be able to leverage map products in such a manner, i.e. their products (or the products they choose to use) may not convey their messages (e.g., Krygier 1995, Crampton 2001, Carton and Thissen 2009). The maps may, indeed, reflect someone else's messages. At worst, those messages may be those of their adversary. Such a situation can happen for a number of reasons. The stakeholder

may not have the means to make maps. As discussed above, this can relate to legitimacy of stakeholder, e.g., the stakeholder is a marginalized group contending against an entity with the status quo means and authority to produce what are considered official maps. And/or it may relate to legitimacy of information, where the stakeholder may not have the technology or education to make successful maps themselves. Thus, it has been common for those engaged in a conflict resolution effort to rely on Other-authenticated maps, even when those maps may not adequately represent their interests.

In fact, stakeholders may not recognize or sufficiently understand that the maps that are used may be working against them. Indeed, those making the maps also may or may not realize that their maps may be doing a stakeholder a disservice. In the theoretical framework, I position the critical matter of map literacy at the interface between legitimacy of information and legitimacy of representation. Map literacy is the ability to read and understand not only the ostensible markings and data on a map, but also the underlying messages and meanings imbedded in maps and map features such as style, symbols, legends, frames, classifications, and so forth (Clarke 2003). I propose that map literacy amongst stakeholders (not least of whom are mediators and facilitators) can help ensure the appropriate, fair, and effective utilization of maps and other geospatial products in support of conflict resolution efforts.

Another key topic related to legitimacy of representation concerns the type of map used. The type of map or other geospatial product chosen is a multi-dimensional reflection of several influences, such as culture, scientific tradition, mapping experience, and resources available. Such influences may also include perceived legitimacy, such as

legitimacy of means of information gathering; source, type, currency of information; the information providers themselves, and so on. Thus, for example, whether a stakeholder chooses to publish a hard copy “flat” paper or PDF map (i.e. un-editable, one-way communication) or to engage in a participatory map project may tell something about a stakeholder’s views on legitimacy. By demonstrating willingness to engage with stakeholders from other interest groups or conflict parties through a map product, rather than to publish a product without means or mechanisms to engage over it, a map-making stakeholder may express their legitimization of said “Other” stakeholders and their information.

Thus, within the above conceptual construct, this research examined the relationship between stakeholder perception of legitimacy of maps/mapping and conflict resolution. Some supporting questions that were investigated include: How is the spatial framing of conflict determined? How are the creation and use of geospatial products used in conflict resolution determined? What is perceived to be a legitimate map (or similar product) by those involved (e.g., stakeholders, mediators, mappers) in any particular conflict resolution effort? How do power dynamics, and social dynamics in general, affect perceptions of legitimacy and vice versa? Ultimately, I hope that the findings from this research are useful for ensuring more appropriate, equitable use of map products in conflict resolution efforts.

This dissertation is organized as follows. The literature review (Chapter 2) investigates theoretical research and supporting practical studies related to maps/mapping, legitimacy, and conflict resolution and presents the theoretical framework

consisting of three types of perception of legitimacy, i.e. legitimacy of stakeholder, legitimacy of information, and legitimacy of representation. Chapter 3, “Methodology,” presents the rationale behind the choice of the Delmarva and Lynnhaven case studies, as well as describes the methodology for the research. The Delmarva and Lynnhaven case study results and analyses are presented in Chapters 4 and 5, respectively. Chapter 6 presents comparative insights from the case studies addressing the key research questions, as well as participants’ insights and recommendations for maps/mapping in conflict resolution. Chapter 7 includes a summary of the findings, categorized broadly as the importance of social considerations, framing, and key research participant input on pros and cons of maps/mapping in conflict resolution. A particularly significant finding concerning the theoretical framework is the central role legitimacy of stakeholder plays. The chapter concludes with potential implications and recommendations for conflict resolution practitioners.

2. LITERATURE REVIEW

Introduction

As introduced above, this research developed a theoretical framework to conceptualize perception of legitimacy of maps/mapping in conflict resolution efforts. Encountering a paucity of literature that explicitly addressed legitimacy, and perception of legitimacy, of maps/mapping in conflict resolution, I chose to structure a framework that would not only guide the literature review but might also (and ultimately did) guide the methodological approach to the research. Thus, my review of the literature focused on theoretical and practical investigation into the intersection of mapping, legitimacy and conflict.

As introduced above, the theoretical framework consists of what I have determined to be three fundamental areas: legitimacy of stakeholder, legitimacy of information, and legitimacy of representation. Broadly speaking, these represent the “who” (i.e. stakeholder), “what” (i.e. information) and “how” (i.e. representation) in terms of how perception of legitimacy manifests. Because this framework derives from various concepts and experiences, this literature review is multi-disciplinary in nature. Topics or areas include, but are not limited to, conflict theory, information and knowledge management, critical geography, political ecology, indigenous geography, developmental geography, social justice, and applied geography. The below sections discuss the three separate but related types of legitimacy.

Legitimacy of Stakeholder

The root of the contest over legitimacy in maps and mapping lies in meaning. Maps, like other texts, are imbued with deeper meaning, beyond the face value of symbols and legends. Thus, whoever controls the map has significant, albeit not complete, control over the meaning expressed through it. The theoretical realization of this, particularly in terms of how power projects meaning, dominated the critical geography community in the 1980s and 1990s, producing key works such as Harley's "Deconstructing the Map" (1989), Wood's *The Power of Maps* (1992), and Smith's "Geography, Empire, and Social Theory" (1994), with critical contributions from outside the field, such as Said's *Orientalism* (1979) and Anderson's *Imagined Communities* (1983).

Understanding the impact of power and power dynamics is an important function in conflict resolution. Although conflict resolution professionals such as mediators are not "gatekeepers" in terms of validating or legitimizing conflict party representatives, they can have a strong influence. Furthermore, some (e.g., Pruitt and Kim 2004) believe that such professionals have an obligation to facilitate a level playing field in terms of parties' ability to represent themselves and their interests in a conflict resolution setting (e.g., during peace talks, problem-solving workshops). As maps and mapping are often involved in conflict resolution settings, it falls to the conflict resolution professionals to evaluate them as they would other texts and products used by the parties. This implies that conflict resolution professionals who work in conflicts where maps play a role should have a basic understanding of maps/mapping, i.e. map literacy. One important

aspect of maps, power, and legitimacy is based in how modern maps and mapping developed as a global phenomenon, discussed next. Other aspects of map literacy are discussed further below, under the section “Legitimacy of Representation.”

The Impact of Western Cartographic Legacy on Maps and Legitimacy

Arguably, power has derived its legitimacy - or at least dominance - in meaning through maps and mapping via two key means: political legitimacy and scientific legitimacy, which, at least until recently, have tended to be strongly inter-related. The political legitimacy finds its origin in Westphalian tradition that privileged national governments as ultimate authorities in mapping on behalf of their inhabitants. Embedded in this seemingly straightforward task lies the prerogative to command a specific narrative perspective. In other words, questions of what is to be mapped and how it is to be mapped are guided by influences such as culture, history, priorities, values, place attachment, relation to Other, sense of ownership, and so on.

The underlying meaning, biases, and power that maps hold, to include underlying subjectivities and narratives, had not been well considered until the past few decades, concomitant with advancements in both theory and technology, leading to more refined understanding of the roles maps play and their social impact.

Maps are generally perceived to be an accurate mirror or graphic representation of some aspect of the real world; cartography is defined as a factual science. But as a wealth of research within the ‘new geography’ has argued at length, the map is an intensely political object. (Neocleous 2003, 417)

Krygier (1995, 6) notes that “Traditional histories of cartography are criticized for their tendency to conceptualize the development of cartography as progressive and teleological while simultaneously ignoring a complex array of cultural, social, economic, and political issues.” In other words, by favoring one set of views and values over others, maps embody a potent means of communicating power relations, albeit a means that commonly goes unappreciated by many map viewers.

From a critical geography perspective, Wood (1992, 107) makes an important observation in terms of power and maps,

...because...maps constitute a semiological system..., they are ever vulnerable to seizure or invasion by myth. They are consequently, in all ways less like the windows through which we view the world and more like those windows of appearance from which pontiffs and potentates demonstrate their suzerainty...

The arguments that promote this idea of the “suzerain’s view,” i.e. maps, the West and empire, are compelling. Harley (1989) discusses the history of cartography in Europe and notes that Western cartography developed (Neocleous 2003) and promoted itself as a science (i.e. objective, unbiased) since approximately the 17th century in imperial Europe. This approach allowed political and other powers to promote colonial worldviews via publishing world maps that included their visions of their territories and “uncharted lands.”

A particularly gripping concept is that of the map as an imperial tool of conquest – what we might now call a narrative of conquest. As Neocleous (2003) argues, the map may create the reality. In other words, political powers have used, and continue to use, maps as means of planning and shaping the environment – politically, militarily, socially, and otherwise – to their advantage. Neocleous (2003, 419) expands on Edward Said’s

connection between imperialism and cartography as “geographical violence,” a process by which every part of the globe is “explored, charted, and finally brought under control,”

And once in place, the map helped to illuminate the late colonial state’s style of thinking about its domain, part of the totalizing classificatory grid which the state uses to order and comprehend civil society. In helping the European powers create a world in their own image, cartography helped stabilize the earth’s surface around the territorial imaginary of the modern state.

In other words, such maps do not just reflect or respond to violence, they create it. Monmonier (1996, 104) adds that the colonial powers used maps “as an intellectual tool for legitimizing territorial conquest, economic exploitation, and cultural imperialism.” He notes (1996, 101) that “Maps made it easy for European states to carve up Africa and other heathen lands, to lay claim to land and resources, and to ignore existing social and political structures.” In fact, indeed, the imperial power of mapping is seen across multiple empires and former empires: British, Russian, Soviet, United States. It extends to subaltern and former subaltern elites in the sense that national governments very often are the only ones with the capability to map, especially in the global South (Pfeffer et al. 2012).

As noted above, the historical interlinkage between science and politics (i.e. government funding of science; scientific pursuit of governmental interests) has had a long-time impact on maps and mapping. This has been well covered in the literature. Aside from establishing conventions for what was to be mapped, the Western cartographic history also determined the trajectory of scientific approach in mapping,

e.g., positivistic and quantitatively focused (Kwan and Ding 2008, McCall 2003, Chrisman 2005, Sheppard 2005, Warf 2010).

The general impact of the dominance of this form of scientific bias has been twofold. First, institutional science has traditionally had a higher capacity and authority for collecting the types and volumes of data used in many quantitative studies, thus further establishing both the implementation, as well as the legitimacy, of its pursuits. Second, quantitative approaches have tended to disadvantage certain types of knowledge often associated with some groups, for example, many types of indigenous peoples, reducing both their efficacy and sense of legitimacy in mapping.

Over time, regardless of political environment (imperial, isolationist, democratic, etc.), the Western cartographic tradition described above became entrenched as an international standard. The “baggage” it carried with it constitutes a form of structural violence that may or may not have been intentional in any given case. Nevertheless, the effect was the continued preferential legitimization of certain types of methods, conventions, and information, perpetuating privileged legitimization of certain groups and interests over others. As an example, a citizen group’s self-made map featuring locally produced knowledge such as informal gathering spots and play areas might be disregarded at a government meeting, apparently because it (i.e. the map) was not produced to accepted cartographic standards. The intent for the exclusion of the map from the discussion may be merely to ensure government standards are upheld. However, the unintended consequence may be that the group’s lobbying is degraded because it cannot as effectively tell its story.

The rise of computerized mapping and related geospatial uses, particularly geographic information systems (GIS), around the 1980s seemed to introduce new possibilities for more egalitarian and diverse mapping (e.g., Krygier 1995, Crampton 2001, Jankowski 2009). Jankowski (2009, 1966) citing Nyerges (1993), defines GIS:

Geographic information systems combine hardware, software, data, people, procedures, and institutional arrangements to collect, store, manipulate, analyze, and display information about spatially distributed phenomena for the purpose of inventory, decision making and/or problem solving.

However, the prohibitive costs of hardware, software, training, data gathering, analysis, etc., kept this potentially valuable tool predominantly confined to the realm of institutions (government, military, academic, big business).

While GIS use has greatly expanded (e.g., with time, perceived benefit, increase in less expensive or free GIS software), one area is noteworthy in its apparent efforts to be more inclusive of stakeholders. Participatory geographic information systems (PGIS) are GIS projects where information is gathered from various stakeholders, often people who are not experts in computerized mapping, or mapmaking at all. A review of the literature reveals a spectrum of participation by laypersons in the creation of PGIS, from low, where stakeholders provide the information while a technical expert produces the PGIS (e.g., Anane et al. 2012, Brown and Donovan 2013, Pocewicz and Nielsen-Pincus 2013) to high, where stakeholders themselves possess the ability to both gather the data and make and manage the PGIS (e.g., Matthews et al. 1999, O'Connell and Keller 2002, Delgado and Sendra 2004, Malczewski 2006a, Malczewski 2006b).

Another challenge noted early on was that the way GIS technology was developed and initially used made it quite effective in the application of quantitative data but less so

in incorporating qualitative data (e.g., Sheppard 2005, Eisner et al. 2012, Pfeffer et al. 2012). This created the problematic effect of reinforcing the legitimacy bias, i.e. the above-mentioned bias towards certain types of cartographic input and standards, with the legitimacy of quantitative data receiving preferential consideration. Even as GIS became more available and mainstream, users struggled with trying either to transform their qualitative data into quantitative proxies or to develop new ways to visualize the data in map form. Thus, while the legitimacy to map seemed to expand, the ability to map many types of information, knowledges, and perspectives in order to effectively communicate meaning remained problematic (e.g., McCall and Dunn 2012, Pfeffer et al. 2012). New methods and approaches to visualization have helped in this ongoing challenge, which has become a major research pursuit of critical geography in the past couple of decades. Approaching the problem a different way, some have adopted other tactics. For example, there have been highly effective recent efforts by NGOs to teach geospatially disadvantaged groups how to make maps that better suit their needs, e.g., dispute settlement, conflict resolution or planning. These range from GIS (e.g., Pfeffer et al. 2012) to hand drawn, i.e. in 2013, I documented an architect's firm in Jogjakarta, Indonesia that was teaching squatters how to map their homes on informal settlements in order to better lobby for their interests with the local government and other stakeholders.

New means of spatial media appear to be redefining legitimacy boundaries in mapping. For example, instead of trying to compete with the institutional system by means of an established approach, e.g., a GIS “like against like” game (e.g., the above example), some stakeholders have chosen to engage in knowledge politics on their own

terms (Elwood and Leszczynski 2013). Elwood and Leszczynski (2013, 545) cite Elwood (2010) in defining “Knowledge politics” as,

the ways in which individuals and institutions leverage digital spatial data and spatial technologies in negotiating social, political, and economic processes, often doing so in ways that rely upon the differential influence and authority that is granted to particular forms of knowledge or representations.

While digital spatial data and technologies are by no way to be construed as all-inclusive, they do offer significant advantages. Not being constrained by structures and processes associated with more traditional maps/mapping enables more freedom in choosing the information, format, and audiences for one’s products. As means of conveying meaning, what have been called “new spatial media” are significant. First, they depend on the Internet for access to audiences rather than on often institution-managed procedures and protocols that tend to serve as legitimization gateways. Second, because of their prioritization of flexibility, inclusivity, and creativity of meaning presentation, they have proven to be highly capable of conveying multiple types of information, knowledges, and narratives. Third, their commonly interactive nature, to include crowdsourced geospatial data, often create an important legitimacy tension between contenders and institutions. More on new spatial media and a related topic, hypermedia, will be addressed below under “Legitimacy of Representation.”

Before moving on, it is important to stress that the impact of the above-discussed cartographic legacy is significant. It has often meant preferential legitimization of the maps used in conflict by those who have had the capacity and authority to map over those viewed as less capable and/or sanctioned. As discussed in the literature, this legitimization has been seen with imperial maps over subaltern, Northern maps over

Southern, national over local, and so forth. Moreover, it is even more problematic that this delegitimization can be transferred from maps as tools to the conflict stakeholders themselves. In other words, representatives themselves can lose legitimacy in the conflict resolution process by not having appropriate geospatial tools, which can be framed as markers of a group's ability (and, therefore, right) to manage its information, resources, claims, and narrative.

Social Dynamics, Maps and Legitimacy in Conflict Resolution

While cartographic legacy has been highly influential, it alone is not the only influence on legitimacy of conflict stakeholders and their maps. The social dynamics of maps and mapping and how they relate to legitimacy constitute an important but understudied influence on conflict resolution efforts. Indeed, social dynamics in maps/mapping in general have only recently gained wider attention. There is more information about social dynamics associated with GIS than with traditional maps mainly because the more widespread interest in social aspects of mapping has come about in the geography field only relatively recently and, therefore, corresponds temporally with more recent methods of, or approaches to, mapping, e.g., GIS, PGIS.

There is a considerable and growing body of literature on social interaction in GIS, particularly participatory GIS (PGIS) and the related public participation GIS (PPGIS), in conflict resolution efforts, as seen below. Participatory mapping has been promoted among geographers, political scientists, government specialists, and others for their value in managing, mitigating, or resolving issues related to conflict (Kyem 2004).

For example, Chacon (2003) uses PGIS in land use conflict in Guatemala. Sandstrom et al. (2003) employ PGIS in developing consensus for land use between reindeer herders and lumbermen. Nyerges et al. (2006) discuss a group-based GIS, WaterGroup, designed as a collaborative spatial decision support system to facilitate participation by stakeholders in solving water management issues in the Boise River basin. Bourgoin et al. (2012) use PGIS in a land zone conflict situation in northern Laos. Brown and Donovan (2013) develop a PGIS based on residents' preferences, opinions, and areas of potential conflict about use of national forest land as part of an input to a forest planning effort in Alaska. Bussink (2003) applies a GIS in participatory natural resource management to help mitigate conflict between professionals and farmers in the Peruvian Andes. McCall and Minang (2005) use PGIS in forest management conflict in Cameroon. PGIS have been used for cases of land conflict resolution (Boroushaki and Malczewski 2010), such as in Nepal (Mather 2000), and Ghana (Kyem 2004), and in water conflicts (Jankowski 2009).

There is ongoing debate over positive versus negative social effects of participatory mapping in conflict resolution efforts. For example, Kyem (2004) asserts that PGIS have been used to solve conflicts through processes of mutual learning and increased mutual understanding. Barnaud et al. (2013) agree. However, they discuss that while spatially explicit geospatial representation is thought to improve understanding and negotiation among stakeholders, they found that it can increase conflict. On one hand, it can increase distrust for the technology because of the increased "black box effect." On the other hand, less spatially explicit representations can create somewhat of a distancing

effect that can reduce tension. They also note that another consequence of using spatially explicit maps with rural communities can be a loss of indigenous conceptions of space, leading to increased conflicts, as well as increased pressure toward land privatization and other problems.

Bryan (2011) asserts that mapping is less about using expert knowledge to solve the problem from the outside and more about transforming relations through social practices. Klug (2012, 617) commends PGIS for “communication enhancement, knowledge generation, education and better understanding of the values and thinking from others.” Bourgoin et al. (2012, 272) state that by improving villagers’ capacity to influence local processes by participating in PGIS conflict resolution, they also “gain the ability to negotiate with government representatives, an aspect that redesigns the power balance.” Zhang and Fung (2013, 552) note that concerning PGIS and conflict resolution,

the land-use plan should be derived from a process of open debate instead of an aggregation of separate individual perceptions. Through discussions and debates, local authorities and stakeholders can understand the different requests of diversified interest groups (Habermas 1984). Moreover, negotiations can promote mutual understandings and search for a compromise space to achieve impartial judgments and consensus solutions (Balram et al. 2004).

Thus, not everyone agrees that mapping and PGIS can promote social relations, or even conflict resolution. On the contrary, some have found it increases conflict and misunderstanding. Reyes-Garcia et al. (2012, 657) provide a review of the literature that demonstrates that participatory mapping can either decrease or increase conflict, such as over boundaries and resources, and can reproduce inequalities and degrade community relations. They note,

...the process and the results of participatory mapping can help in conflict resolution or contribute to conflict generation or exacerbation depending on the political and socio-economic context in which they are conducted. Mapping never occurs in a social vacuum, it always affects and is affected by the broader political, economic, and cultural realm of which it is part, and the effects of mapping depend more on this broader context than in the tool itself.

However, they themselves find that in their study of PGIS use in the Bolivian Amazon, participatory mapping is less likely to cause conflict on its own, but to “get caught up in local political or socio-economic entanglements that result in conflict” (2012, 651).

Throughout the debate about the social effects of participatory mapping in conflict situations run questions arguably related to legitimacy. For example, does participatory mapping increase sense of empathy among conflict stakeholders? Does it improve understanding of other perspectives? Conversely, does it increase marginalization of some parties, e.g., politically and/or technologically? Therefore, while there has not explicitly been much research done on maps/mapping, social dynamics, and legitimacy in conflict resolution efforts, part of the challenge in better understanding it can be facilitated through effective framing of it.

Arguably, one way to conceptualize maps/mapping, social dynamics, and legitimacy in conflict resolution is by looking at the continuum of interaction required by the conflict parties to produce their supporting geospatial products. This is conceptually similar to the visualization discussed above concerning party participation in developing PGIS. However, in this case, we are looking at the quantity and quality of interaction between the parties themselves in product development. This exercise is not necessarily intended to suggest that greater interaction between parties equates to higher sense of perceived legitimacy between them. Instead, it serves as an organizational construct. At

one end of the continuum there is little interaction. Conflict parties make, choose, and use geospatial products that they feel best serve their needs. At the other end of the continuum, parties work together to develop and maintain geospatial products or systems that support relevant groups' needs in the conflict resolution efforts.

This conceptual structure suggests a range of geospatial products based on their capacity to support interaction. At the low end of interaction would be the "flat" maps traditionally typical of a government mapping office, for example, where official cartographers produce maps primarily for government use and/or for informing the populace. At the other end would be cases where parties plan, collect and input data, analyze, and maintain products to support conflict resolution efforts, such as participatory mapping.

However, this spectrum is not a clear-cut formula. Social dynamics must be studied more than at a superficial categorical level for each case being considered. For instance, one case study of a flat map used at a set of talks may begin with an assumption of little interaction between parties (concerning the map). However, take a case where one side complains that the map being used is not universally representative. Instead of dismissing that side's concerns, the geospatially advantaged stakeholder agrees to discuss these concerns. The mediator then facilitates the hand-drawing of the desired information on top of the flat map. This act, done (in this case) in order to ensure more appropriate inclusiveness and to keep the talks going, adds an interactive dimension to the process not normally associated with use of flat maps. It also adds a seeming acknowledgement of legitimacy for the side claiming a map disadvantage. On the other hand, a participatory

mapping project that seems to be inclusive and interactive may actually not be. For example, a PGIS project may focus on a topic that is only tangential to, or even distracting from, root causes of a conflict. Or, it might leave out key parties, or be controlled by the dominant party itself. Such cases would clearly detract from sense of legitimacy between groups and the issues under discussion.

However, with that in mind, this set of constructs introduces some important considerations. The first is that a conflict party that is allowed to control the maps during conflict resolution efforts has a legitimacy advantage unless there is successful acknowledgement of this and balancing of map inclusion across parties. For instance, in a case where a local homeowners' group is attempting to convince town leadership to not locate a garbage dump in their community, there may be a reliance during talks on the local government's maps. However, during the talks, this can mean that government representatives get more "stage" time because they are needed to show the maps or operate the GIS. This may additionally prompt more engagement between them and mediators and other stakeholders. They also may appear to have better knowledge of the discussed location because they are familiar with their own products. Such seemingly small or mundane dynamics can, although not always, have the effect of maintaining or increasing sense of legitimacy for the local officials but eroding it for the local homeowners.

Indeed, another way that conflict stakeholders, particularly power-challenged ones, have worked to improve their ability to successfully leverage maps, mapping dynamics, and associated knowledge politics has been through the utilization of networks

(Ghose 2007). In turn, networks, such as networks of GIS specialists across conflict parties and/or stakeholders or spanning government levels, can increase perception of legitimacy for said stakeholders, as well. For example, where stakeholders do not have the capability or capacity to create needed geospatial products, they may “jump scale” to find connections at higher levels, such as national or international. Such connections may offer them support in terms of training, money, data, and/or recognition of their work. For instance, GIS professionals in an indigenous group may cultivate connections with GIS professionals at the national GIS office (i.e. a specialized form of cross-cutting relationships), thereby improving mutual support, fostering mutual respect, and increasing information sharing, a key issue discussed in the next section.

Legitimacy of Information

The previous section focused on the perceived legitimacy of conflict parties and other stakeholders in their utilization of/engagement in maps/mapping in conflict resolution efforts. This section takes a deeper look at how legitimacy of information in mapping affects conflict resolution efforts. This discussion focuses on two areas that I see as critical for establishing and maintaining legitimacy of information. The first is how stakeholders perceive each other’s information, particularly whether they perceive each other’s information to be relevant, valid, and correct. The second area focuses on the social dynamics of information management. These will be discussed below.

Knowledge politics has been discussed above but warrants an additional note here. Elwood and Leszczynski (2013) describe stakeholders’ attempts to establish

legitimacy for their information claims. They, i.e. stakeholders, are mindful of the information content, its validation, and its use (e.g., analysis, presentation). Elwood and Leszczynski (2013) cite concern over establishing or determining relevance, as does Elwood (2006), Cutts et al. (2011), and Burns (2014). Concern over accuracy of data has been cited as being problematic in some efforts that include (or attempt to include) various stakeholders' information (e.g., McCall 2003, McCall and Minang 2005, Sieber 2006, Dunn 2007, Elwood and Leszczynski 2013, Burns 2014). Thus, the aspects of information relevance, validity and correctness or accuracy are considered key to discussion of legitimacy of information. The three are described below.

Relevance refers to stakeholders' confidence that the maps used contain "their" information and that mapped information relates to the situation at hand in a useful or meaningful way. An example of the former might be where an indigenous group in a land rights dispute with their state government balks at using maps that do not include their ancestral burial grounds. An example of the latter might be where maps supplied for water talks only show features at the national level scale (e.g., borders, boundaries, resources) although the conflict is at the neighborhood scale.

Validity is related to both methodology and epistemology; it connotes acceptance of how information was derived or attained. For instance, a political minority group may question how a government gathered and mapped the census data it used for services planning. On the other hand, a state government may dismiss as unscientific an indigenous group's reliance on traditional means to determine when and where resources should be extracted.

Correctness refers to qualities such as the accuracy, precision and timeliness of the information. For example, conflict parties might dismiss maps provided by a mediator if they are significantly outdated. Likewise, a party could lose trust in another party if that party's maps are proven to contain sizeable errors.

The second aspect of legitimacy of information refers to the social dynamics of map information management during conflict resolution efforts. How people and groups gather, use, and exchange information to support mapping is significant (e.g., Buchecker et al. 2003, Gaddis et al. 2010, Reyes-Garcia et al. 2012, Case and Hawthorne 2013). Significant are such phenomena as information creation, information sharing and co-creation of information, touched upon in the previous section. Understanding these dynamics is important because they can affect the sense of legitimacy of information discussed above, the sense of legitimacy among stakeholders themselves, and, as a result, the conflict resolution effort as a whole. McCall and Dunn (2012, 93) comment on the potential for geospatial marginalization without proper advancement of social considerations in terms of information,

Whatever technology is being introduced, the kind of social dynamics in which it operates will determine whether it will empower or further marginalize poor communities; like the doublesided coin of accessibility and exclusion. It may never be feasible that geo-information tools reflect the full complexities of local spatial knowledge, human interaction with environment, or power relations. There must be significant technological advances as well as a fundamental mind-shift before external expert spatial information and local geographical knowledge could be regarded as truly complementary or integrated.

Thus, they acknowledge the criticality of inclusivity of stakeholders and their information to successful use of maps/mapping in conflict resolution and other such efforts.

Indeed, inclusion/ exclusion, incorporation/ marginalization, or other forms of acceptance/ resistance to stakeholder information sit at the intersection of information flow, social dynamics, legitimacy, and conflict resolution. Cutts et al. (2010, 94) note, “researchers have yet to identify specific ways in which information flow patterns create or perpetuate barriers to consensus.” However, they do note that through understanding structural relationships, one can better understand the dynamics and in part determine the capacity and resilience of groups working in a collaborative information effort. McCall and Minang (2005) discuss the significance of understanding information flow among stakeholders in a natural resource PGIS endeavor. Ghose and Pettygrove (2009) demonstrate the importance of analyzing relationships and information flow in community garden planning. Liu and Palen (2013) discuss how geospatial information flow is changing as a result of social media. There is a common thread throughout that the social dynamics of how information is gathered (or not), shared (or not), mapped (or not) has a major impact on whose vision of reality gets mapped and legitimized.

Thus, the concept of the “new geography,” introduced briefly above, is key here. Crampton (2001, 235) describes said “new geography” as “an ‘epistemic break’ between a model of cartography as a communication system, and one in which it is seen in a field of power relations, between maps as presentation of stable, known information, and exploratory mapping environments in which knowledge is constructed.” In other words, the “old” cartography associated with Western tradition and purportedly focused on objective, scientific, positivist values, created a standard where institutions of power (e.g., government, military, academic institutions) were map producers and information

providers. All others were primarily map consumers and information receivers.

Furthermore, as Harley (1989, 5) notes, the “old” geographic mindset led to the disregard for maps from what are considered less-developed regions or entities of today’s world.

“Cartographers developed a 'sense of the Other' in relation to nonconforming maps.”

With the “new geography” mapmaking has not only been opened up to all (at least theoretically), it has also been transformed into a co-creative process, a means of shared information, exploration, and meaning making among entities with varying worldviews, perspectives, knowledges, and therefore, arguably, cartographic approaches.

A widely accepted means of incorporating not only various types of information into a geospatial product but also various stakeholders into a conflict resolution process is participatory mapping. As introduced above, participatory mapping, particularly participatory GIS (PGIS) and public participation (PPGIS), come from a heritage that has increasingly incorporated the non-technical person, particularly the stakeholder, into the process of mapping, namely to support decision-making. Moreover, PGIS focus particularly on incorporating disadvantaged, minority, or other groups traditionally not included in the mapping process (Jankowski 2009). PGIS have been considered revolutionary for their focus on incorporating non-traditional forms of knowledge, for example local or indigenous knowledge, and have been commonly used in encouraging participation among various communities or segments of a population in order to ensure different concerns, opinions, and values are incorporated into a community project. In contrast to the traditional mapping approach, social processes and relations in a PGIS

environment – or, arguably, any collaborative mapping environment - often provide richer, more dynamic, and generally more space for informational interaction.

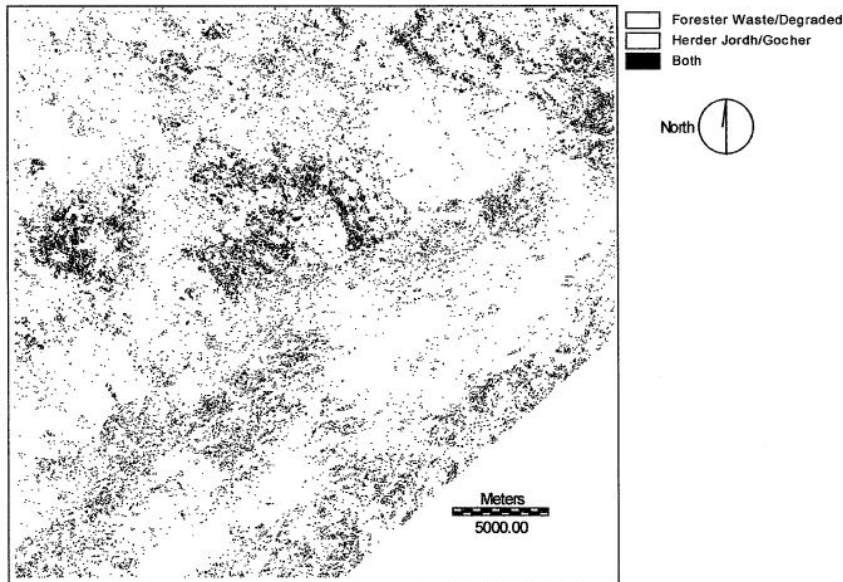


Figure 2: PGIS used for land use conflict resolution between foresters and herders in India. The land is remapped using classifications meaningful to the conflict parties (“Forester-defined waste land and herder-defined *jordh/gocher* land”) in order to determine how to manage the land. Source: Robbins (2003)

In theory, a PGIS creates an environment and opportunity for participants to “collect and analyze data jointly, explore alternative scenarios, create a medium for stakeholders to exchange views about their values and interests, see results of value choices, and learn to develop trust for each other” (Kyem 2004, 39). Kyem asserts there are dual forces that dominate land use conflict: cooperation and competition. In his discussion he combines Weber’s self-interest (competition) with Habermas’ communication (social cooperation) for conflict resolution. Here in particular Kyem sees a significant role for PGIS in helping resolve land use or other land-based conflicts. The

PGIS communication process also helps build a shared understanding of meaning of certain terms, priorities, places, and so forth. McCall and Minang (2005, 349) and Kyem (2004) cite evidence that dialogue between groups improves due to the use of “dynamic geo-information” during PGIS, “leading to a better understanding between actors, and towards conflict resolution.”

One area of research has looked at information exchange among different parties involved in a PGIS, for example, the intersection between scientists, policy makers, and laypeople/ citizens. Within such groups knowledge is developed, maintained, propagated, adjusted, etc., as needed by the group. Knowledge is shared by these groups as deemed appropriate. This is often done through boundary groups/organizations that serve as the interface between groups and through boundary objects, which are products, such as reports, databases, and maps (Lejano and Ingram 2009, Cutts et al. 2011, Schut et al. 2013). Boundary group members work at the intersection of the groups to enhance understanding and acceptance. They may be motivated by an underlying will to promote their own agenda or narrative (Lejano and Ingram 2009), but they are marked by an attempt to engage the other parties and find common understanding.

The relationships between the boundary groups are strongly influenced by – and strongly influence – the information that is shared between them. Take, for example, an environment where the information provided between the groups requires a high level of interaction between boundary group members, perhaps because it (i.e. the information) needs to be updated and collaboratively evaluated frequently. In theory, such circumstances should prompt boundary group members to engage more frequently, which

may strengthen relationships. However, depending on factors such as the conflict environment or individuals, the relationships may not, in fact, strengthen. They might even falter or fail, thus leading to possible degradation of both information and boundary group relations.

Cutts et al. (2011) also assert that boundary organizations create opportunities for increased social capital and capacity. Given the high variability of information sharing and social development potential of various mapping processes (e.g., flat map versus participatory mapping), more research on boundary groups and boundary objects from a legitimacy perspective might yield helpful results for better understanding perceptions of legitimacy of maps/mapping. This is because these dynamics occur at the interface between conflict stakeholders. Therefore, legitimacy claims and concerns should manifest more clearly here.

Another potential way of investigating information legitimacy is “Ways of Knowing” (WoK). WoK studies focus on the processes whereby people know what they know, how they share information, use it, and understand it (Lejano and Ingram 2009). In a collaborative mapping context, this might relate to how the participants have access to or “know” knowledge relevant for the project, how they gather and share (or not) the needed information and data, how they interact with other types of knowledge and how that interaction changes their knowledge, and so forth. For example, one might use methods such as interviews and document analysis to determine which stakeholders have access to which information or data relevant for mapping at which point during the conflict resolution process, how they deal with that access, how that access affects their

geospatial products, perceived sense of legitimacy towards their products, and their participation in the conflict resolution effort.

The WoK approach is deeply tied to the concept of narrative. The WoK approach examines how different WoKs interact and how new relationships are formed and how new narratives are developed and meaning co-produced as a result (Lejano and Ingram 2009). Worldview, culture, social norms and processes (to include the process of education), and identity all play strong roles in knowledge creation and meaning making.

Thus, different groups of people not only have different “knowledges” (per Lejano and Ingram 2009), they also have different ways of dealing with knowledge. Such differences can include the following. Are groups attracted to, avoid, or ambivalent to technological means of relaying information or solving problems? How do they like to share knowledge, for example informally or formally? Who are considered by the group to be appropriate figures to transmit knowledge? Who should be granted access to the group’s knowledge? Should knowledge be held close and divulged only if a clear benefit is determined, or is it something that should be available to anyone for the asking? Such considerations very much relate to perception of legitimacy associated with maps/mapping during conflict resolution efforts, e.g., information-sharing or problem-solving. Understanding how knowledge is used in mapping is key, albeit not sufficient, for understanding how people build legitimacy and trust through sharing and/or creating information together.

Legitimacy of Representation

Having discussed legitimacy of stakeholder and legitimacy of information, we now turn to legitimacy of representation, i.e. the maps or geospatial products themselves. In part, this means returning to the topics of meaning and power as discussed above, but at a more object-oriented level, much like content analysis or discourse analysis. Some of the key contributions in this pursuit were developed by Harley, particularly with his 1989 “Deconstruction of the Map.” Crampton (2001, 241) explains the significance of Harley’s employment of deconstruction to unravel the power relations inherent in maps as follows:

Maps are situated in a particular set of (competing) interests, including cultural, historical and political; maps can be understood by what they subjugate/ ignore/ downplay (what [Harley] called the silences and secrecies); and the way to interpret maps is not as records of the landscape but tracing out the way they embody power (in creating/ regenerating institutional power relations such as serf/lord or native/ European) and are themselves caught up in power relations, i.e., are not innocent... In sum: ‘Deconstruction urges us to read between the lines of the map – “in the margins of the text” – and through its tropes to discover the silences and contradictions that challenge the apparent honesty of the image’ (Harley, 1989).

Harley explores postmodern thought to relook the nature and role of maps as representations of power, stating that “an alternative epistemology, rooted in social theory rather than in scientific positivism, is more appropriate to the history of cartography.” He relies on Derrida and mostly Foucault in support of his deconstruction of the map. From Derrida he takes the concept that rhetoric is embodied in all texts. In other words, written works (to include maps) are persuasive by nature. He takes from Foucault the idea that there is power in all forms of knowledge. Thus, by demonstrating

that the map is both a text and a body of knowledge, he opens up the map to deconstructive pursuit.

In order to analyze the power inherent in map knowledge, Harley positions cartographic methodology, i.e. the “rules” used to create maps, as discourse, a primary Foucauldian unit of analysis (Harley 1989). Harley states that, “The steps in making a map – selection, omission, simplification, classification, the creation of hierarchies, and ‘symbolization’ – are all inherently rhetorical.” In other words, which items are mapped, which items are not mapped, how mapped items are categorized and portrayed, how the legend is organized, all embody some of the rules (i.e. the map discourse) that convey the power relations, with their concomitant views and values, materialized in the map. As such, the map and its contents are very much driven by sense of legitimacy of those making or using the map.

One of the most serious potential ramifications of not addressing the underlying meanings and messages within maps, or how maps selectively frame reality, is that one could create or (more likely) perpetuate power imbalances between parties, particularly where one side has the legitimacy and capability to map and the other does not. Such circumstances counter the mediation practice of attempting to level the playing field for the parties to engage equally in the conflict resolution process, setting conditions for perpetuation – or even worsening – of the conflict. Thus, map literacy is important.

I should note here that this literature review is not meant to provide an in-depth look at the meaning behind map components. There are many current works that provide good insight into cartographic design (e.g., Tyner 2015). Instead, below I provide a

couple of simple examples of interpretation of legitimacy in map design to demonstrate the general concept.

Maps and Frame Theory

One of the more compelling theoretical arguments about the legitimizing (or delegitimizing) effects of maps can be seen in Carton and Thissen's (2009) work. Here, they review the literature behind conflict and controversy over the use of maps and mapping and assert that frame theory applies. They write (2009, 1992),

The practice of map-use-in-action implies creation and choice of boundaries, legends, layers and graphical variables. As a result, maps are not neutral 'mirrors' reflecting what exists and what happens on the ground, but they reflect a culturally, socially and politically shaped view on reality (Harley, 1988; Pickles, 1995). As such, maps frame the world, offering its viewers a particular conceptual lens on spatially related phenomena.

Goffman (1974) provided the foundations for the theory of frame analysis.

Framing is about "characterizing values, concepts, and issues" (Lakoff and Ferguson 2006, 2). Carton and Thissen provide key work in tying maps to frame analysis. They cite Gamson and Ryan (2005) in that frames are "thought organizers" which "put a rim" around some parts of the world, highlighting some events and facts as important and rendering others invisible, like a picture frame." Carton and Thissen (2009, 1992) assert, "Maps do exactly what Gamson and Ryan describe."

As it is the political 'game' to get issues on or off the political agenda, it is part of a strategic game to get legend items on or off the map. Thus, Carton and Thissen explain why controversy arises over maps or the use of maps and also why parties argue over something on a map that has fundamentally little to do with the map and more to do with

their perceptions and positions. Map framing conveys opinions, information, and narratives and influences how others interpret them. Therefore, framing appears an important area to explore when investigating perception legitimacy in maps/mapping in conflict resolution.

A good example of legitimacy and framing is seen in the below map of Belarus. This map was developed by the Belarussian government shortly after the fall of the Soviet Union. Although it is common for a country to position itself in the center of the map, Belarussia chose to organize the map so that Russia was minimized and Europe took up the majority of the map. This suggests Belarus' focus (at that time) westward and a delegitimization of the Soviet Union as a geopolitical entity.



Figure 3: Post-Soviet Map of Belarus .
Belarussian Ministry of Foreign Affairs, 1994. Source: Zeigler 2002.

Cartographic Ascription

The simple acts of naming and renaming people and places, drawing and manipulating boundaries, and including, omitting or changing features can have a profound and lasting effect on people – both those being mapped and those doing the mapping. As Harvey (1990, 419) notes, “...the very act of naming geographical entities implies a power over them, most particularly over the way in which places, their inhabitants and their social functions get represented.” He commends (1990, 419) Edward Said’s *Orientalism* (1978) for its demonstration of how “the identity of variegated peoples can be collapsed, shaped, and manipulated through the connotations and associations imposed upon a name by outsiders.” In other words, people, places, groups, histories, narratives can be validated or invalidated, legitimized or delegitimized in maps.

By way of example, below are maps of South Ossetia. The United Nations map on the left shows South Ossetia as part of Georgia. This is reflected both in the lack of an international boundary around South Ossetia and the use of the internationally recognized place names in Latin letters. The Russian map on the right presents South Ossetia as an independent state strongly tied politically and culturally to Russia. There is an international boundary around it, as well as the locally used place names in Cyrillic letters. The cartographic conflict shown here appears a reflection of the bigger conflicts in which it is embroiled, i.e. between Georgia and Russian, between the West and Russia.



Figure 4: UN map of South Ossetia
Source: United Nations Cartographic Section



Figure 5: Russian map of South Ossetia
Source: Map-site.narod.ru

As Pfeffer et al. (2012, 266) note, “Caution needs to be exercised when the maps become the reality and their borders and elements are used for the identification and differentiation of different interest groups, a process which can potentially fail to reflect opposing group interests.”

Map Type, Empowerment and Legitimacy

A lot of this literature review has focused on power relations and the superior ability of powers to project their interests, narratives, and sense of legitimacy through maps. However, as introduced earlier, new theory and new technology have caused a shift in how people think about cartography, its functions and methodology. Not only can mapping be recognized as a tool of structural violence, imperialism, and power politics, it can also be leveraged to more equitably reshape relationships, redefine power relations, and even resolve conflict. As Wood (1992) notes, “...when the issue is empowerment,

the construction and reconstruction of the map is what it's about." Crampton (2001, 246) states, "...The main underpinnings of contemporary cartography are going through a transition, or epistemic break." Who maps what for whom, how they map, when and where they map, and why they map are going through some significant and fundamental transformations.

Participatory mapping, such as participatory geographic information systems (PGIS) and public participatory geographic information systems (PPGIS), theoretically expands the concept of the legitimate mapmaker, e.g., beyond the government or specialist, to any engaged party.

Participatory geographic information systems (PGIS)... combine[s] a range of geo-spatial information management tools and methods such as sketch maps, participatory 3D models, aerial photographs, satellite imagery, Global Positioning Systems (GPS) and Geographic Information Systems (GIS) to represent peoples' spatial knowledge in the forms of virtual or physical, 2 or 3 dimensional maps used as interactive vehicles for spatial learning, discussion, information exchange, analysis, decision making and advocacy. (Rambaldi et al., 2006).

This is particularly significant as participatory mapping has become more prevalent as a means of engaging in conflict resolution during conflicts involving resource and terrain control or ownership, security, environmental abuse, structural violence in community design or management, and other spatially related problems.

However, the sense of legitimacy of some such participatory mapping efforts, as inclusive as they might appear from the outside, has been questioned in terms of whether they truly represent all stakeholders, particularly those who are commonly marginalized, such as minorities (Eisner et al. 2012). It is common for PGIS projects to follow government or international standards and information protocols precisely in order to

legitimize themselves with authorities, such as governmental and/or international actors, or else risk exclusion, e.g., due to technical reasons. “New spatial media” is a collective label for more recent online geospatial means such as crowdsourced projects, for example those created through the organization Ushahidi. Such efforts are contesting and redefining legitimacy in mapping and have significant ramifications for conflict resolution.

Some cartographic underdogs have sought additional ways to legitimize themselves and their information. Such efforts imply taking some control of platforms, processes, and mediums that traditionally dictate, govern or otherwise control how maps/mapping are constructed, shared, socialized, experienced, and used. “Hypermedia” is defined as “a database format similar to hypertext in which text, sound, or video images related to that on a display can be accessed directly from the display” (Merriam-Webster online, accessed February 11, 2020). Hypermedia enables the creation of texts and other works that can include more types of information. In terms of maps, there no longer must be merely a traditional map and a legend; there can be photos, sound clips, videos, and other items as deemed appropriate for conveying the geospatial story.

Geospatial hypermedia on the internet, i.e. “new spatial media,” both expand and democratize the creation and use of maps/mapping. Hypermedia have become a means by which mapping is becoming not only more universal but also more fluid, more interactive, more dynamic, thus potentially offering an environment where multiple and diverse maps can be shared, discussed, perhaps rejected, but at least presented. Crampton (2001) notes that in such an environment, geographic visualization and data exploration

are the primary functions, rather than mere one-way data presentation. Krygier (1995, 9) promotes the knowledge-building power of hypermedia as “a means of reconstructing the deconstructed; an everchangable, non-linear, unbounded, decenterable, and hyper-relational process for organizing and reorganizing knowledge.” By focusing on such a method of working with knowledge, Krygier (1995, 9) asserts that, “Attention is thus shifted to the process of understanding and knowledge construction, the manner in which ideas are shaped and clarified, and the ways in which we come to know and re-know our world.”

Combined, these technological changes that ease creation and distribution of cartographic knowledge for more and diverse types of people, as well as new theory that acknowledges the power advantage of those who hold the cartographic reins, are causing a new evaluation of what constitutes cartography. As Krygier (1995, 6), in citing Edney, notes, “An alternative view of cartography can be formulated, where cartography is not a neutral activity divorced from the power relations of any human society, past or present [and] there IS no single nor necessarily best way in which to represent either the social or physical worlds.” Along similar lines, Elwood and Lesczynski (2013, 553) comment on striving for legitimacy on the “geoweb,”

Strategies for asserting the legitimacy or credibility of the information or knowledge claims made via these interfaces are cultivated not foremost through demonstrations of conventional norms of science or disciplinary cartography, but through practices of transparency, peer verification and witnessing.

Such changes can have enormous potential for conflict resolution efforts.

Crampton (2001, 248) provides a compelling vision for using a digital cartographic hypermedia environment in a conflict situation,

Will access to the ‘other’ deconstruct nationalism or stereotyping? Access here may include pictures of the environment, live chats, exchange of news, as well as maps. Indeed, distributed maps are dissimilar from traditional static maps in that they link information from various sources and provide a user-defined environment. The information may be in many forms (maps, images, sounds, video and text) which may be connected via hyperlinks into a multimedia database; in other words, a hypermedia environment. Here it is not the map which is the focus, but the mapping environment as a whole (a process, not a product). Because the environment is interactive, the user in large part (although not entirely) determines what information is to be displayed, at what stage, at what scale and in what context (i.e. with what other information)...

As Burns (2014, 51) notes, “The geoweb has advanced different ways of making knowledge claims and appeals to legitimacy, with implications for new socio-spatial practices as well as systems of exclusion.” By exclusion, he implies the means by which mapping methods can, again, as with other technologies and methods before it, perpetuate power imbalances and otherwise work against the wishes of affected groups. An example of this type of geospatial product is the interactive map website “First Nation Profiles Interactive Map,” a snapshot of which is shown below. While this interactive map fits the formula for an inclusive, public data sourced product, nevertheless, being government run, it holds potential for raising legitimacy concerns over possibly “reflect[ing] social, geographical, and power relations” (Palmer 2009, Burns 2014).



Figure 6: Canadian First Nation Profiles Interactive Map
Source: <http://fnpim-cippn.aandc-aadnc.gc.ca/index-eng.asp>

To conclude, perception of legitimacy in terms of maps/mapping bears potential as an important factor to consider in conflict resolution efforts. The theoretical construct of legitimacy associated with stakeholder, information, and representation is intended to support the study of this topic, both in terms of researching available literature, as well as guiding a methodology for evaluating conflict cases. This methodology is discussed in the next chapter.

3. METHODOLOGY

Introduction

This research studied the relationship between stakeholders' perceptions of legitimacy concerning maps/mapping and their associated conflict resolution efforts. The theoretical framework developed and discussed in the literature review above was operationalized in order to support this. Two case studies were explored. The Delmarva case study was concerned with conflict over poultry litter on the Delmarva Peninsula on the eastern coast of the United States. The Lynnhaven case study focused on conflict related to oyster cultivation in the Lynnhaven River in Virginia. These case studies were chosen because of their similarity in type, i.e. environmental, water-related, and for their resemblance in conflict resolution environments, i.e. established stakeholder working groups with extensive governmental participation. Below further explains the choice of case studies. That is followed by a description of the methodological approach that was developed for this research.

Case Study Selection Criteria

The following criteria were set in order to choose case studies that would appropriately and effectively investigate the topic. A comparative study of two cases was chosen. Comparison of two cases was expected to realistically afford more depth of insight than studying multiple cases. By the same token, investigation of one case was

thought to be inadequate for gleaning a reasonable variety of insights. These criteria are not rank ordered.

- o Water-related conflict. Choosing water-related conflicts made sense from the conflict resolution point of view. Water conflicts usually involve tangible items to map, which is a prerequisite for studying aspects of maps and mapping (such as legitimacy) in conflict resolution. Furthermore, water tends to be a quite social issue, e.g., how it is managed, shared, how it is conceptualized and how it creates, maintains, divides communities, societies, and cultures. Thus, choosing water-related cases suggests potential for richly social case studies. Moreover, water conflict resolution efforts often involve multiple types of people (e.g., citizens of different types, government, activists, hydrologists, engineers and other such professionals, NGOs, mapping/GIS offices) as well as various types of information (e.g., hydrologic, economic, residential, political). Especially since water is such a social, political, and critical matter, it tends to be an emotionally charged, “hotspot” type of topic. Thus, water conflicts offer potentially rich opportunities to understand perceptions of legitimacy in conflict resolution. Lastly, water conflicts are common, both in the US and globally, and are felt at multiple scales (e.g., local, national, international). They are also anticipated to constitute an even more common conflict type in the future.

- o Located in the USA. This criterion was based on two points. First, US-based cases tend to be simpler for an American researcher (like myself) to navigate in terms of language, familiarity with mapping culture, and culture in general, as well as ease of access. Second, US-based cases tend to afford a certain amount of transparency of process that is not necessarily available with cases elsewhere due to legal standards and accepted norms.
- o Mature conflict resolution effort. Commonly, mature conflict resolution efforts offer circumstances where relationships have been built, complex social dynamics have developed, and processes are underway. All this suggests an environment useful for analysis. While new conflict resolution efforts might offer the advantage of researching a case from its beginning, there are concerns with such a situation. First, there is no guarantee that such an effort would meet the other required criteria, let alone result in a useful case study for evaluating legitimacy of maps/mapping. Second, mature case studies offer the opportunity to gather recent insights that might have been lost in a long-finished case, or not yet developed to a useful capacity in a new case. Third, it seemed there was less of a chance of my inadvertently influencing the direction of maps/mapping in a mature conflict resolution effort versus a new one by potentially distracting participants with my focus on the topic, i.e. power of suggestion.

- o Undergone or undergoing more than one stage or activity of conflict, such as contention, mediation, informal talks, problem solving. This criterion was rather linked to the previous one and was intended to add overall depth to studying perceptions of legitimacy in maps and mapping in conflict resolution. First, the social dynamics can change or differ from phase to phase or activity to activity. Furthermore, map requirements can also change, or they can serve multiple or different functions (e.g., contention and problem solving simultaneously). As map requirements change, social dynamics change further, such as development or reconfiguring of networks. Moreover, it is often not known when and where perception of legitimacy of maps/mapping is a more or less salient issue. It might be pervasive throughout the conflict resolution effort, or it might dominate only in specific phases or activities. Also, the linkages or relationship between perception of legitimacy of maps/mapping and the conflict resolution effort itself might span beyond a specific phase or activity. Thus, research on multi-phase or multi-activity case studies seemed more useful than studying one phase or activity.
- o Multiple types of participant entities. Relevant examples for water conflict resolution include, but are not limited to, citizens, government, advocacy groups, NGOs, corporate, water professionals, geospatial professionals, and conflict resolution professionals. This criterion was intended to ensure rich opportunity to observe, track, research, and interview about social

dynamics, as well as to investigate power relations, such as government vs. citizens, state vs. local, as related to perceptions of legitimacy in maps/mapping during the conflict resolution effort.

- o Government involvement. To satisfy this criterion, government could serve either as conflict party or as third party. The importance of having government involvement was twofold. First, government involvement in the US implies a certain degree of transparency (as mentioned above). Thus, there is theoretically a reasonable expectation of a relatively clearer understanding of relationships, networks, and situations than there might be where transparency issues are expected to be endemic. Second, government involvement ensures inclusion of the scale factor (e.g., local, state), which is considered a commonly important aspect of studying power dynamics.
- o Power relations. This criterion has already been suggested in other criteria above, such as multiple types of participant entities and government involvement. However, it bears emphasis here, as there are other sources of power not explicitly identified above, such as corporate wealth or cultural norms. The aspect of interest for this research was to see if and how inequalities – real or perceived – impact perceptions of legitimacy in maps/mapping in the conflict resolution effort. There was expected to be a

significant relationship between power relations and perceptions of legitimacy, as suggested above in the literature.

Several of the above criteria were used to investigate social dynamics instead of using a general category “social dynamics” as a criterion so as to attain more specific means of definition and operationalization. Investigating social dynamics implies the need for social activity and interaction. In order to achieve that, there need to be reasons to interact. In the context of this research, that could be achieved through preparing maps/GIS, gathering info for maps/PGIS, discussion, mediation, or problem-solving using the geospatial products, choosing what products to use or information to use, networking in an environment where there is a need to leverage position or gain legitimacy, etc. Thus, the selection of mature conflict resolution efforts involving multiple types of participants, with scale and power dimensions, and continuing over time and conflict resolution processes, was considered to be a good approach for ensuring a rich, insightful study of perceptions of legitimacy of maps/mapping in conflict resolution efforts.

The case studies selected for this research were chosen from initial investigation of the Chesapeake Bay Watershed Agreement, a partnership among various entities across the region and focused on remediation and protection of the Chesapeake Bay watershed, the largest estuary in the United States. While the Chesapeake Bay Watershed Agreement met the fundamental criteria for case study selection as discussed above, it was far too large to study effectively for the purpose of this research project. Key persons

associated with the Chesapeake Bay Watershed Agreement community assisted in identifying appropriate, smaller case studies.

The Delmarva and Lynnhaven case studies were selected upon narrowing down the scope and selecting from eligible possibilities, i.e. those cases that met the above selection criteria. Both Delmarva and Lynnhaven cases related to water-related conflicts located in the US. They were mature conflict resolution efforts with backgrounds dating from several years prior to the research. They each contained conflict-associated working groups, meetings, documents, and so forth that were readily researchable, as well as potential for inclusion in said activities and access to further materials. They each had undergone, or were undergoing at the time of the research, various conflict stage activities, such as problem-solving, mediation, informal talks, and community outreach. Each involved multiple types of participants, including government at multiple scales, citizens and advocacy groups with diverse agendas, scientists of various specialties, corporate interest, etc. Thus, the criterion of power relations was also met in each.

The case studies not only met the selection criteria, they were also remarkably comparable. They were water resource related conflicts in the same region, with working groups that had been established to mitigate the conflicts. They were composed of multiple, relatively similar types of stakeholder members, and there was strong government involvement in each.

Useful contrast between the two cases was less clear at the outset, although later analysis identified some distinctions. These are discussed at the beginning of Chapter 6, “Comparative Insights on Legitimacy of Stakeholder, Information, and Representation.”

At first look, economic disparity of stakeholders in proximity to one another was distinctly different between the cases (i.e. much more pronounced in Lynnhaven), but ultimately was not found to be a key factor.

Theoretical Framework Operationalization

As discussed in the literature review, the theoretical framework identified three areas of perception of legitimacy concerning maps/mapping, i.e. legitimacy of stakeholder, legitimacy of information, and legitimacy of representation. In order to develop the desired understanding of perception of legitimacy, basic questions were developed. These questions are:

1. How is the spatial framing of conflict determined?
2. How are the creation and use of geospatial products used in conflict resolution determined?
3. What is perceived to be a legitimate map (or similar product) by those involved (e.g., stakeholders, mediators, mappers) in any particular conflict resolution effort?
4. How do power dynamics, and social dynamics in general, affect perceptions of legitimacy and vice versa?

The research was projected to produce insight into the relationship between perception of map/mapping legitimacy and associated conflict resolution efforts. I believe

that an improved grasp of this relationship might assist conflict resolution practitioners in understanding how map use may influence their conflict resolution activities. Ultimately, I hope that such awareness may contribute to employment of map products and processes that enhance conflict resolution efforts, or, at least, “do no harm.”

I developed a set of factors to help guide interpretation or sense-making of information as it related to the four questions above. These factors were derived from the theoretical framework developed from literature discussed in Chapter 2. To refresh, such theory included but was not limited to the following. Critical GIS “recognizes the socially constructed nature of GIS as a technology” (Sheppard 2005, 13). Social construction of GIS/ GIS and society perspective “emphasize that GIS is a socially embedded technology, strongly shaped by social, political, and institutional influences” (Mukherjee and Ghose 2009, 300). Knowledge politics research “looks at the social and spatial processes that have led to some epistemologies being included in spatial technology praxis, and others excluded” (Burns 2014, 51). Actor-network analysis (Chrisman 2005) and scalar politics and network analyses (Ghose 2007) are key in understanding aspects such as how individuals use networks to leverage and legitimize mapping and information. Analysis of transitional or intermediary objects and functions, to include boundary objects (Burns 2014) and geovisual framing (Elwood and Lesczynski 2013), further identify ways groups attempt to legitimize themselves and their information. They can also serve as evidence of acceptance or legitimacy between groups.

The factors developed include the following:

- A. Certain map products and processes are favored over others in the conflict resolution process.
- B. Evidence of differential access to map products and processes, including decision-making about what maps and mapping to use.
- C. Adaptation of certain mapping conventions, e.g., of the government or other dominant party in the conflict resolution effort.
- D. Agreement/ disagreement between parties/stakeholders to include certain information on a map product.
- E. Counter-mapping activities tied to the conflict resolution effort.
- F. Integration (or refusal) of other/new map types or mapping techniques into the conflict resolution effort.
- G. Marginalization or inclusion of people into the conflict resolution activities after marginalization/inclusion in mapping activities.
- H. Improved/decreased understanding/awareness of location-based situation.
- I. Manipulation of social networks to gain legitimacy (e.g., scale jumping) as related to maps/mapping in the conflict resolution effort.
- J. Development/change to social networks related to maps/mapping in the conflict resolution effort.
- K. Perception of gain/loss of social capital related to maps/mapping in the conflict resolution effort.

- L. Perception of altered sense of social identity related to maps/mapping in the conflict resolution effort.
- M. Change in narrative/s associated with map/mapping activities in the conflict resolution effort.

Supporting questions were crafted to be used in interviews and related activities to aid in answering the primary four questions. They, i.e. the interview questions, were constructed based on the above factors. Note: the term “case study” below was replaced with case study appropriate language, i.e. Delmarva or Lynnhaven, depending on the interviewee.

- How have maps and mapping been used in (case study)?
- If you can, please describe the maps/mapping involved in (case study)?
- Whose maps are being used? Who makes the maps? Whose interests do they represent?
- Are these maps/mapping products and processes appropriate, effective, accurate?
- Do they contain the right information?
- Do they portray the right representation of what should be mapped?
- Are the maps used helpful? Useful? Why or why not?
- Are you using the maps?

- Do they (i.e. the maps) positively, negatively, or neutrally contribute to (case study)?
- What is your impression of others' perceptions of maps/mapping legitimacy during (case study)?
- What role, if any, have you had in maps/mapping during (case study)?
- In your opinion, what has contributed to the success or failure of maps/mapping during (case study)?
- What role, if any, have maps/mapping played in the progress or outcome of (case study)?
- In your opinion, what would improve maps/mapping in (case study)?

Semi-structured interviews were conducted with relevant stakeholders from the established conflict working groups in each of the two case studies. The intent of interviewing was to gain self-reported perceptions of legitimacy of maps/mapping during the conflict resolution efforts and glean insight into ways these perceptions of maps/mapping relate to the conflict resolution effort. As many of the working group members were interviewed as possible. Occasional additional interviewees were added as appropriate via snowball sampling method (Morgan 2008). Interviews were conducted in person where possible. This was deemed preferred both because of the expected better social interaction, as well as the potential to view relevant geospatial products (e.g., maps) in person. If an in-person interview was not possible (e.g., due to distance, preference of the interviewee, time constraints), Skype was the second preferred method

due to the visual interface. Phone interviewing was the last preference. Interviews took from 30 to 60 minutes. Most interviewees were interviewed once, although additional conversations, as well as follow-up questions, occurred occasionally. Overall, over 40 interviews and discussions were conducted across both case studies.

In addition to interviews, participant observation of relevant meetings and events (e.g., court proceedings, citizen outreach) was conducted to gain understanding of participants' perceptions of maps/mapping and how these perceptions might relate to the conflict resolution effort. Document analysis of relevant materials was also conducted. Such materials included maps and other geospatial products, meeting proceedings, working group reports, newsletters, and open correspondence.

The interviews and other engagements and analytical notes were input into NVivo. An Excel spreadsheet had been created for each case study for the purpose of managing stakeholder interviews and engagements and to ensure as appropriate a coverage of stakeholder types as possible. In the analysis phase, these spreadsheets also served to provide preliminary knowledge of relationships in each group.

Each case study was analyzed through general qualitative exploration. Each interview was examined first as a stand-alone item. This was done for three reasons. First, several participants provided useful overviews and analyses of the case studies in their interviews. Thus, it was helpful to review such interviews in their entirety in order to present informed case descriptions in the case study overview chapters (Chapter 4, "Delmarva Case Study Overview" and Chapter 5, "Lynnhaven Case Study Overview").

Second, it was not uncommon for participants to provide relevant responses that inexactly answered one or more of the interview questions. This might mean that either the interview questions were not adequately designed, or that communicating the topic was problematic. Regardless, the review of the whole interviews helped capture more complete meaning conveyed by the interviewees.

The third reason was to better understand interviewees' individual stories and narratives, which often provided valuable insight. For example, the story told by one government employee in a map/mapping related duty position accentuated both a stated prejudice towards their own data as well as a commitment to public outreach and service. This employee believed their data was better than other sources' data and also felt they owed it to the public to provide the best possible information, maps, and services. This story appears to reflect the sense of authority to map that is commonly associated with government and is influential in power dynamics, a key "hook" (Luker 2008) in this research, as discussed above in the introduction and literature review. The comprehensive study of this single interview allowed for this understanding to arise.

Likewise, the review of an interview with a state Department of Agriculture employee produced a profile of someone very attuned to and interested in communicating the benefits and detriments of using maps in their work. Every response in the interview spoke to topics such as map bias and disinformation, ethics in mapping, controversy and disagreement over maps, and so on. The expressed level of concern over such issues went well beyond that of other interviewees and delved into the themes of legitimacy, and

perceptions of legitimacy, of maps/mapping. This mostly unsolicited slant provided a unique perspective, particularly when taken as a whole.

After the case study overviews were summarized from the collected materials (e.g., interviews, documents), and the interviews were individually studied as discussed above, the materials were reviewed against the list of factors in order to provide input to the four basic questions. Lastly, the case studies were then subjected to comparative analysis. This analysis was conducted by returning to the proposed theoretical framework to address each of its three types of legitimacy associated with maps/mapping, i.e. legitimacy of stakeholder, legitimacy of information, and legitimacy of representation. This analysis constitutes Chapter 6, “Comparative Insights on Legitimacy of Stakeholder, Information, and Representation.” Common themes and lessons concerning perceptions of legitimacy of maps/mapping in the case studies were reviewed. Across the three types of legitimacy of maps/mapping, it became clear that inclusion/exclusion of stakeholders and their data was linked to the outcome of the conflict resolution effort. Furthermore, such inclusion/exclusion was strongly tied in both cases to interpretation of government authority to map. This comparative study produced a contrast between the two cases that incorporated several key themes, such as framing, authority, and power.

Conclusion

This research developed and operationalized a theoretical framework to investigate perceptions of legitimacy of maps/mapping in conflict resolution efforts. The developed methodology was applied to two cases in a comparative study. This research

resulted in considerable insight, as hopefully will be demonstrated in the following chapters.

4. DELMARVA CASE STUDY OVERVIEW

Introduction

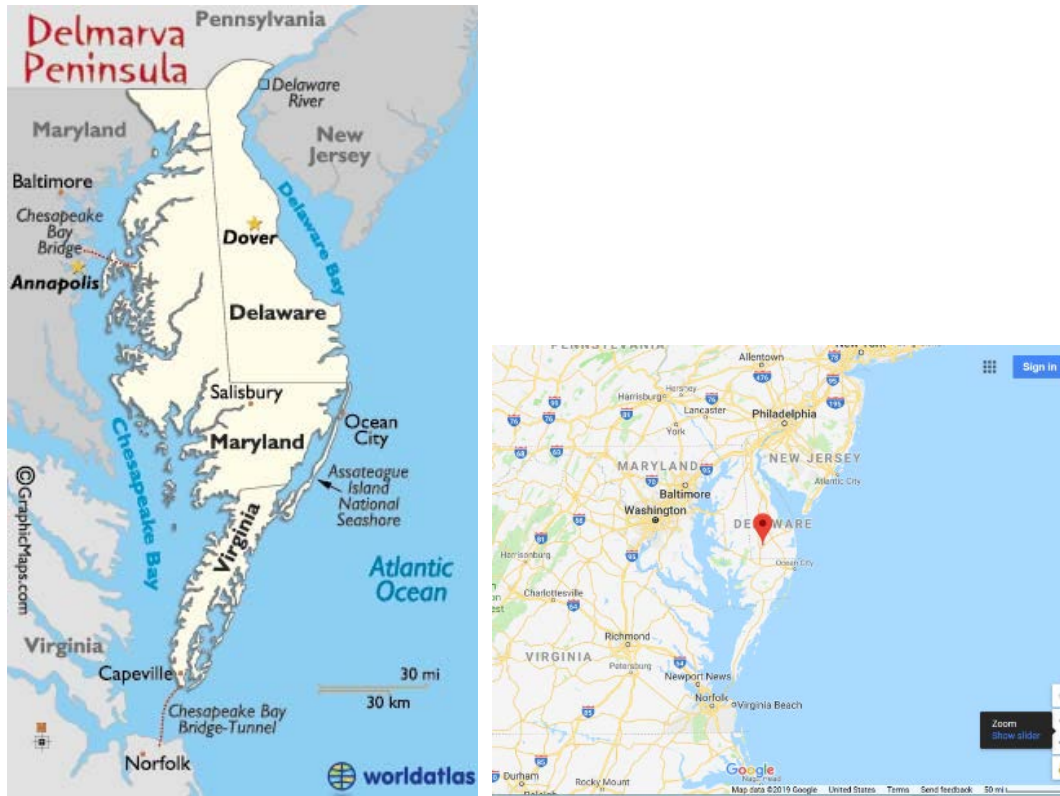


Figure 7: Delmarva Peninsula, USA
Source: World Atlas and Google Maps.

This case study, situated on Delmarva Peninsula in eastern USA, focused on a key dilemma there: how to maintain both a thriving poultry industry and healthy water quality in the Chesapeake Bay. The Delmarva Land and Litter Challenge (DLLC) is a group that was brought together in 2016 to try to determine a mutually acceptable way forward in balancing the interests of the various stakeholders. The DLLC website

(<https://delmarvalandandlitter.net/governance/>) states its mission as such: “The Delmarva Land & Litter Challenge (DLLC) is a knowledge sharing and problem-solving platform where collaborating partners work together to develop strategies to abate poultry related nutrient pollution on the Delmarva Peninsula without exacerbating problems in adjacent regions.” According to their website, the DLLC’s vision and goals are as follows,

Delmarva Land & Litter Challenge members believe that significant progress can be achieved in meeting the nutrient reduction goals that have been established for the agricultural sector. Working together they are committed to supporting pathways for land management that will improve the health and productivity of agriculture and the Bay, while strengthening the economy that preserves and protects the region’s rural cultural heritage. DLLC members embrace the following vision and goals: Delmarva farmers and their agri-business partners are respected stewards of the land, guardians of natural resources and champions of the rural cultural heritage in the Chesapeake Bay watershed. By 2025:

1. Delmarva farming and poultry complex becomes a national model as an environmentally friendly and economically sustainable regional agricultural system;
2. Delmarva agriculture is regionally neutral in importing and exporting nutrients, and wherever possible, nutrients are recycled locally to support sustainable agricultural operations;
3. Nutrients are utilized in farming operations without negative environmental impacts on land and in adjacent waters; and,
4. Growers are rewarded for producing high value food, feed, fiber, clean energy, and ecosystem services.

Stakeholders in the DLLC include the agricultural community, consisting of poultry farmers, crop farmers, and agro-industry; environmental groups concerned about the impact of nutrient overload on water systems; and various levels and types of government offices tasked with managing the effort. The below chart (Table 1) represents my attempt to describe the main stakeholder groups involved. Although it may be somewhat overgeneralized, this chart is intended to convey some of the broad-brush characteristics of the stakeholder communities involved so as to better understand their

perspectives. The interests, concerns, and perceptions are primarily based on comments made by interviewees.

Table 1: Delmarva Case Study Stakeholder Matrix

Stakeholder	Interests	Map Concerns	Other Stakeholders' Perceptions
Poultry Farmers	Maintaining successful poultry operations; managing nutrient load	Use of data supporting lower environmental impact assessment of poultry operations; data privacy	In DOAs camp (environmental community)
Crop Farmers	Maintaining successful crop operations; leveraging nutrient benefits	Use of model input supporting lower environmental impact assessment of poultry operations; data privacy	In DOAs camp (environmental community)
Agricultural Industry	Maximizing agricultural industry on Delmarva; managing ag resources	Use of model input supporting lower environmental impact assessment of poultry operations; data privacy	In DOAs camp (environmental community)
Environmental Groups	Repairing/maintaining healthy waterways; managing nutrient load	Use of model input supporting higher environmental impact assessment of poultry operations; data transparency	Stall and derail mass balance assessment process (agricultural community; State DOAs)
State DOA and associated offices	Managing and maximizing resources to support agriculture	Use of model input supporting lower environmental impact assessment of poultry operations; data privacy; mass balance process ownership	Fulfilling own agenda in controlling mass balance process leadership (environmental community)

There have been others involved from both public and private sector, for example other state and federal offices (e.g., United States Geological Survey (USGS), agricultural services, and academia/science, but the above seemed to be the ones most involved and invested as conflict parties.

It took a while for me to comprehend that this stakeholder working group was not using maps in its efforts at problem solving. It was not as if the group did not have access to them. Some of the stakeholders themselves were government offices or agencies that either produced maps already or could have them produced as needed. The group also appeared to have the ability to acquire support if it were to choose to fund its own maps. Additionally, several stakeholders appeared to use maps as part of their own work, so using maps in the group did not seem some sort of procedural or technical stretch. What was most intriguing, albeit confusing, was that the conflict seemed clearly to have a strong geospatial component, i.e. it was a conflict where place and space mattered.

In short, it was argued by several participants that maps had simply not been needed until nearly the point when I began the research. There seems to be some validity in that, for example, there was a strong reliance on “mental maps.” However, once the group felt that there was a need to create a map, even if primarily for external audiences, this effort failed. It appears there were three key contributing factors that may be important to understand in this case study and beyond. First, there was a lack of agreement among stakeholders as to what information to map, i.e. which figures to use in assumptions required for modeling. Second, there was a lack of trust among some due to

perceived lack of data sharing. Third, there was also a lack of trust among some in the data used.

These issues were inter-related and will be addressed below. While the key investigation of this research focused on perceptions of legitimacy of maps and mapping, this particular case study offers some lessons that appear very much related to one of the three types of legitimacy as described in the theoretical framework developed above, i.e. data legitimacy. However, it ultimately leads to concerns about stakeholder legitimacy.

The fundamental dilemma has been framed as a balancing effort of sorts, i.e. there are poultry producing areas that produce too much poultry litter (a mix of fecal matter, feathers, bedding, leftover food particles) and crop producing areas that might be able to absorb the litter. Litter itself is not inherently bad. The key components of concern, the nutrients phosphorus (P) and nitrogen (N), which are significant components of chicken litter, are valued as fertilizer in the region, to the point where there has been not only willingness to gather litter up and transport it; there has even been a market for it. However, when P, N, and sediment run off into local water sources, they can degrade water quality.

In terms of balance, there typically are places where the relationship works, i.e. there is neither too much nor too little litter, and places where there is not adequate balance, such as nutrient “hot spots,” waterways with poor water quality, or, conversely, under-fertilized fields. Although various options to achieve better balance were considered by the group, the one favored at the time of this research focused on relocating litter from places of high to low nutrient load. But while there was (somewhat

surprising) agreement across stakeholders on the method for dealing with excess litter, there was significant disagreement over how to model relationships and impacts associated with litter, nutrients, vegetation, and related factors.

This is the crux of the conflict touched upon above - a failed attempt to model the mass balance of phosphorus and nitrogen in the soil on Delmarva, i.e. an estimate of nutrient levels in the soil based on various factors, including absorption by crops. Understanding this balance is critical to managing chicken litter to optimize agriculture without damaging the environment. As described below, the stakeholders, depending on which self-identified “camp” they fell into (i.e. agricultural vs. environmental), disagreed on the impact of poultry operations on the environment. The agricultural community believed poultry farming had a lower negative impact and that crop farming served a more effective mitigating role than did the environmental community. This manifested in the mass balance model when the numbers representing the assumptions preferred by the agricultural community showed fewer and less damaging poultry land parcels in terms of litter production, and more – and more effective – crop land parcels in terms of ability to absorb P and N.

Once the DLLC steering committee determined the necessity to do an assessment of the mass balance on Delmarva, it convened a sub-committee to conduct this study. It was the key state departments of agriculture (DOA), headed by Delaware Department of Agriculture (DE DOA), that led this mass balance assessment project. As intimated in the chart in Table 1, some stakeholders, particularly from the environmental camp, felt that the leaders were heavy-handed in their approach. This was particularly expressed in

concern that it was their (i.e. DOA's) assumptions that would be used in the model, that these assumptions were based on DOA self-described professional expertise, that data supporting these assumptions could not be provided in finer detail because of state legal restrictions tied to citizen privacy, and that the group had to decide on one map, i.e. one interpretation of the situation.

Below I discuss the background of the crisis that developed in the working group. I begin by examining stakeholders' thoughts and perceptions about why maps were so little used in the project. First, the significant difference in spatial framing between the two self-identified camps, i.e. agricultural and environmental, is discussed. In "Lost in Aggregation," I discuss how data selection, whether determined by availability or choice, served as a polarizing, alienating act between the two camps. In "Balancing Acts" issues with data interpretation and assumptions associated with the mass balance model are examined. "Opportunity Costs" provides perceptions from the stakeholders about what they thought was lost by not having successfully completed the mass balance report and map. In "The Way Ahead," there is discussion about how the group had just contracted a third-party group to develop the mass balance product for them. In this manner I wish to demonstrate how strong of an influence data legitimacy, particularly in terms of its selection, acquisition, sharing, application, and interpretation, had on this conflict resolution effort.

Uncharted Territory

I was told in several interviews that maps were not necessary in the early stages of the working group because the area of concern was small and everyone on the committee

knew where everything was already. One interviewee, interestingly with GIS experience, asserted that maps were not being used because the group had been focusing on relationship development and trust building. It appeared that maps were not viewed by at least this individual as compatible with or relevant for (or both) these endeavors. Indeed, another participant mused about what kind of map might be useful to the group at the time. They noted that perhaps it might include the counties, waterways, roads, i.e. the basics, along with location of poultry facilities, farms, and so forth. However, they pointed out that it did not really seem necessary. One interviewee speculated on the lack of map use in the DLLC,

The first explanation that comes to mind...the members of DLLC all have a baseline understanding of this problem. And until we get to the point of trying to explain the problem to others who don't understand, we don't need them. We're not to that point yet. When we say the data is organized by county, we all have a mental map of where those places are.

Another interviewee commented on what they described as "under-use" of maps at DLLC,

At DLLC people are so familiar with the distribution of charts in place of maps. We use a lot of tabular data to illustrate the same thing. Where you might use a heat map, we pass out a table in place of maps because there is a strong familiarity with location there. So, a map doesn't really add anything. And it's a technological hurdle to produce them. Almost anyone can throw together a spreadsheet, but you would have to have access to relatively expensive software if you're going to map.

However, another interviewee did not quite agree that maps were not needed,

The DLLC group, as far as I recall, hasn't used or relied on mapping at all. I certainly have a much better understanding of the problems that group is dealing with as a result of mapping efforts by other groups in trying to better understand the scope of agricultural pollution problems.

The interviewee also added,

You really can't talk about pollution problems in the Chesapeake without thinking about maps. And particularly when talking about watershed groups. Everyone wants to know where their property begins and ends relative to others.' The most impactful efforts dealing with maps have been with manure problems.

These types of concerns are real and are documented in literature elsewhere.

However, it occurred to me later that there might be a more significant connection between establishing rapport among DLLC members and the lack of map use than not wishing to waste people's time or insult their intelligence by inflicting superfluous, potentially misleading products on them. There seemed to be key sensitive areas that appeared to be related to data availability and interpretation, i.e. the key issues introduced above.

Through the interviews it became apparent that the spatial framing of the conflict was quite different between the two groups. The stakeholders had reached an agreement on a general, at least short-term solution to the problem, i.e. transport of litter from the nutrient-heavy south to the north, where agricultural fields were acknowledged to be able to accept extra nutrients. However, it is arguable, at least in part, that they failed to come to agreement on the spatial framing of the solution because they differed in their spatial framing of the problem.

The agricultural camp's political framing appears to have been largely influenced by the government entities, particularly the states' DOA because of their role in advising and assisting in agricultural matters, their regulatory responsibilities in efforts for Chesapeake Bay restoration, and, more immediately, reliance on them for the data and expertise to inform the mass balance subcommittee. As discussed in the previous chapter,

the state DOAs maintain databases at a fine (i.e. property level) spatial scale. They have a variety of roles and functions that span from fine to coarse scale, to include individual advising to farmers to larger-area planning, e.g., Chesapeake water quality management. Thus, they can be expected to have a good understanding of nutrient load and dynamics at various scales. It is unclear whether they selected the county as the primary unit for the mass balance study because of the restrictions on data sharing at finer scales, or if, at this point in the mass balance study, broader-scale, conceptual spatial planning seemed more appropriate to them, particularly in their stated goal of using the products to communicate general plans to the public. Given the interviews, the answer appears to be both.

In perhaps simplistic, but hopefully not too simplistic, terms, whereas government tends to frame issues in terms of political problems and solutions, environmentalists, generally focused on environmental health, tend to frame problems and solutions ecologically. In other words facts and assumptions needed for their (i.e. environmental) framing, analysis, and planning require information based more in observation and science than regulation, law, and other means of political organization. An example is the choice whether to use a regulatory figure (i.e. legal maximum amount of nutrients spread on an area; supported by the agricultural camp) or an observation-based calculation (soil test derived data; preferred by the environmental camp) to assess nutrient load.

On the other hand, ecological framing in this problem set would have required a few things not offered with the political framing. First, the problem itself, i.e. nutrient load, would have focused more on natural features, e.g., watersheds, and processes, rather than political units (e.g., counties) in order to investigate more directly the causes and

effects in terms of nutrient load. Tied to this, finer scale data were needed to gain more precise understanding of environmental dynamics, e.g., nutrient sources and potential sinks.

I argue that because the agricultural and environmental camps did not share, or at least did not understand (or even apparently acknowledge the need to understand) each other's spatial framing of the problem, they did not agree on the spatial framing of the solution. While this may not have seemed an issue to them at the time, perhaps this differing framing of the problem contributed to the breakdown. The fact that they did not see maps as necessary among themselves might have masked the conflict further by allowing them to avoid the issue until the mass balance map was already developed and presented by the DOAs as a final product.

The agricultural camp more readily perceived as legitimate the DOA-developed mass balance map product, including its framing, for several apparent reasons. First, as has been mentioned above, the DOAs held authority in the mass balance sub-committee. Second, they held key data and experts needed for its success. Third, the relationships between the DOAs and the agricultural community were already well established and the agricultural community was accustomed to working with the DOAs using the same or similar maps in other activities, such as planning and advising. Lastly, agendas and priorities of the DOAs and the agricultural community were generally perceived to be compatible between the two groups.

On the other hand, the environmental community less readily perceived the DOA map products and framing as legitimate. They appear to have accepted DOA leadership

in the group, arguably in part because they themselves were invited later on to the process. At least some of them were skeptical from the start about their involvement. As one environmentalist notes,

DLLC started out as an individual group without a significant part by the environmental community. It was aided by the DOA and land grant colleges. I think their intent was to come up with a conclusion that they thought was favorable. They seemed to have realized that wouldn't work, so they decided to bring environmental groups into it.

The environmental community also acknowledged that the DOAs had the type and scale of data that could truly answer the mass balance question. However, the unwillingness or inability, depending on stakeholder point of view, of the DOAs to provide the scale of data needed to more precisely and accurately assess the nutrient load degraded the legitimacy of the map in their (i.e. environmental) view. Furthermore, while the environmental community may have accepted the DOAs political authority, such authority could not substitute for scientific authority in their eyes. In other words, while the DOAs appeared to expect its "best professional judgment" to be accepted as legitimate in the group, that did not obviate the need for proven scientific rigor among the environmentalists. Thus, there was the push to write the academic article, to be reviewed and published, i.e. legitimated, in a scientific journal. Lastly, unlike with the agricultural community, the agendas and priorities between the DOAs and the environmental community were commonly not perceived, on either side, to enjoy a high level of compatibility.

Lost in Aggregation

The DOAs framed the issue of nutrient balance assessment as one requiring a broad-scale view of litter movement from southern counties to northern ones. One DOA-associated interviewee noted that the mass balance project was to be conducted at the “macro” scale. “Micro” scale studies could be done later, if there would be enough interest and means to conduct them. However, from the environmental point of view, the micro scale approach was needed for this mass balance study. The environmental community felt it was this so-called micro scale that would allow for a more precise understanding of ecological processes and dynamics. An example of this is that finer scale data input and analysis could be helpful in better understanding the relationship between point-source effluence of contaminated run-off and downstream pollution.

Thus, some participants, primarily from the environmental community, indicated that maps would be useful if they contained certain information, particularly more detailed data about various land plots, such as location of individual poultry houses and fine-scale soil information, to include type and nutrient load. More than one participant noted that they did not understand why they could not have this information. They noted that maps with such information would be extremely helpful for better understanding the nutrient source and sink dynamics on Delmarva.

It appears that some of this information simply had not been collected to the extent, frequency, and consistency required to produce useful, reliable maps at the scale needed to support what the group had stated it was attempting to accomplish, i.e.

attainment of a sustainable nutrient balance on Delmarva. For example, this agricultural community interviewee noted,

...not every acre is created equal. You have a general nutrient application rate that we in agriculture know to be not overly accurate, so farmers are making hundreds of decisions a year of what the nutrient application should be, and there's no way to capture all that. So, there's general understanding that no model is completely accurate. Anything that's modeled is not gospel but can certainly inform decisions or recommendations.

Furthermore, at least in both Delaware and Maryland, the state governments are legally bound to keep information about land plots private. In other words, these states collect information at property scale for their own use as well as to assist citizens, particularly farmers, in managing their land and businesses. However, they cannot disclose such information to the public. As described by one state Department of Agriculture representative,

There is publicly available data that we are looking at, but there is also internal proprietary data, so State protects that and doesn't share it. We can aggregate up to watershed level, like how many waste facilities, but we don't give it down to the person level, not to that fine of a scale. We know a decent amount of information about who is doing what on the land...where is what farm, how much litter, bringing it in, etc., ...data about a producer. [Ours] is a regulator state, so we require and have producer level detail. We don't disclose it. It's protected legally by the State.

Another participant tied to the environmental community commented,

The agriculture industry is more secretive about data related to its operations than others I'm familiar with. There are literally dozens of government programs to give them incentives. In part DOA collects huge amounts of data, but there are specific laws in place at federal and state levels that are unique to the agriculture industry that keep most of the data secret. Certainly, anything pertaining to conditions on farmers' lands. The only data available to environmental groups would be aggregated data over fairly large areas. That limits the use of mapping to some degree.

However, some questioned the motivation behind the withholding of information. As one interviewee from the environmental community noted,

A critical assumption in our mass balance was how much phosphorus was in the soil and how to treat that soil information. Because if the soil already has a lot of phosphorus, then you don't need to apply more manure. So, Maryland Department of Agriculture won't release soil information from farmers... only in bins, won't release the whole data set. Why? You got me. There are a lot of privacy, proprietary issues. Aggregated data doesn't reveal private information. I expect it's more political.

They continued,

The DOAs seem to have more of a political bent than industry... I think they don't want to make the problem worse than it is. Well, not worse. They don't want to highlight that phosphorus levels are high because they don't want agriculture to look bad.

Thus, participants have noted that while there are maps – and supporting datasets – available, they are at a coarser scale and do not provide nearly as good an understanding of the situation on the ground. Such maps have been built from aggregating finer scale data to provide general information without violating privacy laws, as well as for overall consistency, as data are not necessarily available at finer scales. Concerned participants did not often question the accuracy of the information but did question the value of the more “chunky” maps, regretting the level of analysis and understanding they perceived as lost in aggregation. It seems this is one reason maps have not been used much – it has been problematic to produce ones that would meet the needs of certain stakeholders. If, as they said, the goal was to do a fine-scale analysis of sources and sinks of litter and associated nutrients within a small area, which would tie responsibility to specific parcels and, therefore, landowners, then fine-scale data collected frequently would be needed. However, that degree of detail – and analysis – was not seen

as necessary to all stakeholders. For some, such as the DOAs, the aggregated data, informed by “best professional judgment,” were adequate input for modeling mass balance.

Thus, this situation speaks to the two types of lack of trust mentioned above, i.e. the perception of withholding of data, and questioning of the relevance, validity, and correctness of the data provided. That there seemed to be a perception among some stakeholders that data were being unrightfully withheld by other stakeholders is problematic. There was some sense that the DOAs were unfairly advantaged in that they could see all the data and could make decisions on the committee’s behalf, decisions that were believed by the environmentalists to benefit the agricultural camp. Such perceptions contributed to the damaged trust in the group. In theory, such a situation could have been circumnavigated by gathering data from other sources or means. This point will be revisited later.

Balancing Acts

The second area of sensitivity, data interpretation, touches a core area of conflict in the group. Being generalizations, models require that assumptions be made about the inputs, processes, outputs, relationships, etc., that are to be employed. Applying different assumptions in even the same model can produce dramatically different results. This was very much the case with the mass balance committee, i.e. there was strong, fundamental disagreement among the stakeholders over the assumptions to be used for the mass

balance assessment. One state government interviewee described the foundations of the group,

So, the demographics of the DLLC was intentionally set to be inclusive of all parties interested in the question of poultry litter, so states, Farm Bureau, industry, non-profit, EPA, others on the more environmental side, I should say. The objective was, if you bring these dissimilar parties to the table, can you find consensus around quantifying mass balance? There's a perception that too much litter is produced on the eastern shore of Delmarva and if there is excess, what is the capacity to relocate it? That was the intent. We had to have all parties at the table, so when we got to an answer, everyone could feel good that we tackled the question and got an answer.

As noted above, a sub-committee of the DLLC was tasked with developing the assessment of the mass balance of problematic nutrient load, i.e. phosphorus, nitrogen, as well as suspended sediment in the area of concern. One participant from the environmental community noted,

There have been other efforts by federal, state, NGOs to portray nutrient imbalance... This one was unique because it would have represented a collaborative effort among state and NGOs and other agencies to do it, with the idea being that we need to know where the excesses are and how much, if we want to come up with policy solutions. Having all parties agree to numbers was needed for that.

This assessment should have provided a solid estimated spatial understanding of how much of these nutrients and suspended sediment was produced and/or located where. It should have identified hotspots of excess poultry litter, the main source of these substances. It should have identified source locations where litter needed to be removed, and potential sinks, possible recipient sites of said litter. The end product was to serve as a planning tool that would help determine the balance between too much and too little of these nutrients in order to maintain successful agriculture and healthy waterways.

Much to its own surprise, this subcommittee ultimately failed, “at the eleventh hour,” to produce the mass balance assessment due to disagreements over the assumptions that fed into the model. Interestingly, while it is common to hear of models themselves being the source of disagreement, the specific model in this case was not a source of contention. Key statistical assumptions included (but were not limited to): how much litter was produced by a certain number of chickens on a certain size plot of land, how much P and N would be estimated to be contained in said litter, and how much P and N could be absorbed by a certain volume of crop type (e.g., corn, soy), as tied to yield. As mentioned above, the agricultural community wanted to use figures that assumed lower levels of nutrients produced by poultry, and higher levels of nutrients absorbed by crops. The environmental community’s preferred numbers assumed generally the opposite: higher levels of poultry-produced nutrients and lower levels of plant-absorbed nutrients. It is not surprising, given their interests, that the agricultural community would present the nutrient situation as less problematic and the environmental community would present it as more so.

However, given the strong influence of the state DOAs on the mass balance assessment project, the run of the mass balance model used the assumptions that were favorable from the agricultural point of view, thereby providing results that were approved by the agricultural community but not the environmental community. Nevertheless, the mass balance working group was asked to endorse the assessment. A senior scientist from the environmental community asked for the supporting data in order to run the model independently but was not given the requested data or, apparently,

further information about the role of expert opinion in achieving the results. The explanation given was that the data were not legally releasable, but it is unclear why further reasoning behind the methodology was not provided. Such communication might have instilled in the scientist more confidence in the DOAs. At this point, representatives split along camp lines, with the environmental community refusing to endorse. The environmental community blamed the agricultural community, particularly the DOAs, for trying to hijack the project by holding the data hostage. The agricultural community blamed the environmental community for sabotaging the process. As one agricultural community participant described it,

So, we had a series of meetings to come to a conclusion on assumptions, largely what yield we would use. The mass balance committee all agreed on it. So, we thought we had a report we would take to the steering committee and get approval. Then, at the steering committee, a lady who was part of this mass balance committee asked for some numbers prior to the steering meeting and she came and said, "I can't reproduce these numbers, so I can't support this report." The rest of the environmental community went with her.

The agricultural community did support the figures. The numbers were made from the assumptions. It was a number but not an absolute, of course. The agricultural community were the data divers, did most of the work to develop the algorithm or whatever you want to call it. They had invested a lot of time and expertise into it and one of the agriculture departments said, "We're done. We're not investing any more time in this. We have other projects to do." Then, we were stuck at an impasse. I let it be known how unhappy I was about the situation. They all knew I was unhappy. We made up a number, then at the last minute, we didn't agree to it.

Another participant from the agricultural community noted issues tied to interpretation of generalized data,

The maps themselves portray an accurate representation of the acres of grain that are being produced. Where we run into conflict sometimes is the interpretation or utilization of the next step. The map says there are a million acres of grain in

Maryland. Where we disagree is how the information on the map in terms of number of acres translates into nutrient application and nutrient load. The Bay model uses general numbers like book values... they're standardized. So, the map is accurate, but sometimes there perpetuates problems because it overgeneralizes the problem.

One environmental community participant noted, "... and the DOA that sits on this data relying on these secrecy rules use these rules to manage releases of the data that diminish confidence in different users at different times." Another perspective from the environmental community highlights how there were primarily two ways to build the assumption concerning phosphorus in the soil. One was based on legal regulation and was supported by the agricultural community. The other was based on environmental process and was supported by the environmental community. Apparently, the DOAs would provide only the information that supported the legally based assumption. Interestingly, there were members who agreed to disagree, and felt it appropriate to present both variants. However, this was not allowed, per the DOAs, as described by this interviewee from the environmental side.

At another point, there was another controversy: how much phosphorus can be used on shore without causing a pollution problem? There's a couple of different ways you can model that. One is how much phosphorus are farmers allowed to legally spread on land, assuming they'll do that. Another way is to model how much phosphorus is used up by an acre of soy or corn, etc. Those can lead to significantly different results. Industry wanted one way; environment wanted the other. Department of Agriculture said, "We're only going to give them data of what one can legally spread." Another said we can't do a difference of opinion [i.e. can't do both models and agree to at least present both from the different points of view]. It has to do with the legacy phosphorus in the soil. It's measured by FIV [Fertility Index Value]. There was a fight where industry wanted FIV of 150. We wanted 100. We compromised and decided to use both. Again, DOA refused to give data for 100. They tried to control the data and the outcome of the process.

A representative at the intersection of both communities delved into the FIV problem further, and provided some insight into both camps,

Ultimately.... there were some data issues... availability of data issues. We know to some extent where there are soils with high phosphorus, at least in Maryland. But not below a certain level- the cutoff is 150. So, all the stuff that is low, we don't know if it's 0 or 149. We're talking hundreds of thousands of acres. Depending on what you assume, if you assume hundreds of thousands of acres are 0, then there's plenty of land to apply more litter. If you assume 149, it's right on the cusp of the mid category, then there isn't. But they didn't know. The state agriculture departments were not giving it [data] out. The committee had to make some assumptions to build the model. The agricultural agencies... it's not like they just said it should be 0... they had some rationale for where they wanted it. The enviros said bullshit and that was the big rub. Because if you take hundreds of thousands of acres, what assumptions you use change the results. Whether it's close to the mass balance or not. That was one of the big rubs.

This explains why the environmental community wanted the FIV of 100 rather than 150. They felt the data would have helped facilitate a more accurate environmental assessment that would more precisely guide decisions on litter transport. The FIV of 150 allows a much more permissive interpretation of where litter could be applied. However, as suggested in the above explanation, this problem in part ties back to data availability. The DOAs could not legally provide the soil information that would be needed to inform such assumptions, as discussed above. It seems that would be understood across all parties. But it also seemed that a problematic dynamic arose by which those who had both the power and the data expected those who did not have either to accept their expert opinion as legitimate to inform the methodology for deriving the model assumptions. I argue that the environmental scientist's request for the data constituted a significant rejection of this claim to legitimacy of the perceived pro-agriculture government stakeholders.

Thus, as the mass balance subcommittee could not come up with a solution, or, as some asserted, *would* not, the process came to a standstill. This failure, or perceived failure, appears to have had profound effects on not only the group but individual members themselves. Interviewees told me they considered quitting, or that others quit or disengaged from the project. There was mention of losing sleep, and worrying about the future of the project, and their own stake in it. There were comments that reflected a variety of negative feelings, including disappointment, anxiety, even disgust, shame, and shock. This interviewee from the agricultural community described their experience thus,

The environmental community, in my opinion... I thought they put up road blocks because they said it [the mass balance report and map] had to be peer reviewed, and there were other processes they said were needed. That they wanted to make it 100%. Maryland Department of Agriculture said they didn't have that information in a form easily accessible. They probably had it in hard copy sheets for every farm in a file. I kept telling myself we'll delay to make it better by having it peer reviewed in a journal and so it would have scientific credibility. But then they threw in another roadblock. I've struggled since then whether to stay in the DLLC, that I was losing sleep over this, whether we could get consensus in the future or not. I decided to stay on because I'm hopeful we can.

Another participant tied to both communities described the situation in this way,

The other thing in talking with enviros involved that they felt the number crunching was all done by Delaware Department of Agriculture and they felt there was a lack of transparency on what was being done, and it was being done behind closed doors. It wasn't hugely complicated... I think in Excel... so, it couldn't be that complicated. But the enviros said, "We can't approve this report." It got kind of ugly. The state agencies said, "We're done. We have other stuff to do." It was kind of unprofessional on the part of the state agricultural agencies. They didn't win themselves... I'm kind of in between. It seemed disingenuous on their part.

This interviewee from the agricultural community generally attributed the problem to politics:

The group could not at the end agree on the assumptions used with the methodology is the short answer. I more think the reasons were politically

motivated and not about data itself. The reason everyone was brought to the table was because of differences of opinion about the question to begin with. As we got closer to the end and got to start answering the question in a way that could be transparent as to how we got there, I'm still not convinced that answer was not... it didn't suit the narrative of some at the table. They had a preconceived answer and when the calculation was being finished, it didn't suit their interests.

In sum, the agricultural stakeholders, particularly the state departments of agriculture, were accused of withholding data, substituting their professional judgment for data, and driving the process without adequate consideration for others' concerns. In turn, environmental stakeholders were blamed for waiting until the last minute, the "eleventh hour," to disclose a fundamental and cataclysmic disagreement, thereby sabotaging the project.

Opportunity Costs

It did not occur to me until later, about halfway through the interviews, to ask participants about their perceptions of the impact of not having developed the mass balance assessment. There were several helpful responses. One participant from the environmental community commented, "Moving forward on policy has come to a halt...policy that all the diverse partners could agree to." An agricultural community interviewee noted the degradation of relations, loss of members, and failure to develop common understanding,

We lost several key stakeholders from participating anymore. It definitely embittered the two Departments of Agriculture that worked on it with a lot of staff time. And in the end, this was supposed to be the culmination of the group and we don't have anything to show for it. It was intended to be used for the idea that one side says there's too much nutrients. The other side said that's not the case. Why

don't we scientifically look at it? Is it or is it not? Then one side was completely prepared to have it published and the other side wasn't.

Another agricultural community participant commented on loss of credibility, degradation of relations, money, and time,

The map would give credibility. The agriculture departments don't want to work with us. They are professional and work with us if we ask but they... It's even questionable if they will attend anymore. And we asked for money from various groups, various associations and we told them we're doing this mass balance and then we came out that we're not going to come up with a report. I refuse to go back to ask for more money. We didn't deliver. Many feel we spun our wheels and wasted time.

Another agricultural participant identified the loss of long-term engagement with the public on this issue. This is a particularly useful insight in that it suggests both the social and temporal value of the assessment.

A real opportunity was lost because the momentum behind the effort... and the general public and outside the group were aware of what was happening. The word was getting out. And the project was drawing to a conclusion where it could be communicated to the outside, which was anticipating a product being produced. But it lost wind in its sails. We can't agree so we can't move forward. The public perception... there is a lost effort of having a broader dialogue with the public. Without consensus in the group, we lost the opportunity to put good data out there to continue the conversation. The intent was not to do this one time, but to let it evolve as the industry evolves and it is evolving... the answer today is not necessarily the same as 5 years from now. It is a lost opportunity to evolve what data is out there, what and how to share it, the methodology, bring more data to the table. When it got cut the way it did and so unceremoniously, the momentum internally was really diminished.

Furthermore, this environmental representative appears to perceive a loss in relations, and perhaps authority, with the public as a result of not having produced the mass balance map.

Lack of appropriate maps led to the [...] stall in policy development and agreement with all the interested parties. The idea was that we [nonprofit

organization] would meet with various communities [...] and would broaden acceptance of results. Obviously, that didn't happen.

This interviewee, tied to both agriculture and environment, noted the real and sudden lack of consensus, both in physical form (i.e. the map) and social (i.e. lack of agreement).

What was lost... there is the tangible of being able to say, "Yes, there's been a consensus around these numbers. These counties or these fields have a high phosphorus level. This one does not. There's still these versus those maps, etc. More intangible: we went through this process. Everyone thought we were on the same wavelength and then in end, not to have this tangible produced... there was this concern that DLLC might not survive it...

There are a couple of key points from these comments that bear particular relevance. First, this case appears to demonstrate how perceived or real lack of data sharing can serve to alienate stakeholders. Second, data vetting, i.e. discussion among stakeholders about what data to use, how and why to use it (or not), and the risks associated with use, non-use, or substitution, can lead to trust-building, or trust-breaking. Third, and in summary, the significance of the social aspect of group data use should not be underestimated.

The Way Ahead

Indeed, participants identified some lessons for the future from the mass balance experience. There seemed to be an acknowledgement of the importance of the social aspect, particularly in terms of data. An environmental community interviewee provided the below view into the group itself, indicating that there had been, and still was, the will to work together. This view also hints at the power dynamics associated with legitimacy

of stakeholder, as identified in my conceptual framework, and discussed above in this chapter.

I've been pleased to observe that most [DLLC members] seem to really want to come together to solve a problem. I've had some previous experiences with some stakeholder processes and have been very disappointed. It's typically a way for the government to try to get buy-in to get to a decision that they've already come to and handpicking to achieve that. This one hasn't been without some of that, but there are some real stakeholders that want to get to real answers to real problems. Most people have realized the damage that has been done and are trying to limit government agents so that they won't interfere with our reaching results.

This interviewee from the agricultural community noted that there had been both success and failure in the DLLC (i.e. not only disagreement), attributing data to be the key issue,

The success comes when the info is agreed upon, the data and maps are agreed upon. Failure primarily comes when there is disagreement on what data should be used. Two primary things: manure transport program. We came up with the best overall program. So, the data was appropriate and we came to an agreement. There is a breakdown with what data to utilize in the mass balance program, so at this point that has not been a success. There is a difference of opinion of what data should be utilized.

Another participant from the agricultural community commented similarly,

Certainly, our preliminary findings confirm what a lot of people thought all along, which was there's too much phosphorus on the lower shore and not enough on the upper shore. It's a distribution problem, not gross oversupply. Certainly, we had a lot of data that showed that. We ran mass balance on a county basis. We had a phosphorus number for each county as surplus or deficit. We generally agreed we should move litter from south to north. The group agreed the best use of manure is land application.

Moving on to suggestions, one interview associated with both agriculture and environment commented on the need for a process that, from the beginning, establishes "check-ins" among stakeholders.

And to take a positive spin, yes, the group can work together but we need to have some sort of structure in place when pursuing something like this. A process more than a structure. How to go about doing a project like that. There need to be

checkpoints along the way, like, “Ok, we don’t agree on this. Or that.” Don’t wait until the end of it until you realize you don’t agree. There needs to be a process for how you go about collecting data and how people work together. As far as choosing third party mapping: either do it at the beginning or when it became clear that there were going to be loggerheads or problems.

This interviewee from the environmental community provided these suggestions,

One is to make clear the significance of assumptions going into the analysis. Not everyone has that expertise, but the committee is full of people who are not experts in nutrient management. Explain and discuss before going forward. Having a third party do the data crunching. Agreeing on data sources that should be publicly available, not “best professional judgment.” Being more transparent with the process.

Another participant operating between agriculture and environment related the lack of data, namely appropriate data, with lack of consensus. Their solution was to go out and gather their own data, which might help remove or at least alleviate the need to rely on certain stakeholders who may or may not be legitimized by the entire group,

And there was a lot of angst in the group. But in my mind, I could understand some of that. But the whole point of the group was to come to consensus. And if we can’t, then we don’t, and that’s it. Maybe we’re just not ready. It’s not the end of the world that we couldn’t come to consensus in my mind because there was a lack of information with all these fields that we didn’t know about and didn’t have information and if it didn’t have such an impact on the conclusions. It’s supposed to be a scientific analysis. If it’s such a huge assumption, then just go out and collect the data.

This participant from the agricultural community appeared to agree with the need to find other means to gather data, “Obviously, if an organization feels that animal agriculture is killing the Bay, they will show a map of animal densities. They’ll slant a map for their interests. Versus a contracted group to do an independent study.”

And, indeed, the DLLC later decided to hire an outside third party to develop such an independent assessment, now called the “State of the Industry.” One agricultural community interviewee commented,

We’re hoping to learn from that [mass balance experience] with this State of the Industry project by almost over-asking for feedback at every progression: “Here’s where we are. Here’s what’s being done. Any issues with this?” Give ample opportunity to raise concerns, so that at the 11th hour, it doesn’t get blown up.

This interviewee with both agricultural and environmental ties discussed the role of maps in the upcoming project,

In DLLC we have undertaken the “State of the Industry.” The whole concept behind that part of the project is to look at what is out there in terms of mapping and data and to establish a baseline that everyone can look at when they are having these discussions about poultry litter because it does vary depending on what source you look at. We need to get our arms around what that is, and we think mapping is the way to do it. The Eastern Shore GIS out of Salisbury University is working on it. Mapping is important for that.

The Salisbury University GIS office was brought in to take over the effort, to include conducting research, gathering data, and developing a dashboard, which would include calculating assumptions and running the model that would produce the map. As the above interviewee noted,

The stakeholders are so varied. For example, county staff, NGOs, general public, etc., so it is hard to say one specific group of stakeholders. And that’s what we’re hoping to do with DLLC is to make a website that has information that is both understandable and accessible to anyone from industry, NGO, consumer, etc.

This agricultural community interviewee noted,

...now, besides this mapping effort [i.e. the Salisbury GIS project], we have no other way to reach a data driven common ground. Because we’re all coming from our own interests in the outcome, where this mapping will help us reach an objective view of what the situation is with the poultry industry.

By the time this research concluded, the Salisbury State of the Industry project was well underway.

Conclusion

The Delmarva case study demonstrates how lack of trust and legitimacy associated with data and data sharing can have negative effects on a conflict resolution process. In turn, these issues highlight that the social side of data use can be overlooked or under-valued, despite the often profoundly social processes and relationships associated with working with them collaboratively. Some valuable lessons about data, legitimacy, and related social considerations were offered by the stakeholders themselves. For example, it was noted by several interviewees that the breakdown might have been avoided had the group done more in-process check-ins to ensure there was still consensus among the representatives. In other words, discussion about data needed to start early and occur frequently. Thus, it appears that an important consideration in conflict resolution is the need to assure appropriate attention to the social side of data use, particularly when attempting to gain consensus across stakeholders in a data-heavy environment.

5. LYNNHAVEN CASE STUDY OVERVIEW

Introduction



Figure 8: Lynnhaven River.
Lynnhaven River is located to the east of Norfolk, within the jurisdiction of Virginia Beach, Virginia.
Source: Google Maps.

As puzzling as I initially found the lack of map use in the Delmarva mass balance dilemma, I found an equally surprising, albeit different, phenomenon in the Lynnhaven case study. Not only was map use considered central to the conflict resolution effort, there was, in fact, one product that, more or less, served as the common and relatively undisputed map for the working group that had been convened to resolve or at least mitigate the conflict. Moreover, it functioned as the central map product for the Lynnhaven oyster conflict writ large.

From the various interviews and discussions, there was little argument that the Virginia Marine Resources Commission (VMRC) Engineering/Surveying Department GIS was considered the most commonly used geospatial product in the conflict. Moreover, its legitimacy was little challenged. It was not that the stakeholders had little feeling about the conflict. I had heard some rather harsh comments in some of the interviews, including the occasional apparently joking threat of violence against other stakeholders. However, when it came to authority in terms of mapping, there appeared to be surprisingly little issue or questioning. This will be discussed below.

This case study focused on Lynnhaven River, located in eastern Virginia, in the jurisdiction of Virginia Beach. As in other locations in the Chesapeake Bay, there has been a resurgence of oyster cultivation. Although oysters have long been a part of life and livelihood in this area, a few factors have converged to create the current conflict: 1) There has been rapid development; 2) There is increased interest in cultivating containerized oysters, rather than harvesting wild ones; 3) There is considerable support for oyster cultivation because of its positive impact on water quality, an important consideration for the Chesapeake Bay meeting its restoration deadlines, per the Chesapeake Bay Watershed Agreement.

Historically, there was an abundance of oysters in the region. In fact, this is not the first time there has been conflict over oysters there. The Oyster Wars, which occurred approximately mid-19th to mid-20th centuries, consisted of frequently violent disputes among legal oystermen, illegal oystermen (aka pirates), and authorities in Virginia and Maryland (e.g., the Oyster Navy) in the Chesapeake Bay, well described in Kate Livie's

Chesapeake Oysters: The Bay's Foundation and Future (2015). Lynnhaven used to produce 50-60% of the country's oysters. President Taft apparently was quite partial to them and had them regularly delivered in large quantities to the White House. According to one interviewee, from approximately the 1880s to 1930s, there was a significant sewage pollution problem that damaged the oysters. There were several additional compounding issues, such as overharvesting of oysters, disease, as well as the treatment of homes with DDT. The water was closed to oyster harvesting for 50 years.

There has been a boom in aquaculture in the past 10-15 years, accompanied by a "goldrush" mentality fueled by the market demand for oysters, especially on the half-shell. The shift from oyster reef seeding to caged operations has greatly increased the monetary value of oysters (i.e. size, uniformity of shape) as well as nearly year-round availability. As one interviewee tied to oyster cultivation notes,

Cages grow oysters faster, and protects them from predation. They're more consistent products for the half-shell market. It's more lucrative but more costly, more labor intensive. And location matters: You want shallow water, but not too shallow, bottoms where cages won't sink into. That means up close to the shoreline, where the piers are.

Forty-six percent of the Lynnhaven estuary is purportedly now open for shellfish harvesting.

More Oyster Wars

The oyster conflict in the Lynnhaven area is mostly between property owners and those in the oyster business but includes other stakeholders. Other stakeholders include local government (i.e. City of Virginia Beach), state government (most notably Virginia

Marine Resources Commission (VMRC), federal government (e.g., Army Corps of Engineers (ACE), National Oceanic and Atmospheric Administration (NOAA), environmental NGOs (e.g., Lynnhaven River Now (LRN), Chesapeake Bay Foundation (CBF), and science/academic institutions such as Virginia Institute of Marine Science (VIMS), and various universities. The conflict revolves around who owns the water, i.e. who has the right to use the water, and for what.

The Lynnhaven oyster working group was convened by VMRC in 2016 to try to find a way ahead concerning the conflict over oyster cultivation in Lynnhaven River. Its members consisted of participants representing key stakeholder interests. But, as one interviewee noted, “The working group... it was a stalemate from the first session. We were polarized. Very little was accomplished, although there was better signage, and a better notification process for adjacent property owners.” One environmentalist noted, “I try to understand it from everyone’s point of view. Homeowners feel they don’t have any control over their view. Watermen have a long culture and history. And it’s a perfect estuary for oysters: shallow, warm, salty.”

A chart of stakeholders in the last case study provided some general context. Below is a similar chart for this case study. However, unlike the previous case study, where the stakeholders were limited to the working group, this list incorporates stakeholders beyond the working group, as a broader focus was taken in this case study due to the dynamics, as well as the limited purview of the working group. In essence the working group community was used as a means to gather stakeholders for this research via the snowball method.

Table 2: Lynnhaven Case Study Stakeholder Matrix

Stakeholder	Interests	Map Concerns	Other Stakeholders' Perceptions
Property Owners	Legal, visual, physical rights to the water	Representation of their interests ; accuracy of data	Wealthy, sense of entitlement (watermen)
Watermen	Successful oyster cultivation; livelihood	Accuracy of data supporting their claims	Invasive; degrade lifestyle and property values (property owners)
Aquaculture Industry	Managing and maximizing aquaculture industry	Accuracy of data supporting their claims	Invasive; degrade lifestyle and property values (property owners)
Environmental Groups	Repairing/maintaining healthy waterways and ecosystems	Accuracy of data; effective telling of the story	Overly supportive of oyster cultivation and cultivators (property owners)
Academic/scientific community	Various types of research	Accuracy of data; appropriate representation	Mixed, depending on type of research
Local government	Managing resources, balancing interests	Accuracy of data; map ownership	Fueling conflict with maps showing property owner ownership of water (state government)
State government	Managing resources, balancing interests, meeting Bay environmental goals	Accuracy of data; reliability of map process; map ownership	Overly supportive of oyster cultivators (some property owners)
Federal government	Various, e.g., regulatory (EPA), monitoring (NOAA), restoration (USACE)	Accuracy of data; map ownership; appropriate representation	Following own agendas (multiple across stakeholder spectrum)

NIMBY (Not in My Back Yard)

Many homeowners along the shores of the river and tributaries believe that they own the water adjacent to their property, or if not own, then at least have significant

rights to it. While homeowners do generally have riparian rights to 200 feet into the water from shore, they cite other lost benefits with oyster cultivation near their properties. For example, they commonly express that the view onto the waterfront should be theirs, and that the right to engage in water activities is included in property ownership, as well. It is important to add that in recent decades, property values have risen dramatically in the area, resulting in some quite high-priced properties being built there. Lynnhaven is now home to both wealth and celebrity. For example, the pop singer Pharrell Williams (hit song “Happy”) owns a house along the Lynnhaven. This injection of fortune, even fame, appears to flame tensions due to perceptions of property owners’ sense of entitlement.



Figure 9: Homes along Lynnhaven River.
Expensive homes have cropped up in Lynnhaven, putting wealthy property owners and often not-so-wealthy watermen in very close proximity – and conflict – over use of the water. (author’s photo)

One waterman provides this insight,

The controversy was the homeowners seeing the cages. It had nothing to do with the lease other than it was in front of the person's property. The question was how the lease was being used to grow oysters. The cage culture is new. The Lynnhaven has been leased up since the early 1900s but was used primarily for shell-on-bottom husbandry. Only in the past 15 years have cages arisen. Traditional on-bottom culture was replaced by containerized culture, which has made the practice more visible. It's the gear that has changed. Before all the McMansions came, there was oyster aquaculture. The leaseholders have changed the methodology to something that is more visible and the upland property owners have realized, "There is something going on that I didn't know anything about."

VMRC Oyster Lease Process and Map

Anyone has a right to apply to lease plots to raise oysters in the area as long as they are legal citizens, can pay the lease fee, and have an acceptable plan for how they will raise oysters on the plot/s they are trying to lease. Those leasing generally range from hobby cultivators, part or full-time watermen, aquaculture industry, environmentalists, and academics. The environmental interest lies in the benefits oysters bring to the environment, particularly in their remarkable ability to purify water of certain contaminants. Additionally, their reef-like communities enhance habitats for fish and others in the ecosystem. Scientific interest ranges from environmental to economic, particularly in how to improve shellfish cultivation.

The Virginia Marine Resources Commission (VMRC) "serve[s] as stewards of the Commonwealth's marine and aquatic resources, and protectors of its tidal waters and homelands, for present and future generations" (VMRC website). Within the VMRC, the Engineering/Surveying Department is "responsible for surveying and mapping subaqueous ground for public and private shellfish cultivation, leasing private shellfish

grounds, and maintaining oyster ground lease records.” It is responsible for 300,000 acres of public ground and over 100,000 acres of private ground. Its website (<http://www.mrc.state.va.us/hmac/hm-engineering.shtm>) also notes, “In cases [of] user conflicts and objections, the department weighs all available information in making recommendations to the division head for presentation to the Commission.” While it is officially the Commission that hears and decides oyster lease conflict cases, the Engineering/Surveying Department plays a very large role in conflict resolution. According to the VMRC Engineering/Surveying Department,

Currently, there are around 400-plus pending leases, with over 100 of them protested. For perspective, from 1983 until 10-15 years ago, there were no more than 100 new pending leases, about a half dozen protested per year. Now, there are more applications, from 100 to up to or greater than 300 per year, although it’s now tapering off. We can’t keep up. Once one is protested, it has to go to the commission for hearing unless resolved. We’ve resolved a bunch at this level. Only about 3 cases can be done per month, and there’s no time limit, leading to frustration; there are some pending applications that go back to 2011.

More on VMRC’s Engineering/Surveying Department’s role in conflict resolution will be discussed further below.

Central to the effort of managing oyster leases is an Engineering/Surveying Department developed and maintained GIS. The GIS delineates various categories of public oyster grounds, e.g., those that cannot be leased, are already leased, what is open to be leased, what is the classification under the Health Department (e.g., open for harvesting, prohibited, etc.). This GIS, along with other products produced and maintained by the department, are the legal purview of VMRC. As this VMRC Engineering/Surveying Department interviewee asserts, “We act as a courthouse. Before the 1980s, all this was kept at courthouses. Our maps will hold up in court when in

disputes over who owns what. It's a section of the code of Virginia law." This NGO and waterman also notes, "The oyster leases are all mapped out on the VMRC master map. And those are the gospel as far as who can pull oysters out of where. That's the one master document that everyone uses to do with oysters in Lynnhaven."

The backbone GIS is used internally for management, planning, and other purposes, but there is also a version available to the public online. It is searchable and can be used to make customized products and reports. It is most commonly used for checking the status of pending applications for leases, by both those applying for the leases, as well as those potentially protesting them. The 24-7 access to such data has been credited with the increase in citizen interaction (read: complaints) over oyster plot permitting, and also increased engagement by multiple stakeholders (e.g., property owners, watermen, environmentalists, government) over issues. Figure 10 is a snapshot of the online tool used to manage oyster ground applications. Figure 11 shows a map associated with one of the lease applications.

← → ↻ https://webapps.mrc.virginia.gov/public/oystergrounds/search_applications.php

Virginia.gov Agencies | Governor

Virginia Marine Resources Commission

Engineering / Surveying Department > Oyster Ground Applications

<< Back Chesapeake Bay Map

389 Pending Oyster Ground Applications

Click on column heading to sort table. Click on Chesapeake Bay Map button (above) to see all oyster ground leases and applications.
Requires Google Chrome, Mozilla Firefox, Safari, or IE 10.0 or greater.

Application Number	Applicant	Date Application Received	Lease Type	Status	Applied Acreage	Waterway	Locality	Public Notice	Map
2019023	JOSHUA H. WEBB	02/26/2019	Regular	Application Fee Paid	35.00	Wachapreague Channel	Accomack	Public Notice	Non-Surveyed Map
2019022	JOSHUA H. WEBB	02/26/2019	Regular	Application Fee Paid	72.30	Pungoteague Creek	Accomack	Public Notice	Non-Surveyed Map
2019024	MICHAEL E. WEST	02/27/2019	Regular	Application Fee Paid	47.00	North River	Mathews	Public Notice	Non-Surveyed Map
2019025	THOMAS H. JAMES III	02/27/2019	Regular	Application Fee Paid	0.30	Nassawadox Creek	Northampton	Public Notice	Non-Surveyed Map
2019020	WOODROW C. GASKINS JR.	02/22/2019	Regular	Application Fee Paid	15.00	Horseshoe Lead	Accomack	Public Notice	Non-Surveyed Map
2019018	JOHN BARR	02/20/2019	Regular	Application Fee Paid	15.00	Milstone Creek	Accomack	Public Notice	Non-Surveyed Map
2019019	JOHN BARR	02/20/2019	Regular	Application Fee Paid	12.00	Milstone Creek	Accomack	Public Notice	Non-Surveyed Map
2019017	MATHEW A. FREEZE	02/20/2019	Regular	Application Fee Paid	3.00	Nassawadox Creek	Northampton	Public Notice	Non-Surveyed Map
2019015	PATRICK CANTWELL	02/15/2019	Regular	Application Fee Paid	10.00	Occohannock Creek	Accomack	Public Notice	Non-Surveyed Map
2019021	CHARLES E. HARVEY PAUL E. NESTER, O. WOOLAND HOSG JR.	02/15/2019	Regular	Application Fee Paid	2.00	Milford Haven	Mathews	Public Notice	Non-Surveyed Map
2019016	JONATHAN R. TURNER	02/12/2019	Regular	Application Fee Paid	150.00	North Inlet	Accomack	Public Notice	Non-Surveyed Map
2019013	D & S OYSTERS LLC	02/08/2019	Regular	Application Fee Paid	20.30	Thorofare York	York	Public Notice	Non-Surveyed Map
2019014	D & S OYSTERS LLC	02/06/2019	Regular	Application Fee Paid	22.00	Thorofare York	York	Public Notice	Non-Surveyed Map
2019012	GREGG FINNEY ADRIAN MATTHEWS	02/05/2019	Regular	Application Fee Paid	91.00	Metomkin Bay	Accomack	Public Notice	Non-Surveyed Map
2019006	HARRY L. BOYEN JR.	01/16/2019	Regular	Application Fee Paid	6.00	Fisherman Inlet	Northampton	Public Notice	Non-Surveyed Map
2019005	MARK VANN	01/14/2019	Regular	Application Fee Paid	4.00	Jones Creek (York)	Gloucester	Public Notice	Non-Surveyed Map

Figure 10: VMRC Online Oyster Lease GIS.
https://webapps.mrc.virginia.gov/public/oystergrounds/search_applications.php

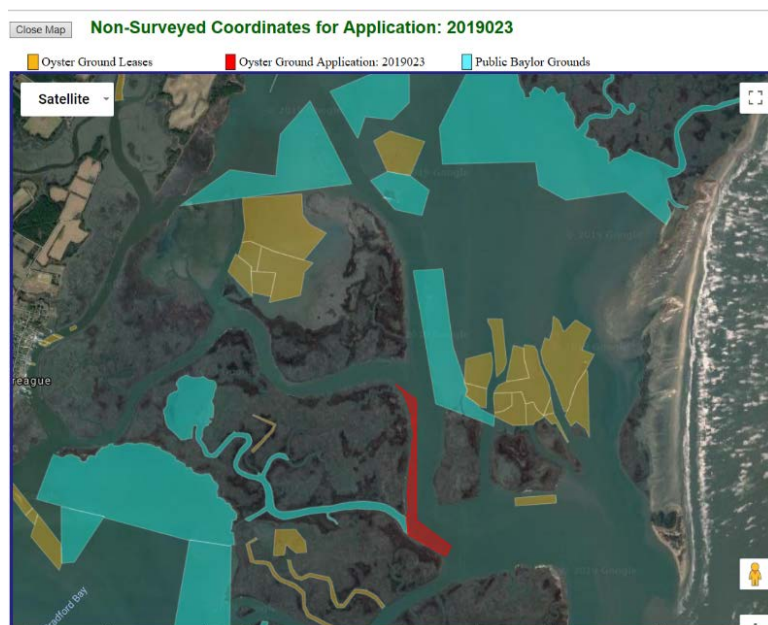


Figure 11: Map of an Oyster Lease Application.
 Such maps can be found in the above applications page under the “Map” column.

There was substantial and interesting ambivalence about the VMRC GIS. I encountered considerable acknowledgement that the online GIS adds to the legitimacy of the information and process, as well as to the organization, especially as issues related to the GIS and other map products are apparently addressed by the Engineering/Surveying Department in a relatively timely and transparent manner. That the GIS is available in a reliable, relatively easy to understand and easy to access manner (for example, see the note on the website about its availability on various browsers), and is frequently updated, also boosted perception of all three types of legitimacy discussed in the literature review, i.e. stakeholder, information, and representation.

However, there was also a perception, particularly within government, that this GIS is a “double-edged sword.” On the one hand the GIS was seen as a great improvement in service over past approaches, particularly in that the information is available 24 hours per day, 7 days per week. Anyone can get the information any time they want it, in a reasonable variety of user-friendly media. By the same token, such easy, timely availability is perceived to have increased the amount of conflict. Whereas property owners in the past would have had to go somewhat out of their way to even discover that someone was trying to rent oyster leases near their property (e.g., they may or may not have noticed the legally required postings), now they can easily monitor the addition and progress of lease requests. Furthermore, they can also address them online, such as through email queries to the Engineering/Surveying Department. They can even engage with lease applicants themselves, as names and contact information are included in the lease applications in the GIS. Thus, with the increase in access to information and

communications have come dramatically increased awareness and interaction, and, therefore, given the situation, conflict.

Map Panic

One key result of the oyster lease GIS was that already anxious homeowners got the impression that the whole Lynnhaven was, or soon would be, dominated by oyster cultivation. An environmentalist noted,

Homeowners look at the map and think there are oysters bank to bank, covering the whole river. However, there's about 2000 acres in leases. Less than 10 acres of that is actively farmed... Almost every inch of Lynnhaven is leased. There is no space, no room for anything else. The maps don't show that not all of that is used for oysters. There's sanctuary. There's boat channels. There's no way to tell where the channels are from the map. What's used is misleading.

As another interviewee commented, "At the VMRC working group [on the Lynnhaven oyster conflict], when they showed a map that showed that only 5% of the bottom was actually cultivated, that was new information for people." VMRC Engineering/Surveying Department leadership elaborated:

Once the issue became apparent to a few landowners...they could spread the word quicker by telling their neighbors. "You'll be shocked by all these polygons. So close to your house. How many could be staked?" But they're [e.g., watermen] not always using their grounds. But this [the online lease map] allowed people to get a visual of what could be. It's the worst case scenario...all the possible things that could happen under the rules. And it was conflated by spreading it around. Not completely not true, but in reality wouldn't happen at the same time. Putting these maps out has increased awareness and reaction.

The Engineering/Surveying Department has spent considerable time trying to explain the product to allay concerns.

GPS or the Wild West

The watermen offered a different perspective on the value of VMRC mapping, the oyster lease GIS, and associated products. They saw them as a means of keeping the peace among lease holders. The historic identity of the rough waterman is often evoked, seemingly both for nostalgia, as well as warning. One waterman had this to say,

When you apply for a lease, you tell VMRC, “This is the area I want,” and they go out in a boat with GPS down to 3 decimal points and they get it down to within a foot as to where the stakes are. This is their livelihood [the watermen] so it’s important to them. Lease areas tend to be strange shapes and sizes. Most leases are very odd shapes. There is no standard. That’s why they use the PVC poles, because they give a very graphic point of reference. And if you don’t like where they put it, you go back and engage with them about it. You don’t want people getting shot over a 10-foot mistake. Like the Wild West... it’s like that among watermen. If you’re caught poaching, you might end up face down in a ditch. You could really be taking your life in your hands. Maps are critical for resolving disputes. I can tell you exactly where my corners are.

They went on to add,

GPS is absolutely a beautiful thing. Before, we had to use marine surveyors in a moving boat trying to get references along a moving shore, which was often hit or miss. The whole system was prone to error as opposed to now. GPS has been a huge contributor to calming people down. Accuracy has eliminated boundary disputes. Read it and weep. It’s a tremendous innovation.

As well as this,

Another thing along the same lines: the satellite photos... There can be whole regional photos, but you can blow them up and see from outer space the poles. So, it’s a combination of accurately placing the poles and viewing the poles from space. Outer space is solving our oyster problems [laughs].

This set of remarks is quite insightful. First, one can see that the PVC pipe poles used to mark lease areas do serve a valuable purpose despite homeowners’ complaints about their unsightliness and potential danger for water-goers, i.e. they constitute a “good fences make good neighbors” approach. This type of clear demarcation, on both map and

in the water, is especially important given the irregular shapes and sizes of the plots, as well as the often tense history of oyster harvesting in the region. There are now the added tensions of a growing and different (i.e. wealthier) set of property owners, in addition to the expansion of containerized aquaculture. Second, one senses the trust in the science of the data collection and mapping of the plots, i.e. the legitimization of the oyster lease GIS.

Ground Zero for Oyster Grounds

If it has not become clear by now, the VMRC Engineering/Surveying Department, apparently somewhat unwittingly, became fixed at the epicenter of the Lynnhaven oyster conflict. The uniqueness of such circumstances caught my attention early on. Having been allowed to review public files and materials for this research in the Engineering/Surveying Department office, I would hear what sometimes seemed a constant stream of phone conversations between GIS analysts, surveyors, or others and the public, with the employees fielding public inquiries, concerns, and complaints about oyster and other shellfish leases and issues of various types. It seemed sometimes that the employees were working at least as much conflict resolution as mapping. In fact, indeed, department leadership assessed that the oyster lease conflict situation had placed a substantial additional strain on an already resource-strapped department.

Additionally, the Engineering/Surveying Department facilitates mediation and public meetings of various types. They work to spread understanding of the lease process,

resolve protests, and clarify information. When it comes to maps, particularly GIS, department leadership commented,

And we didn't have the information available before [the online GIS]. Now it's just a click. More information is good. More information is more conflict because then we have more questions. But nothing is wrong with that. It's human nature. And it's not a secret operation. People have the right to know what's being done. We don't want misinformation.

This quote provides important insights. First, one sees that the Engineering/Surveying Department representative has embraced the responsibilities of conflict resolution, arguably an unconventional role for such a department. Second, they feel that their experience with GIS in conflict resolution has proven positive, i.e. the ability to map dynamically to provide relevant, meaningful maps in the eyes of stakeholders has helped facilitate or support their conflict resolution efforts.

Additionally, the online map appears to have impacted social networks through a democratizing effect, i.e. by making the information more open and more easily accessible to all. Thus, it has both broadened and somewhat flattened the network of stakeholders. Broadening has occurred in the increase in interaction not only with VMRC, but also with other stakeholders. For example, there has been more direct contact between homeowners and oyster lease applicants, i.e. homeowners have referenced contact information in the GIS to address their concerns personally with potential lease holders. As one VMRC interviewee noted about the GIS, "It also made available pending applications. You could get information about those people [applying for leases], including contact information. It changed the nature of public input. There always had been a public review/input component, but this made it more so." Flattening of the social

network has occurred in that there has been much more input from stakeholders to authorities and to traditionally authority-driven geospatial processes, thereby “flattening” the traditional hierarchy. The same VMRC interviewee commented on the impact of the GIS,

There is more interaction, like discussed earlier. That’s a good thing. The current mapping we provide is a net plus for everybody: the public, us, industry. My view is that the more info that’s accurate that people have, it’s a lot better than before, and gives them information to call and inquire. In Lynnhaven in particular, it blew up, caused creation of a task force, a lot of people learned and got put on the task force... a lot of property owners, lease holders.. to explain ideas, problem solve.

Thus, the oyster lease GIS was viewed by this individual as a tool for mobilization, not only in conflict but also in conflict resolution. A homeowner also noted the GIS’ potential for at least facilitating conflict resolution, if not actually mobilizing people to engage in conflict resolution, “And when the data is shown in this manner on a satellite map [via the VMRC oyster lease GIS], you can easily see where conflicts might occur with property owners. But, also, it would suggest alternative sites where cage aquaculture could be practiced and not in conflict with homeowners.”

Maps and Framing the Conflict

Arguably the most significant insight gathered from this case study relates to the impact of the map itself on how a situation is understood, how problems are contextualized and how solutions are devised. As suggested above, as well as in the previous case study, framing of the conflict in the maps used appears to have played a significant role. In this case study homeowners appeared to frame the problem at a

fundamental level centered on their properties and in terms of where oyster cultivation exists. They were concerned about viewsheds, water activity, privacy, and related aspects and implications of aquaculture near their properties. This included the temporal, both in terms of how future oyster leases might impact their standard of living, their property values, etc., as well as how the history of the land plot might support their legal or other arguments and/or interests.

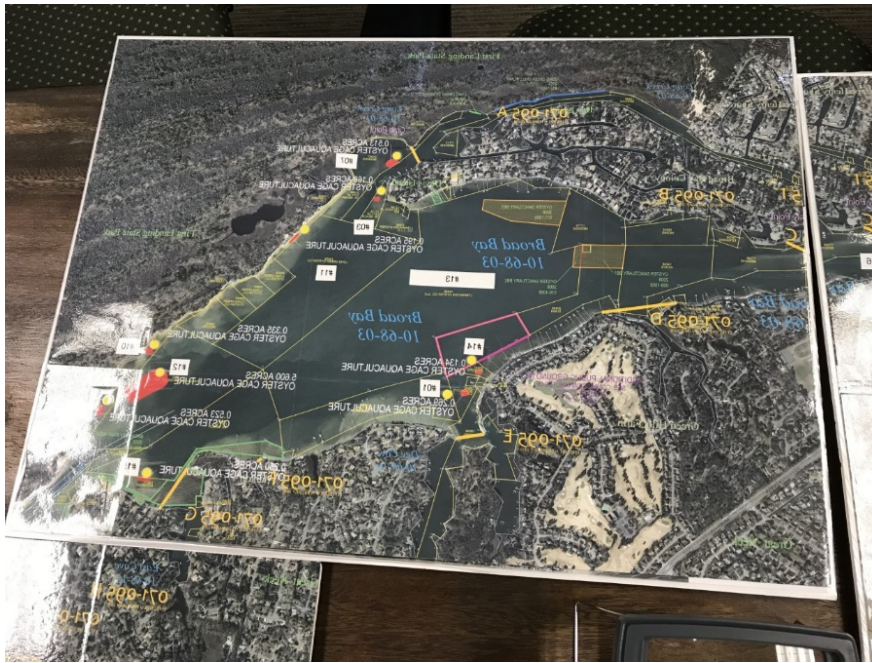
Watermen also based their framing on their local interests, i.e. their oyster lease plots. However, their sense of conflict was slightly expanded, as they expressed additional conflict concerns, such as other leaseholders infringing on their plots. Additionally, this community tended to look beyond their own plots temporally, both in order to identify future areas for leasing, as well as monitoring the status of aquaculture in the area in general, e.g., status of oysters, areas of sanctuary. The historic perspective was also considered important for such endeavors, as well as for providing a general validation of the watermen's existence, i.e. the long history of oyster harvesting in the area, although the distinction (and thus the major point of contestation) between harvesting and cultivation is sometimes missed.

However, VMRC framing continues to be based on oyster lease management. Therefore, the GIS portrays where oyster plots of various status are, where properties are, and provides some fundamental layers for context and pertinent analysis. It does not include some types of data that might be helpful in resolving the conflict. That does not mean the map is deficient. That map was intended as a government tool for management of shellfish leases. It was not designed for the purpose of serving as a forum where a

diverse set of stakeholders representing various interests in a working group could convene, develop a common understanding, or at least acknowledge the different stakeholders' points of view, and engage in problem-solving. Nor was it intended to serve as a snapshot of the conflict between property owners and watermen.

However, one impact of multiple stakeholders using the VMRC GIS in conflict resolution was that information critical to some stakeholders' framing of the conflict was not included, which appears to have negatively affected sense of legitimacy, particularly among the homeowners. Some stakeholders have been seen to adapt by bringing their own geospatial products to engagements (e.g., old maps, legal documents, Google Maps snapshots, photos).

On a slightly different note, one stakeholder described how they felt confused by the VMRC maps being used at a set of meetings, and sensed confusion among others. The confusion was described as overload of data and inadequate labeling for the purpose of the group. This stakeholder requested and received from VMRC large print-outs of portions of the GIS, laminated them, and created a system of labeling so as to make the lease situation more easily understood in the meetings (see example, Figure 12).



VMRC's apparent willingness to incorporate geospatial and other materials into the conflict resolution process appeared to help some stakeholders feel that their information, framings, and/or geospatial products were legitimized. In some cases, VMRC mapped the data that stakeholders brought them, such as locations of property features, such as docks, a particular point of contention for property owners. This VMRC interviewee noted resource constraints in mapping stakeholder information, "There's not the manpower to locate all the docks. They'll [Engineering/Surveying Department] map what people ask for." In other cases, VMRC did not map the stakeholders' special information but did allow stakeholders to use or present their information during conflict

resolution related activities, either individually or in group settings, such as town hall meetings, charrettes, information sessions, protests, etc.

The absence of a comprehensive map including features important to certain stakeholders has arguably made it more difficult to engage with such concerns among stakeholders, leading to their sometimes “invisibility,” which in turn has led to frustration. As one environmentalist commented,

So, it's [the VMRC oyster lease map] not an accurate representation. [VMRC Engineering/Surveying Department] would say, “We can't do that type of map because we don't have the information.” And it's not their job. It seems no one collects the information and that's why no, it's not mapped. ACE has some [data]. VMRC does have the sanctuary data. There are parts. No one entity has all the information. The most likely, with funding, might be someone at VIMS. I don't know who would provide the funding. It seems no one has discussed why the data have not been collected and mapped.

There is considerable insight to be derived from this quote. First, the interviewee identified that they felt that the map was not an accurate representation in terms of reflecting the interests of various stakeholders in the conflict. Furthermore, through various comments about who does/does not have data and will/will not make maps using them, it is evident that the interviewee has looked into this matter, thus reflecting its importance to them. Lastly, their comment concerning whether anyone has questioned why the data have not been collected and mapped is important. It appears to support that there has been little questioning of the legitimacy of a map that, while appropriate for its intended use, i.e. oyster lease management, is not appropriate for what the map has, arguably unintentionally, become, i.e. a conflict resolution tool.

The Time Factor in Framing

Another aspect of framing that appears to be problematic in this case study relates to time. The VMRC oyster lease GIS contains some temporal data, particularly related to application information, but otherwise holds little publicly available time-related information. However, the geospatial history of the location is significant to many of the stakeholders, albeit for different reasons, as introduced above.

Homeowners have often gone to the VMRC Engineering/Surveying Department office or meetings bringing historical maps of their properties to compare with the oyster lease map to demonstrate how features may or may not have changed over time (e.g., moving coastline, erosion), or to further stake their claim to what they see as theirs in terms of benefits associated with the property. For their part, watermen have knowledge of where oysters have and have not been in the Lynnhaven, and where oyster cultivation has occurred or is occurring. In such a manner, they also have asserted their right to the location, not only legally, but also historically, as part of the waterman tradition. Interestingly, historical geographic knowledge appears to support the personal and social identities of some of the stakeholders.

Environmentalists and scientists have commonly mapped certain relevant physical features, such as where submerged aquatic vegetation (SAV) has or has not grown, and the status and priority of restoration projects. They commonly use such background information for planning, assessing, and other related functions. For their work, attention to temporality is particularly important in a location where a) there has been a

considerable amount of damage in the past, and b) the environment has a propensity to change abruptly and massively.

To the second point, being a coastal site in a climatically dynamic location means commonly rapid and significant change to the Lynnhaven landscape. As one environmentalist said, "...the Lynnhaven is a living system. That's a very tough thing. It is a dynamic, coastal system. The day-to-day changes are pretty incredible at times. Having a more informed public as a whole would be helpful."

Returning to SAV, oyster cultivation is not permitted on sites where there is SAV, as SAV is protected. However, populations of SAV can be highly changeable. One interviewee tied to oyster cultivation provided these insights,

The SAV maps are sometimes controversial because SAV can be fickle. Sometimes, it might be there, sometimes not. Sometimes SAV maps are recognized by VMRC and the public, but the problem comes in that SAV comes and goes. Last year there might have been a ton of grass on a sand bar; this year there might not be a single sprig of grass. Which is why VMRC has changed its policy so that they're looking back 5 years. It helps solidify whether an area is a true SAV bed. Maybe it only showed up once in 10 years, in which case it's usable by industry. It's not a regularly occurring SAV bed.

Admittedly, it takes considerable resources to map SAV, or to map in general. While regular updating of maps would be highly helpful, there are clearly some constraints.

Frame Awareness

As suggested above, one way to mitigate negative framing effects is to ensure stakeholders are aware of the framing of maps being used and any anticipated impacts. In a way, this was seen in VMRC Engineering/Surveying Department's efforts to defuse the uproar among Lynnhaven homeowners described above in "Map Panic." In public

meetings the Engineering/Surveying Department head appeared to have calmed down some stakeholders after explaining the map and what the features on it meant, thus reducing fears about oysters dominating the river.

While the Lynnhaven oyster working group primarily used the VMRC oyster lease map in its conflict resolution efforts, a different working group that focused on restoration efforts expanded the framing of its maps by creating its own, more inclusive, tailored map products. This restoration working group consisted mostly of various government and academic offices (e.g., VIMS, USACE, NOAA) and engaged heavily with VMRC Engineering/ Surveying Department on oyster leases. This group developed a working environment that incorporated map products from various perspectives, knowledge bases, and collection efforts into its problem-solving process. An interviewee from the academic community described how this group used maps,

ACE made the maps. ACE interests are represented, or their work. They put on the reefs [on the maps]. Usually, we'll add our own oyster reefs onto it. I don't have one from Lynnhaven right now, but I have an example from Lafayette where we put our own oyster numbers onto their maps. So, sometimes we'll use their maps and use our own sampling results to put onto their maps. I believe we have [used additional maps] but I can't think of a specific example, though. We do use VMRC maps for work on looking at different dredge sites. We made our own GIS maps but we also initially used their geological report. We actually had some maps made from a consulting firm.

Thus, according to this interviewee, this group was able to mitigate potentially problematic framing by gathering data from various sources and collectively choosing which data were appropriate for the group and its needs. Also implied is that the stakeholders had a general understanding of the data and were able to navigate the

construction and use of the maps accordingly. Another government interviewee also stressed the geospatial collaboration in the restoration working group environment,

Sometimes the maps we create with the Lynnhaven oyster restoration working group are supposed to represent all our interests. We have a conference call and go around and ask, “Do you agree?” from each organization... NOAA, VIMS, CBF, ACE, VMRC, that everyone agrees with the information. That usually sets the restoration project. Is it viable? Is it possible? We use the map for that, agree on it. That product is a multiple stakeholder product.

Of course, to say the working group used a relatively diverse set of geospatial products with the specified purpose of avoiding framing problems is an oversimplification. They used what they used in order to answer their own questions. And for most of those offices or organizations, mapping was already a function they performed or otherwise acquired. Additionally, they were all primarily scientists, looking at solving problems through scientific means, so data sharing, geospatial or otherwise, was the norm. The key point, though, is that framing problems appeared, and appeared more problematic, in the Lynnhaven oyster working group environment, as well as between homeowners and watermen trying to engage with VMRC and each other, over a map that did not adequately reflect all of the relevant viewpoints, concerns, and interests.

Conclusion

As suggested above, arguably the most significant lesson observed from this research is that mapping can have a significant role in influencing conflict stakeholders' framing of a conflict. In this case the use of the VMRC oyster lease map largely restricted the focus to oyster lease information. Regarding oyster lease management, this was entirely appropriate. However, regarding conflict resolution between various

stakeholders, use of this map framed the conflict in a rather one-dimensional manner. In other words the location and status of oyster leases only partly addressed the interests of some stakeholders, particularly homeowners, who were not able to adequately understand the information for themselves, let alone effectively lobby for their interests. They developed a distorted view of the landscape, i.e. they visualized waterways entirely filled with aquaculture cages. Meanwhile, many of their concerns, such as impact of containerized aquaculture on viewsheds, water navigation and sports, were not officially, systematically, or otherwise meaningfully incorporated into the legitimate geospatial discourse of the group. Thus, it is important to critically consider how maps are being presented and used for conflict resolution. Such evaluation may determine that an unhelpful, counterproductive, or even damaging framing might negatively affect a conflict resolution effort.

6. COMPARATIVE INSIGHTS ON PERCEPTION OF LEGITIMACY OF STAKEHOLDER, INFORMATION, AND REPRESENTATION

Introduction

This research presented the opportunity to gain a considerable amount of insight into perceptions of legitimacy of maps/mapping in conflict resolution. The research results provide input to the literature and the theoretical framework discussed in the literature review (Chapter 2). This chapter summarizes the main lessons. It reviews major findings based on the three types of legitimacy proposed, i.e. legitimacy of stakeholder, legitimacy of information, and legitimacy of representation, and provides a comparative assessment of the two case studies.

First, there are significant shared traits between the two case studies. The case studies are geographically proximate, i.e. located in the Chesapeake Bay. Both are water-related, resource competition driven environmental conflicts. Furthermore, these case studies revolved around working group structures that were investigated through the same or similar means, particularly via interview, participant observation and document study.

Some important distinctions between the two cases were discovered upon analysis. For example, the Delmarva group was trying to create a geospatial product. The Lynnhaven group was not; it used the products provided by the group that convened it, i.e. VMRC. Second, in the Delmarva case, there was no community to consider beyond the working group at that point. As discussed above, the group thought it was developing the mass balance map largely as a communication tool with the public. In the Lynnhaven

case the public was already involved, and citizens were using the VMRC lease map in their individual and interest-based concerns. Third, there may have been some influence of group composition. The Delmarva mass balance working group was composed of stakeholders with various interests, as was the Lynnhaven working group. However, the Delmarva working group was composed of a higher number of people with scientific and/or technical backgrounds, which may have influenced their questioning of the legitimacy of data, maps, and other such materials.

Key insights were gathered that hold implications for conflict resolution. Both case studies appear to demonstrate that perceptions of legitimacy of both stakeholder and information do relate to conflict resolution. In both case studies, such linkages were found in fairly standard power relations, i.e. between government entities with mapping authority and other stakeholders. On the one hand, the Delmarva case displayed negative effects on the conflict resolution effort through perceived or real delegitimization of stakeholder and stakeholder information. Without information perceived as legitimate across the key stakeholders, the mass balance sub-group was not able to produce the analysis needed to support conflict resolution tasks, e.g., problem-solving, negotiated planning, etc.

On the other hand, the Lynnhaven case demonstrated relatively positive effects on conflict resolution through real or perceived legitimization of non-government stakeholders and their information through broader inclusion. Concerning legitimacy of representation, particularly the Lynnhaven case study showed how map framing can significantly affect a conflict resolution effort. It also provided a helpful example of

social interaction in an arguably ad hoc participatory mapping environment. Indeed, throughout all three types of legitimacy, the presence and impact of social relations on maps/mapping were found to be significant. Below is a chart that summarizes key aspects of the case studies.

Table 3: Case Study Comparison

	DELMARVA	LYNNHAVEN
Description of conflict	Conflict over impact of poultry production on the environment, particularly water quality	Multifaceted conflict over oyster cultivation, including land and water resource issues
Description of conflict resolution effort	Delmarva Land and Litter Challenge (DLLC), to include sub-working group tasked with assessing key nutrient mass balance to be used for group planning, problem-solving	Oyster conflict working group facilitated by Virginia Marine Resources Commission (VMRC) Engineering and Surveying Department; tasked with balancing stakeholder interests
Stakeholders	Poultry farmers, crop farmers, agricultural industry, environmental groups, state DOA and associated offices, including academic/research entities	Property owners, watermen, aquaculture industry, environmental groups, academic/ scientific entities, local, state and federal government
Maps and Mapping	Attempted mapped analysis of estimated location and impact of key nutrients associated with poultry production on Delmarva Peninsula	VMRC Engineering and Surveying Department run oyster lease GIS; associated products, including public online version
Map/Mapping Concerns	Poultry Farmers, Crop Farmers, Agricultural Industry, DOAs: Use of data supporting lower environmental impact assessment of poultry	Property owners: Representation of their interests; accuracy of data. Watermen, Aquaculture Industry: Accuracy of data supporting their claims.

	operations; data privacy. DOA: Additional concern to manage mass balance process. Environmentalists: Use of model input supporting higher environmental impact assessment of poultry operations; data transparency.	Environmental groups, Academic/Scientific Community: Accuracy of data; effective telling of the story/ correct representation. Local, State, Federal Government: Accuracy of data; map ownership. State gov't: Additional concern of reliability of map process. Federal government: Additional concern of appropriate representation.
Perceptions of Legitimacy of Maps/Mapping	Legitimacy of Stakeholder: Perceived marginalization of stakeholders. Legitimacy of Information: Attempt to produce nutrient mass balance assessment failed due to disagreement over data and information management. Legitimacy of Representation: N/A.	Legitimacy of Stakeholder: Wider perception of stakeholder inclusion. Legitimacy of Information: VMRC framing influenced conflict framing; inclusion and social engagement improved perception of legitimacy. Legitimacy of Representation: Online GIS increased interaction with the Engineering and Surveying Dept. and other stakeholders.
Key Outcomes	Perceived marginalization of environmentalists during mass balance project reduced perception of legitimacy of maps/mapping, resulting in a significant setback in the conflict resolution process.	Perceived inclusion of stakeholders in maps/mapping appears positively related to higher perception of legitimacy of maps/mapping in conflict resolution effort despite original framing that did not include key stakeholder information.

This chapter also provides insights on maps/mapping in conflict resolution writ large that would be worth examining beyond these two cases. Participants provided

thoughts on both benefits and problems associated with maps/mapping in conflict resolution related activities, including important concerns about map literacy. Participants provided recommendations for improving maps/mapping in conflict resolution. These recommendations were compiled into categories as follows: map design, map information, interactive maps, and resourcing of data collection. These recommendations are based on two cases and would merit consideration in the conflict resolution field more broadly. Finally, the concluding section segues into the dissertation concluding chapter.

Legitimacy of Stakeholder

This section focuses on findings gained concerning perceptions of legitimacy of stakeholder, the first of the three types of legitimacy from the theoretical framework. Each of the two case studies offered insights. As discussed below, aspects of power dynamics appear to have impacted sense of legitimacy of maps/mapping in both case studies, particularly as related to inclusion, resulting in negative influence on one and positive influence on the other of the conflict resolution efforts. Additionally, the relevance of social engagement regarding maps/mapping in conflict resolution was determined to be significant in both case studies.

Before the research began, perceptions of legitimacy of stakeholder were anticipated to relate to aspects of authority, power and power dynamics. Such concerns revolve around perceptions of who has the right to map, who has the authority to map, whose information is valid to include in maps, and other such considerations, as discussed in Chapter 1, “Introduction,” and Chapter 2, “Literature review.” At a certain

level it seems that the crux of the matter is that, as also discussed in the literature review, power projects meaning, e.g., values, agendas, narratives, messages. This research appears to provide some validation for such assertions. As discussed below, the case studies provided case-specific insights and nuances that enriched understanding of both how perceptions of legitimacy might develop, as well as how they might impact a conflict resolution effort.

Moreover, the two case studies presented an unexpected contrast in terms of perception of legitimacy of stakeholder. As discussed above, while political power has traditionally enjoyed the greater authority to map, in recent decades, that authority has been more often challenged. In the case studies examined for this research, such dynamics were apparent. In the Delmarva case, as discussed in Chapter 4, “Delmarva Case Study Overview,” stakeholders in the working group that had been convened to find consensus on the way ahead for handling chicken litter on the peninsula included: government agricultural departments, agri-industry, poultry farmers, crop farmers, and environmentalists. The DOA led the effort to develop the mass balance assessment that would be used by the group to plan the process. The fact that the project was primarily spearheaded by the government elements, with certain stakeholders being brought in only later (i.e. environmentalists) played a strong role in why the DOAs’ products were used. However, as will be seen in the next section on legitimacy of information, there was also the significant issue that the government agencies relied on data that others could not legally access, thus drastically reducing the transparency of the process and product. Furthermore, the government leads conducted the analysis primarily using a

methodological approach that was seen by some to unfairly support DOA interests to the detriment of other stakeholders' interests. In other words, the approach taken was commonly criticized by environmentalists as more favorable towards agriculture and not adequately protective of the environment.

This combination of circumstances resulted in part of the group (primarily agricultural stakeholders) being far more comfortable with trusting the DOA's professional judgment and experience in producing an appropriate product, while others (particularly environmentalists) questioned the legitimacy of the government agencies to produce such products unchallenged. This experience led some environmentalists to feel that they were delegitimized as stakeholders in the conflict resolution effort because they felt they were not adequately included in the mass balance project. As a result, the conflict resolution effort reached an impasse. This situation appears to be an apt example of delegitimization of stakeholders as conflict parties as a result of perceived preferential treatment of certain parties in mapping.

The second case study, concerning Lynnhaven oyster management, offered a different set of dynamics in a similar set of relations, i.e. an environmental conflict resolution effort with a strong government lead. As discussed above in Chapter 5, "Lynnhaven Case Study Overview," the VMRC Engineering/Surveying Department was the government authority responsible for managing and mapping oyster leases. It provided an online version of its GIS to the public, and it also primarily used its own map products during efforts at conflict resolution among stakeholders. Various stakeholders took issue with the map. However, it appears that because VMRC allowed stakeholders

to present their own data, and even incorporated their data where possible, there was a greater sense of inclusion among stakeholders that at least ensured continuance of the dialogue. This dynamic seems to demonstrate that greater sense of legitimacy among stakeholders, particularly between government and others, existed at least in part due to the fact that various stakeholders were allowed to participate in the mapping process. This inclusion in the mapping process seems to support higher levels of perception of legitimacy of stakeholder, which supports higher levels (or continuance) of dialogue.

This leads to a related point. As discussed in Chapter 2, there has been considerable debate in the literature about whether participatory mapping helps or hurts in conflict resolution. As discussed, some literature asserts the increase in mutual learning, mutual understanding, and empathy among stakeholders, e.g., Kyem (2004), Klug (2012), while others discuss potential negative effects, as well as the impact of the political and/or socio-economic environment surrounding a case (e.g., Reyes-Garcia et al. 2012). This research indicates that the perceptions of legitimacy among stakeholders based on their experience of interaction in the mapping process can have an impact, either positive or negative, on a conflict resolution effort, as demonstrated by findings from these two case studies.

In fact, the importance of interaction among stakeholders concerning maps/mapping in conflict resolution, particularly as it relates to perception of legitimacy of stakeholder, appears to be one of the most important lessons learned in this research. The significance is not only that powers and/or those with primary authority to map allow others to participate. Nor is it only the sense of inclusion that stakeholders perceive, thus

compelling them to participate, or to participate more genuinely, in conflict resolution efforts. It is also the act of social engagement itself, facilitated through participatory mapping, that can be very important for the conflict resolution effort.

Concerning participatory mapping, aside from leveling the playing field, i.e. trying not to reproduce social inequalities through the mapping aspect of the effort (e.g., Bourgoin et al. 2012), Zhang and Fung (2013), there is also the improved potential for what Bryan (2011) recognizes as the transformation of relations and ability to effect change. In conflict resolution efforts where participatory mapping may be appropriate, this equates to the ability to have discussion, debate, information sharing, trust building, i.e. interaction. In fact, during this research one interviewee had this to say, “So, I think maps can be very helpful in starting a conversation. They can be helpful in being a visual in educating people. And then, depending on what data is included, they can be helpful in looking at solutions and identifying where problems are.” They go on to add,

It doesn't go well when you just give people a map. You should have a discussion. Where did the information come from? What sources were used? Those types of conversations are important for better understanding the map and also to create that exchange of information both ways. Does this map answer the questions? Does someone else have information that should have been included? ...there is a social aspect.

However, in order for such valuable engagement to occur, three things have to happen. First, stakeholders have to be allowed and/or empowered to interact in the geospatial environment. Second, they have to see it as important to do so. This leads to the third point, that stakeholders must have an adequate mastery of map literacy to represent themselves and lobby for their interests. More on such interaction in mapping

will be further discussed below, both in the section “Legitimacy of Information” and particularly in “Legitimacy of Representation.”

Legitimacy of Information

This section focuses on findings gained concerning perceptions of legitimacy of information, the second of the three types of legitimacy from the theoretical framework. The main insights on legitimacy of information relate to the observed impact of social components of knowledge management on perceptions of legitimacy of maps/mapping. Framing in terms of boundary groups and objects and ways of knowing (WoK) uncovered how perception of legitimacy of maps/mapping was affected in both case studies. Aspects of power played a role in legitimacy of information through differential treatment of information. The process of information exchange was seen to be highly important to perception of legitimacy of maps/mapping as associated with conflict resolution in both case studies.

As discussed in Chapter 2, sense of legitimacy of information connects primarily to 1) perceptions of relevance, validity and correctness of information, and 2) the social dynamics of map information management (e.g., Elwood and Leszczynski 2013; McCall 2003). For this research, the case studies offered pertinent insight. As has been discussed in Chapter 4, the Delmarva case study presented a situation of considerable conflict concerning data. First, the environmental camp questioned the data used for the mass balance project in large part because it was not accessible to them at the scale they felt they needed it, i.e. property-scale rather than county-scale. They questioned the relevance

of the county-scale data, as they asserted that property-scale data would be more appropriate for understanding environmental dynamics, as discussed previously. Even more importantly, though, they had wanted access to the property-scale data in order to run and validate the mass balance models on their own. Additionally, the DOAs' refusal to use other than their version of the model parameters exacerbated the data disagreement. The "black box" situation left the environmentalists questioning both the data and the methodology. It also left them feeling disempowered in the mass balance project which was needed to support the Delmarva Land and Litter Challenge effort.

The social dynamics associated with map information management in the Delmarva case study are interesting and useful in understanding legitimacy of information in conflict resolution. Two concepts introduced in the literature review will be discussed here, i.e. boundary groups and objects, and Ways of Knowing (WoK). First, the mass balance subcommittee may be viewed as an example of a boundary group, where, as discussed in the literature review, representatives from respective groups engage to lobby for their own interests, but also to find common ground (e.g., Cutts et al. 2011; Lejano and Ingram 2009; Schut et al. 2013). Likewise, the mass balance map and report may be considered an attempt at a boundary object, an item developed and used by boundary groups to better communicate with each other, co-create knowledge, and create shared understanding.

An interesting point in the Delmarva case is that several interviewees expressed that they considered the mass balance map more of a product geared towards cultivating common understanding with the public than with each other. As noted in Chapter 4, that

assumption made the situation especially disconcerting, even dismaying, when they realized, quite late in the process, that they did not, in fact, agree on basic elements of this foundational tool, such as the assumptions and the methodology. As discussed previously, the environmental community was invited to the group later, after the group had already been working. It may have taken some time for these representatives to fully understand the dynamics of the group and the data. Ultimately, they were unwilling to accept the DOA's analysis without their own verification. They claimed to have tried to recreate the research results as best they could with the data the DOA provided but without the same outcome, further exacerbating mistrust, and leading to their walking away from the table.

As also discussed in the literature review, boundary group relationships influence, and are influenced by, the information shared between them. In the Delmarva case study it seems that the information not shared had the strongest influence on the relationship between the DOAs and the environmental side. Breaking it down a little more, this dynamic very much relates to what was described above as how structural relations, particularly ones involving power-based authority to map, can create or perpetuate environments of inclusion or exclusion. This does not necessarily mean (and in this case study I do not feel it means) certain parties are withholding or otherwise barring stakeholders from the mapping process for nefarious reasons. The most likely explanation for the information sharing dynamic between the DOAs and other parties relates to the traditional government authority to manage data and to map. As noted above in Chapter 4, several interviewees discussed how the DOAs felt that because they were the keepers

of proprietary data unable to be released to the public, including the mass balance subgroup, and because they were overall responsible on behalf of their state governments, the group should trust their “professional judgment” in terms of conducting the analysis. It seems important to recognize such dynamics in conflict resolution efforts so as to identify negative or unbalancing impacts that might arise as a result.

This leads to the related concept of Ways of Knowing (WoK), which also offers useful framing of the problem. WoK, as discussed above in Chapter 2, is an area of study that addresses how people acquire, comprehend, manage, exchange, value, and otherwise use information and create knowledge (Lejano and Ingram 2009). Understanding WoK associated with mapping offers useful insight into legitimacy issues. The Delmarva case study presents a situation where some stakeholders’ WoK conflicted, i.e. the DOAs and the environmentalists, with degraded perceptions of legitimacy of information (and stakeholder, as well) resulting. Both the DOA and the environmental stakeholders were represented by scientists. They generally shared certain characteristics of WoK, such as the scientific research process and the use of technology. They even agreed on the model for calculating the mass balance, as discussed above.

However, there were significant differences. The DOAs WoK reflected their narrative of authority to steward agricultural activities within their respective states. As such, and as facilitators for the mass balance project, they considered it their purview to select the methodology for the research. They chose to use county-scale data for two apparent reasons, i.e. because they could not legally share the property-scale data, and also because they felt county-scale was the appropriate operating scale to pursue their

goals and priorities as state managers. Indeed, and as noted above, the DOA focus on politically based mapping, i.e. by county, makes sense given their roles and responsibilities. In other words use of the county feature, i.e. a political unit (instead of the environmentalists' preferred focus on natural features), is intended to facilitate management.

On the other hand the environmentalists' WoK reflected their own narrative of professional scientific support for protecting the environment. Their WoK prioritized using the best data possible to study the environmental dynamics for the mass balance; thus, their interest in the much finer-scale property level data and natural features over political where relevant. When the DOAs would not permit the presentation of two different mass balance products to reflect the conflicting points of view concerning model assumptions, the environmentalists balked. They also resisted what they considered to be the DOA "black box" approach, which they justified by citing scientific standards of data sharing, transparency, and reproducibility of results. The most problematic difference between the two WoK was that the DOAs considered themselves, as government authorities, to have primacy of control over information, while the environmentalists insisted upon a more egalitarian knowledge management approach, which they justified through scientific tradition.

The Lynnhaven case study offers both a helpful contrast, as well as additional insight into perception of legitimacy of information. While the Delmarva case study presents an example of how a conflict resolution effort can become mired down in data legitimacy issues, the Lynnhaven case study provides one where there is more

information sharing, information co-creation, and meaning making. As with the Delmarva Land and Litter Challenge (DLLC) mass balance sub-committee, the Lynnhaven oyster working group served as a boundary group among the various stakeholder representatives. The stakeholder structure was roughly similar between the two case study working groups in that each was led and/or strongly influenced by state-level government entities with authority to manage data and to map, i.e. the DOAs for Delmarva and the Virginia Marine Resources Commission (VMRC) Engineer/ Surveying Department for Lynnhaven. As with Delmarva, environmentalists were among the stakeholders of the Lynnhaven oyster working group, which also included homeowners and various types of oyster cultivators, somewhat on par with the assorted agricultural stakeholders in the Delmarva case study. Scientists supporting various perspectives were also central to the effort.

The VMRC online oyster lease GIS was intended to serve as a boundary object. However, it turned into a different type of boundary object in ways not anticipated. Its primary original purpose was to inform the public about the status of current and potential oyster leases and applications. As discussed above in Chapter 5, although the previous, primarily in-shop oyster lease information process had generated engagement, including conflict, interaction among stakeholders (e.g., between citizens and government, between homeowners and oyster lease applicants) increased exponentially with the posting of this product. More about the topic of GIS participation will be discussed below under “Legitimacy of Representation,” as this case study offered a

considerable amount of insight in this area, whereas the Delmarva case study did not, as such a product was not successfully developed during the research timeframe.

Concerning Ways of Knowing (WoK), as with the Delmarva case study, there were significant differences in WoK among the Lynnhaven stakeholders, as well. However, there was a more inclusive knowledge management environment in the Lynnhaven case, which appears to have led to greater overall perception of legitimacy of data. As addressed in Chapter 5, the VMRC Engineering/Surveying Department allowed inclusion of other stakeholders' data during various meetings and events, as well as in the online GIS, where possible. The department mission was based on its roles and responsibilities to map and manage oyster leases. In this regard it resembled the mission of the Delmarva DOAs, i.e. to manage agriculture. However, a large difference lay in that the Engineering/Surveying Department considered it a significant part of its mission to engage in information exchange with citizens and other entities, both in terms of explaining government data as well as including others' data where appropriate and possible. One interviewee from VMRC comments,

The more the public can see how these [leases] are being managed, the better. They [maps/GIS] are for all citizens who have interests in it. For us, they're used for technical, operational purposes. These are public trust lands. We have been charged to manage these for the people of the Commonwealth.

They go on to add, "The public has more information than they ever had to inquire, make opinions. They [online maps] give an opportunity to have a voice. They [people] may still not like the final answer. But at least they can find out in a timely manner and can voice their opinion."

Voicing this opinion often took the form of citizens providing their own information. This included, but was not limited to, maps, sketches, and photographs, as discussed above in Chapter 5. Through its relatively open view to including, rather than excluding, such data, the VMRC Engineering/Surveying Department enabled information exchange despite the traditional hierarchy that can, and has elsewhere, led to problematic information flow. This is an example of the “epistemic break” discussed above in the literature review, an evolution from one-way information provision (i.e. government to others) to co-production of knowledge. In the Lynnhaven case study, such an exchange appears to have contributed to a higher degree of perception of legitimacy of data between government and other stakeholders. This is largely because the dynamics allowed for more inclusive social interaction and the means for stakeholders to validate the relevance, validity, and correctness of each other’s information.

Legitimacy of Representation

This section focuses on findings gained concerning perceptions of legitimacy of representation, the third of the three types of perceptions of legitimacy from the theoretical framework. Perception of legitimacy of representation refers to confidence that the map product itself, and the use of it, is appropriate for telling the story or stories needed to be presented to support the conflict resolution effort. Two relevant areas were noteworthy in this research: framing and participatory GIS (PGIS). It is important to note that most of the insight into this aspect of legitimacy in maps/mapping was found in the Lynnhaven case study. As previously discussed, this is because the Delmarva case study

did not accomplish a map during the timeframe of this research. However, ample insight was gained from the Lynnhaven case study, particularly regarding how a map's framing can influence the direction of a conflict resolution effort, as well as the significance of social interaction in maps/mapping supporting a conflict resolution effort.

Framing was discussed extensively above in Chapter 5. As argued in Carton and Thissen (2009), framing in maps can be quite influential in the messages and narratives they convey, whether purposefully or inadvertently. In the Lynnhaven case the VMRC Engineering/Surveying Department GIS framed the situation as an oyster lease management problem. Given the Department's role, it was. However, the GIS and derived products were used for more than that, e.g., community information, citizen engagement, conflict resolution. The rather specific framing had some unexpected and undesired effects. First, it compelled users to visualize the environment and context in the manner that the VMRC did, i.e. a landscape of oyster leases. Consequently, there was misunderstanding among some stakeholders, particularly homeowners, who thought that the entire Lynnhaven River was, or would soon be, filled with oyster cultivation, as described above in Chapter 5's "Mass Panic." Moreover, also because of the oyster lease framing, homeowners were not able to visualize all that was important to them, such as viewsheds from their homes because such data were not included in the oyster lease GIS. It could be argued that the combined effect reduced the ability to think case by case in terms of compromise. Instead of looking for possible solutions, a sort of binary "oyster lease" or "no oyster lease" framing seems to have encouraged homeowners to push back against leases instead of trying to see what the situation really was or would be for them.

For example, were oysters actually being cultivated in a space of concern? Was or would the view truly be impacted? Would there really be an obstacle to boat traffic or other activities?

As discussed in Chapter 5, these last points and questions did often arise in talks between stakeholders and at community engagements, particularly with VMRC Engineering/ Surveying Department representatives. Also as discussed, some stakeholders provided their own information to help argue their cases, for example photos of views from their homes, or sketch maps noting areas of heavy water activities. Such augmentations could be viewed as attempts to support the reframing of the problem, and the map products, e.g., from one of oyster leases to one of oyster leases and their impacts on homeowners. In other words, by including sketches, photos, and other maps in the conflict resolution dialogue where an official map was used, both the government map and other stakeholders' supplemented engagement with the map, if not actual modification to said map, achieved some validation seemingly purely through interaction.

Indeed, such social interaction is important for perception of legitimacy in conflict resolution, as has been argued above. Map representation can either support or weaken such perception. The literature review discussed lack of agreement over the relationship between participatory geographic information systems (PGIS) and conflict, i.e. does it help, does it hurt, or does it depend. This research offers a few points in this regard. First, as the Lynnhaven case study demonstrated, any GIS can be “participatory” if one allows it to be. By permitting stakeholder involvement and data inclusion at community

outreach, problem-solving meetings, and other engagements, the VMRC

Engineering/Surveying Department somewhat transformed its GIS into a PGIS.

Second, map representation fosters such interaction through its level of interactivity, i.e. stakeholders' ability to interact with it, and to interact with each other using it. One interviewee from the Lynnhaven NGO community commented,

We need to be getting a better idea where people think a conflict exists and where it is perceived to exist. It would be great to put a map on a screen and someone could go up with a pointer and point to one's own channel, where they boat, the path where their kids use jet skis. Add additional information where the conflicts really are. Generally, there's conflict in Lynnhaven. Is it mostly in the east branch, west branch? etc. I could say, "I think this," but I think it would be helpful for people to be able to go up and say, "This is the area that concerns me."

They asserted, "I think the biggest thing...interactiveness would be the biggest thing in moving forward in these types of user issues."

The representation that this interviewee is describing would not necessarily need to be technologically advanced or highly engineered. The key piece is that stakeholders are able to effectively use it in voicing their interests and concerns. This means that their information must be permitted and included, and that they understand the map well enough to be able to use it successfully.

Insights on Maps/Mapping and Conflict Resolution

Interviewees across both case studies provided a wealth of information, insights, perceptions, and ideas that extended beyond the parameters of the interview questions. In other words, while the interview questions asked participants only about map use in the specific case studies, several participants discussed maps and map use in a broader,

general context. Many of the interviewees related their comments to their own experience with maps in conflict resolution.

First, several participants commented that maps can help with conflict resolution related activities. Several participants (sometimes the same ones commenting on their value) also noted that maps can be unhelpful or even harmful during conflict resolution related activities. This suggests a broader level of awareness about pros and cons that might be used to inform map use in conflict resolution. The main topics gathered and presented below include: the value of maps in conflict resolution related activities, some problems associated with maps, and map literacy. Please note that the below reflects often spontaneous insights provided by interviewees; it is not a comprehensive study of these topics.

Some Benefits of Maps in Conflict Resolution Related Activities

While it is not surprising that there is an appreciation for the value of maps in conflict resolution in the field of geography, there does not appear to be the same widespread conclusion in the field of conflict resolution. Thus, input on this issue from conflict cases may be helpful. Indeed, several stakeholders noted the benefit of maps in conflict resolution during their interviews. An environmentalist from the Delmarva case noted, “So, what we do is we use science and I view maps as a gateway to science. So, a lot of people say, ‘My field doesn’t drain into the water.’ And I say, ‘Prove it.’ And they say they can’t, and so I show a map that shows that it does.” This quote demonstrates a

situation where an environmentalist used maps (and the science behind them) to communicate and lobby for their cause with other parties.

Other stakeholders also noted the utility of maps in communicating and understanding information. Another Delmarva interviewee commented, “Maps are really important as visualization tools to help people understand and learn and take in large datasets. Seeing maps is more powerful than looking at data sheets. We can see how this data has changed over time.” Another Delmarva interviewee seemed to concur, “Generally, I think people respond easiest to complicated information if it’s presented visually. It’s more digestible.” A federal mapper in the Delmarva case provided a unique and valuable insight into how maps can be used to help conflict parties gain proper perspective. In this case (unrelated to the Delmarva case studied in this research), a farming community came to the realization that they were contributing more pollution than they had realized.

...we developed a relationship with the community and by the end of 3 years of investigation they began to realize they were the most intense source of pollution. And the response of one was, “I should have known.” As stewards of the land, he felt badly. And it’s only by comparison that they understood that. By using images and maps that when you’re in the middle of a hotspot, you may not know you are there because everything around you looks the same.

This insight is valuable in that it shows how maps can be effective in helping parties achieve perspective concerning their place in and contribution to a conflict. In this case the federal mapper essentially pulled this farming community up to a broader view – literally.

One Lynnhaven environmentalist found maps to be helpful for both general communication as well as problem-solving purposes. Here, they noted citizen response to

maps during the Lynnhaven case, "...in public hearings people who come into second or third meetings could instantly see why people were concerned and why they contested." They also noted the utility of maps in creating different scenarios "that might work for coming to agreement on some of these agreements."

A Delmarva agricultural community member valued maps as a way to initiate interaction over an issue, "They [maps] at least provide a central starting point for discussion. Whether one or another person agrees is another thing, but it is a start for people to hash out the topic of the day." Thus, stakeholders expressed that maps are valuable for lobbying, problem-solving, communicating large amounts of spatial data, and for providing on-the-ground perspective.

Some Problems with Maps in Conflict Resolution Related Activities

On the other hand, research participants also noted problems working with maps. Some interviewees noted that rapidly changing environments can create legitimacy problems for map use in conflict resolution efforts. Such situations happen primarily as a result of an inability to maintain updated maps that reflect the rapidly changing reality. Both Delmarva and Lynnhaven were described by stakeholders as either dynamic or having changed considerably, or both. A VMRC representative described issues associated with the differences between the original maps developed in the 1890s (i.e. Baylor's Survey) and now, "...topography has changed, creeks opened, closed, moved. Baylor's work was very good, but Mother Nature has been very cruel to parts of it." A Delmarva state interviewee described similarly, "There's a lot of change. It's faster

change now. A lot of maps get out of date quickly because of the rapidity of change.”

Another Delmarva state interviewee described how maps can be contested under such circumstances. In this case, poultry inventory, important for (among other things) correct understanding of the mass balance of poultry litter, was questioned,

If you were to present data about chickens in Sussex and presented it with dots, there could be a case where someone very familiar with the area could refute that map because there is a constant turnover of chicken houses in that area. The environment changes a lot. In an aerial map the roofs would be gone but would still show up on the map although they’ve been gone for 30 years. These are not valid data points in today’s world.

The above comments demonstrate an understanding that the legitimacy of maps in changed or changing environments is often questioned, for good reason. However, there is an important distinction to be made between lagging maps and ones where information is misrepresented. Lagging maps is commonly a resource issue, although it could be argued that lack of updated information may reflect lack of priority and, therefore, might be considered misrepresentation in itself.

Thus, while stakeholders described the usefulness of maps, they also described how maps can be detrimental, or at least problematic. Indeed, there appeared to be a widespread interest across the interviewees regarding miscommunication and misunderstanding associated with maps. Unsurprisingly, considerable discussion revolved around data and presentation of data. This Delmarva interviewee noted, “The map, or any visual representation, is only as good as the data. It can't come off as too biased. Like, where did it come from? This process is truly based on trust, which is truly unusual here, like identifying issues that all agree on, and come up with consensus for those.” This Delmarva-associated academic asserted, “So, if it’s a case of someone

putting a map out there, like ‘I think there’s this many fields of whatever,’ or how many poultry houses, if it can’t be substantiated, then it’s not the right map. We need it to be substantiated in fact.”

Bias was expressed as playing a large role in map/mapping legitimacy. This Delmarva environmentalist asserted, “People make maps for info graphics to support their position. So, environment will make maps showing where pollution is. And [Department of Agriculture] will show where pollution isn’t.” Thus, map legitimacy, and perception of legitimacy, starts with data choice, i.e. what data to include on the map. This Delmarva interviewee described the relationship between bias, data source and use, and perception of legitimacy,

I think it's all about the source of where it's [data] coming from, such as bias in collection or choice of data being used. It's hard to find a neutral source of data. Looking at the poultry industry, DPI [Delmarva Poultry Industry], collecting and sharing information about industry, environmental groups engaged in various dimensions of water quality, air quality, runoff and stormwater. There's all sorts of sources. And there's suspicions about how it's collected and analyzed. Depends on what side of the fence they're on. And then there's federal, which has the Chesapeake Bay Watershed Agreement. It's led by the EPA, so it's broadly trusted. There's still some concern from the poultry industry. Still, it's viewed as reliable. And there's agricultural census data from USDA.

Here, “data source” not only means what data are used; it also signifies how the data are collected, as well as how the information is processed, organized and presented. An interesting related side note concerning the above quote is how readily, and without prompting, the interviewee ran through their own index of legitimate data sources.

Somewhat conversely, one Delmarva environmentalist tied perception of legitimacy of maps/mapping not to what is portrayed, but to what is not portrayed,

Everyone assumes maps are legitimate. No one has questioned the legitimacy of a map ever. When I say legitimacy, I'm saying the location of the lines, features, content. People question what's off the map. Did we leave something out from what's displayed. That's what strengthens the argument of what is put on the map. They question what's listed. [When asked for an example:] Let's say they show a map of where soil tests are hot with phosphorus, but they leave off where the chicken houses are. Or where water is polluted but not where the permits are to discharge pollution. Those types of things.

This is somewhat of an elaboration on the above quote, "...environment[alists] will make maps showing where pollution is. And DOA will show where pollution isn't." What is particularly significant is that Harley's (1989) "silences and secrecies" in maps (i.e. that there is a lot of meaning – and power – tied to what is not shown) is more broadly and experientially understood than by critical geographers alone.

Also, interestingly, in addition to the bias of the map maker, as discussed above, there is also bias of the map reader. Such bias can play a large role in how maps are interpreted and legitimized. This Delmarva environmentalist commented,

It's like, do you watch Fox or MSNBC? We all have to evaluate the credibility of maps like anything else. If Farm Bureau sends me a map, I tend to think Chesapeake Commons is more credible. [When asked, "Do people question maps?"] ... I don't know. Certainly, some do. Many have more sophisticated understanding of them than I do. But a lot of people are like with general news and listen to what they agree with and tune out the rest.

Beyond where data comes from, how data is processed and then displayed is also important. A Delmarva state representative provided an example that incorporated what they considered to be both problematic data source and display. First, they questioned the science behind the ammonia data collection. Second, they criticized as inappropriate the method used to display air pollution.

Historically, they've [maps] lent a lot of credence to pollution coming from chickens. The maps of density helped to understand that this is a very real source of pollution. The utility of the maps is behind us. So, when maps are produced with new data, I think that there's an opportunity to use maps to push an agenda. And I think that opportunity is pretty attractive to activists. So, we see a lot of crummy maps. One hot topic is air pollution. So, you know chicken industry is full of ammonia. Ammonia is a noxious gas. But you can stand in a chicken house and breathe and survive but it would be bad for chickens, too, so farmers are not managing their farms that way. There's been at least one study that tried to measure ammonia in the air near chicken houses, but away from them. But that doesn't lend well to understanding airsheds. They developed a heat map of ammonia. There were two things wrong. First, it actually proved their hypothesis wrong and said pollution was coming from the urban center, which I could have told them. And there is a problem with these types of maps for air pollution. When you are producing these maps with discrete points and then interpolating these points, there's a lot of different ways to do that. Rasterizing will produce different results than representing hot spots as diffuse sources, i.e. concentric colors around a point than if all those discrete sources were rasterized. The whole thing is disingenuous as to how airsheds work. It (air) is a fluid, so things that affect fluids are governed by fluid dynamics. I don't see the point of using discrete points on a heat map. Why even use a map? Just put the data on a.... (sigh).

While this example is rather long, it is valuable to include because the speaker provided a considerable amount of good insight. They started by admitting that maps have played a strong role in legitimizing the concept of poultry-related pollution. They delegitimized environmental activists by commenting that their lobbying via maps has resulted in many "crummy" maps. They then provided a quasi-technical explanation as to why the maps have been wrong, as discussed before the quote, i.e. problems associated with both the scientific process of the air testing as well as the method of displaying the data. They ended with a sigh of apparent frustration. The frustration towards the environmental community was palpable.

However, to their unfinished comment, "Why even use a map? Just put the data on a... (sigh)," they suggested that tabular (i.e. raw) data may sometimes be preferable to

developing a map, especially if there are concerns about how data are displayed. Below describes further how a map might be made to mislead,

...people can accuse of misrepresentation. Tabular data is harder to misrepresent. I've been frustrated by misrepresentation. You show a map that shows relative [...] distribution and use varying shades of color. The scale for which those colors are being applied is very easy to misinterpret, even not notice. So, you might think of relative effectiveness as 0 to 100% and you would probably expect 0 to be blue up to varying shades of red up to 100%. ...frequently we're presented with very binary maps that I consider use an inappropriate assignment of colors from 0 to max value. To the untrained eye that is a staggering image. They think, "I need to put focus here and here (for example, effort, money) and I can ignore pollution controls everywhere else to get the best efficiency. This is one example of misleading maps where I think tabular info would be more ethical. Should not be arbitrarily assigning color to a number or category.

The main point here is that the way information is organized and represented on a map can be done to present a rather black and white picture (literally and figuratively) that can inappropriately shape perceptions and guide decisions, as discussed above in the literature review. It is interesting that this interviewee suggested putting the data in a table rather than trying to find a more appropriate means of display on the map, for example an organization of the data that produces a less dramatic, more realistic portrayal of the information (i.e. different classification methodology).

Another form of problematic mapping was described as the fusing of good and bad information, e.g., truthful and untruthful, accurate and inaccurate, fact and opinion. The concern is that the viewer might inadvertently place their confidence in a map based on recognition of some of the data to be true. This Delmarva state interviewee explained in this way,

A bad map can do more damage than a good map [can do good] in my opinion because maps - and I'm not a sociologist - because maps lend a sense of credibility... because a lot of maps have included boundaries and overhead

imagery and when combined with [other] data, they can juxtapose obviously good information with perhaps questionable science and results. Everybody can agree that Delaware, Virginia, and Maryland share an area called Delmarva. Now you have this good information overlaid with data that may not be valid scientifically.

As an important side-note, a particularly interesting comment in this quote is, "...maps lend a sense of credibility...." When coupled with the preceding phrase, "I'm not a sociologist," it seems that the recognition of the social aspect of communication through maps is broader than the realm of geography specialists.

An interviewee from the Delmarva agricultural industry further elaborated on the problem of mixing "good" and "bad" data in maps/mapping, especially as it relates to perception of legitimacy,

...information breakdown... a legitimate map effort is plugged into a model to create another map but this information in the model might not be as accurate, vetted, or transparent as in the first map and this can create contention. Like USGS land use data and plugging [it] into a nutrient loading model. You'll see the eastern shore light up bright red for nutrient contribution. I don't think anyone is saying that agriculture isn't contributing nutrient load to the Bay. But lack of transparency and overgeneralization of information included in many of the models can lead to a legitimate map, when overlaid with model information, to be perceived as illegitimate.

Lack of transparency has been discussed elsewhere in this research. It was first associated with the intricacies of technology in the literature review. It was later addressed as a significant issue in the Delmarva case, but not so much as a problem of technology as information control. Altogether, transparency appears not to be an issue for all, but it is an issue for many. This may be tied to map literacy, addressed next.

However, first to conclude this section by recapping, several interviewees commented on some significant positives and negatives of map use as associated with conflict resolution. They commonly agreed on ease of communication and visualization

as positives associated with maps. However, they warned that aspects of data, e.g., source, inclusion, exclusion, portrayal, manipulation, etc., enabled the creation of maps that could intentionally or unintentionally portray an incorrect picture of reality or elicit a certain interpretation of it.

Map Literacy

This leads to the topic of map literacy, the ability to read and understand maps, although it was rarely called such in the interviews, likely due to the term's usage primarily in certain fields, particularly geography. However, map literacy is very important to perceptions of legitimacy of maps/mapping in conflict resolution, as discussed above in the literature review. Indeed, map literacy appears to have played a role in both acceptance of the use of maps and how maps were interpreted in both the Delmarva and the Lynnhaven case studies. For example, this interviewee from the Delmarva agricultural industry community suggested that the farmers they worked with exhibited a high degree of map literacy,

Farmers use maps a lot, whether it's yield mapping or variable rate seeding or hydrology or overlay on top of each other. There's a lot of faith in mapping. Farmers view maps for Bay issues in a positive light because whoever is making it is viewed as impartial. The agricultural community sees maps to accurately tell the story, whether we like the outcome or not. I think the agricultural community has been good about accepting the outcomes of mapping efforts. So, even if the outcome tells us that what we've been saying is wrong, if it's done in a statistically valid way, they're willing to accept those results.

The interviewee implied map literacy by asserting that the farmers accepted the outcome of maps, even if counter to their original opinions, as long as they were "done in a statistically valid way." There is more to appropriate mapping than statistics but this

term appears to have been used as a proxy for what is correct in a map. It seems reasonable to make this assumption, given that the particular interviewee had a solid education in mapping. This interviewee was not alone in noting that farmers are skilled and “comfortable” using maps because “they do it all the time.” For example and to remind, there was a story cited above where a farming community finally accepted a countering outside voice’s assertion that they were the source of pollution in the area through the use of maps.

However, participants also noted a concern about what was described as a common blind trust in maps. As a Lynnhaven VMRC interviewee noted, “Most people believe maps because people have grown up believing maps are accurate.” A Lynnhaven government representative asserted this about the maps they provided,

A lot of people assume maps are a final determination. But they are not 100% accurate. They are a representation. They are not accurate enough to use in the court of law. And not 100% of the time. That’s the way even on land. Hydrographic is even more so, as it’s constantly changing.

It is important to note that these comments were about the particular map that interviewee provided, not all maps. Certainly, other maps may be usable in court, for example. This Delmarva state government interviewee described map literacy. It is interesting that they noted that map literacy issues are not limited to laypeople,

I think people who are less map literate can easily come away with the wrong impression from a map that's portraying an illegitimate way. Map literacy would push against that. I do it all the time. I think that some map less-literate people would be confounded by a map that shows something against their tacit knowledge. And then there are those who might be very influenced by bad information and be poorly informed as a result. I have a guy who is scientifically very literate, and he's been confounded by poor maps. I had to explain that the scale used for pollution is incorrect.

This is an important consideration for conflict resolution, i.e. that lack of map literacy can cause people to misread what might be fundamental tools in a conflict resolution effort. This could potentially lead to miscommunication, misunderstanding and other problems during the conflict resolution effort.

To conclude this section, the interviewees collectively provided perspectives that connoted recognition that both map providers and map users have impact on the function of maps in conflict resolution. They explained this in terms of how maps are created, presented, and received. They noted perceptions of legitimacy concerning the three types identified in the theoretical framework, i.e. stakeholder, information, and representation, with legitimacy of information appearing to be the one of most concern to them, or at least the most discussed. In all, these interviewees provided a helpful snapshot, albeit partial, of how some people involved in conflict resolution cases view the utility of maps/mapping, as well as broadly described impactful dynamics between stakeholders producing, providing, and using maps.

Participant Recommendations

The stakeholders additionally provided a variety of recommendations for maps/mapping in conflict resolution, some general, others based on their experience with the Delmarva or Lynnhaven conflict cases. Such recommendations ranged from establishing map standards to an assortment of data considerations to dealing with resource shortfalls. The main ones are presented below. They include map design, map information, interactive maps, and resourcing data collection.

Map Design

Some recommendations focused on map design, to include standards, layout and other properties. This Delmarva state government interviewee focused on standards when asked about what could be improved in maps/mapping for conflict resolution,

...certainly a more centralized set of standards has been done in other scientific arenas. That's an opportunity but a pretty big hurdle. And I wouldn't want to be involved. [When asked why not] It would be a very tedious thing to do and frankly, you know, it's not really worth my effort [laughs]. I don't consider myself a map expert, so I wouldn't be an effective communicator for those standards.

It is interesting that they acknowledged the need for improved standards but did not want to take part in effecting such a change. However, standardization would, in theory, help alleviate transparency concerns and some of the data evaluation issues.

Several interviewees specified a need for improved map design. This Delmarva USGS representative provided an excellent point in that they wished funding could be available to help develop maps and standards for maps that would help in more effective communication,

Our job is to take science and communicate it, and so in that sense we're not a map generation group. So, when we make maps, it's part of our communication tools, which is kind of different from other parts of USGS, where their job is to make maps. Our goal is to create the color schemes, class schemes, gradients, base that help best communicate the data that we've generated so we can describe what's happening across the watershed. We've tried to do that in some of the best ways possible. Sometimes that means test marketing. And we've failed before. We'll create a map that we think is the best thing since sliced bread, and we'll try to convey what we think should be conveyed. And when the audience doesn't respond with the understanding we expected, we go back to the drawing board. [When asked how they know how to do this]: Just experience based. It would be neat to have a team of experts in that stuff. It's really, really, really hard for me as a senior manager to steer people to graphics that communicate versus communicate with ones that don't. Maps are another form of graphic. Scientists tend to try to put more information on a map than people can ingest at any one time.

It is interesting that they mentioned that they put sizable effort into trying to better the communication capability of their maps. This Delmarva state representative noted that more training on how to better communicate with maps would be helpful so as to avoid miscommunication,

People can grasp concepts quicker through visualization but they also can be misled through how maps are presented. So, they should be both simple but not misconstruing the intent of the message, either. [When asked how they learned how to do that]: experience. Training would be great. There's not often too much state budget money for this. A lot has just been learning on the job and experience as to how people respond. It's evolving.

It is noteworthy that these government employees, i.e. the ones with the authority to map that has been discussed at considerable length above, admitted they are struggling with how to better make maps for the benefit of usability, particularly by their citizenry.

Map Information

Several interviewees expressed the need to include more information on the maps. This does not mean greater volume of data, but information from more sources as relevant for the purpose of the map. A Lynnhaven environmentalist commented about the lack of such data on the maps used in their situation, "Different people will want to see different things on the maps. We're probably not at a point where all those different things are being mapped." Another Lynnhaven environmentalist noted that the maps used did not meet the needs of the stakeholders involved,

Maps are being used to meet needs that they don't really meet. There are multiple uses of the waterway. There are other legitimate uses. If only you could layer [on the map] other uses. Others need to be represented officially. For example, recreation is not officially recognized unless it's a beach. Public access to water is a big issue everywhere.

Basically, they were recommending the inclusion of more stakeholder information. In the words of another Lynnhaven interviewee when asked how maps/mapping could be improved in conflict resolution, “A combination of maps – it tells a story.” It is that story of the conflict, as complete and representative as possible, that is what is needed to ensure all relevant stakeholders’ voices are heard, that their narratives are included, that they have a “seat at the table.” For example, this Lynnhaven federal interviewee supported including the voice of the watermen.

When oystermen come, having their active knowledge of working those leases out there and what is doing well. Getting their perspective on it. Sometimes those things haven’t been caught in numbers. Have that ground truth knowledge from oystermen, fishermen. Not sure if everyone agrees. Can’t get that historical knowledge sometimes.

Historical data was also mentioned as being important for the usefulness and perceived legitimacy of the map. The above Lynnhaven federal representative added,

The historical data layers are used to set targets for restoration in the river. Without hard data most homeowners won’t be assured, won’t see it as legitimate. They want the details. Everyone in this world now has so much information; they want the information. They ask smart questions. This is the information age now.

In fact, indeed, this Lynnhaven homeowner expressed their desire for such data thus,

You know the VMRC online GIS... one time they used to have oyster books. Up until the late ‘70s, all the oyster leases were recorded in the books in the courthouse. Duplicate copies etc. That whole process with how do maps associate with oyster leases. You could trace back and see the historical record. One thing is missing in the VMRC ones.. sometimes you want to see the history, how has it changed hands over time. Can’t do that with how it’s set up. Not easy to figure out. ... It’s cool because you can go to the courthouse and from 1900s to 1979 you can follow the history of different leases. It’s a pain in the ass, but you can follow it, and their maps are laid out the same way. For example, I could go to the maps from my childhood.

Of special significance to conflict resolution, this Lynnhaven interviewee believed providing homeowners with historical data improves their historical perspective on their conflict, particularly that aquaculture predated the housing boom in the area, and in itself was not a new phenomenon being inflicted upon the homeowners,

Historical charts are good to show how things used to be historically. Lynnhaven, Virginia Beach are lined with million-dollar homes. It was helpful for homeowners to see these places have always been leased. Lynnhaven River... this goes back a long time [that] we've leased ground for private shellfish aquaculture.

Thus, historical maps were seen by participants as useful for both ensuring various voices are heard, i.e. telling their story, as well as improving understanding among the stakeholders.

Not only was data from various sources, perspectives, and times seen as important, so was the inclusion of metadata, the information about the data used in the map. Metadata includes information such as when, how, and by whom certain data were collected, how they were processed, what models (if any) were run on them, etc. Thus, such information is helpful in understanding the validity of the data on the map. Obviously, this should have a significant impact on perception of legitimacy. However, many, if not most, non-specialists are not aware of metadata. This is another issue tied to map literacy. This Lynnhaven federal interviewee commented on what makes for successful maps/mapping, "Being really transparent with data. When they request our shapefiles, we give all the metadata, etc. with it. We try to make sure our information is as accurate and legitimate as possible."

They went on to note that it is important to document how a map itself has changed and developed over time, including the decisions made concerning changes in the map, like what information is added, deleted, or changed. They commented,

We need documentation of how a map evolved. It would help the group to know that because players change over time and have lost some of that historical record. Also, a decision log, for example, for risks. When creating a large map with multiple stakeholders, to have bare bones decision [documentation] used.

The use of map metadata, including the decision log, enhances transparency, institutional knowledge, and ownership for stakeholders. Transparency is improved because of the access to the development of the map and decisions associated with it. This approach reduces the “black box” effect experienced by some in the Delmarva mass balance case, i.e. when some felt they did not know what data and data decisions (e.g., assumptions) were going into and coming out of the map product. Institutional knowledge is created and maintained, as well, largely because of the shared understanding of the mapped information and how it has been used. Sense of ownership may be heightened due to the accountability inherent especially in documented logs, such as the ones mentioned above.

Interactive Maps

The topic of interactive maps proved to be a common interest among interviewees from both case studies, and was recommended by a few. Concerns largely related to stakeholders being able to view and engage with mapped data, and each other over said data, as they saw fit. A Lynnhaven VMRC representative described the value of using such maps as being increased engagement among stakeholders,

There's more engagement... I've brought a map [to meetings]...it's always a good thing because people would ask specific questions about specific places. Maps contribute to constructive conflict resolution. Before, I had no way to make a map to take with me. But even then, to put that whole system on a 36" wide sheet... detail would not be very good. Now, we can use GIS on the computer and project it so you can zoom in.

A Lynnhaven environmentalist commented that the availability of the VMRC oyster lease GIS on the Internet meant that stakeholders could use it independently or with others based on their goals and interests. They remarked, "Coming in, people were concerned they didn't have a say about where oyster leases were permitted. [But with the GIS] they could look at it together and separately. No one had control of the one map we used." This stakeholder linked universality of control of the map with a more level conflict resolution environment, i.e. anyone could use the data any time or way they saw fit. This environmentalist recommended using interactive mapping in conflict resolution efforts such as the Lynnhaven working group and community outreach efforts,

I would almost say we need a map that is interactive, to be able to zoom in and discuss certain places, etc. Think about maps used when there's election night. They put up the whole state with different counties. If we did that, we could zoom in on one branch and have all the information in the database and be able to put that up on the screen.

The ability to interact with the map data, and to interact with each other over the data, was thus recommended as a means of enabling stakeholders, i.e. allowing them more universal control over conflict resolution related information. That multiple participants representing different types of stakeholders from both case studies made such a recommendation, i.e. to support interactive mapping, is significant.

Resourcing Data Collection

The last set of general recommendations deals with resourcing data collection and mapping. Multiple Delmarva interviewees shared their experience of bringing in a third party to conduct data collection and analysis when the group was not able to produce an agreed-upon product that would meet the requirements. Such interviewees commented on considerations such as transparency, bias, and capabilities. Such input was provided in Chapter 4, “Delmarva Case Study Overview,” so will not be repeated here.

However, several interviewees across both case studies noted that without adequate resources, mapping efforts struggle, and, therefore, associated conflict resolution efforts commonly struggle, too. There were broad calls to ensure appropriate priority. For example, given the rapidly changing environments in both Delmarva and Lynnhaven, interviewees from both mentioned the need for more personnel just to keep the maps updated. For example, this Lynnhaven waterman commended VMRC on its work but stressed that they needed more personnel,

What they [VMRC] lack in human resources, they have in great software mapping and surveying technology... They need physical people to go out and do the surveys. [When asked what would improve maps/mapping in the situation]: More people doing the surveys. More human resources.

This Delmarva agricultural industry representative appeared to agree when asked what should be done to improve maps/mapping, “Another thing is resources and human capital to be able to not only create a mapping effort but also continuously update them. We’ve seen a diminishing human capital in human resources in the Chesapeake Bay Program but if there’s more people that it’s their job to do this, it would be helpful.” Another Lynnhaven interviewee remarked, “The more up-to-date they [maps] are, the

better they are. [Updating the maps] every year is better than every 10 years. Things change so much in the marine environment. Everything boils down to money.” It might be worthwhile to do broader assessments of map usage when determining resource allocation. If offices such as the VMRC Engineering/Surveying Department use maps for unconventional or previously not covered functions, such as conflict resolution, perhaps funding from other offices or agencies could be allocated to ensure the best possible map/mapping products to support mediation, public engagement, and other related conflict resolution functions.

Conclusion

Comparison between the two case studies provided important findings concerning perception of legitimacy of maps/mapping in conflict resolution. It allowed for the understanding that perception of legitimacy, particularly in terms of inclusion or exclusion of stakeholders and their information in maps/mapping, can have a significant impact on a conflict resolution process. In the Delmarva case study, perceived marginalization of some stakeholders led to a breakdown in the conflict resolution process. Conversely, in the Lynnhaven case study, perceived inclusion contributed to higher levels of perceived legitimacy among stakeholders and greater levels of social engagement in the conflict resolution process.

This factor of exclusion or inclusion relates directly to legitimacy of stakeholder. Interestingly, and quite importantly, although I had predicted a marginalization/inclusion dynamic, I had only visualized said dynamic in the sense of a more powerful, or at least

more “map-authoritative,” stakeholder either marginalizing or including a less powerful stakeholder in maps/mapping, leading to marginalization/inclusion in the conflict resolution effort. This was represented by factor G, “Marginalization or inclusion of people into the conflict resolution activities after marginalization/inclusion in mapping activities.” However, what I had not adequately considered was a dynamic whereby less powerful, or less “map-authoritative,” stakeholders might choose to decrease or increase their engagement in conflict resolution activities based on perceived marginalization or inclusion regarding maps/mapping. And this is exactly what happened in the Delmarva and Lynnhaven case studies, albeit with quite different results between them. Lastly, research participants also provided considerable valuable perspectives on advantages, disadvantages, considerations, and suggestions for maps/mapping in conflict resolution.

7. CONCLUSIONS

Introduction

This research produced significant findings concerning perceptions of legitimacy in maps/mapping in conflict resolution. First, a theoretical framework was developed that focused on perception of legitimacy in three key areas, i.e. stakeholder, information, and representation. Then, two case studies, Delmarva and Lynnhaven, were researched and evaluated in a comparative analysis. Below summarizes the results, including considerations for conflict resolution practice. This is followed by a discussion of shortcomings found in the research, as well as recommended future research before concluding.

Summary of Findings

Key findings may be broadly categorized in terms of the social component, framing, interviewee perceptions of pros and cons of map use in conflict resolution, and the central role of legitimacy of stakeholder. The significance of the social aspect of group data use should not be underestimated. For example, inclusion or exclusion of stakeholders and their data was found to be linked to trust-building or trust-breaking and impacted the conflict resolution efforts. Social engagement was not only seen to be a significant factor in the case studies; it was also identified by participants themselves as important, e.g., via multiple recommendations to increase interactiveness in maps/mapping.

Framing proved to have a significant impact on stakeholders' perceptions of not only the maps/mapping, but also the conflict itself, as well as the conflict resolution effort. Therefore, consideration should be given to how maps are presented and used. It is important to at least avoid framing that might prove detrimental to the conflict resolution effort.

Research participants believed maps to be helpful for lobbying, problem-solving, communicating and visualization, especially of large amounts of spatial data, and providing perspective. However, they expressed concern about intentional or unintentional miscommunication and misunderstanding associated with maps, particularly regarding data. Thus, map literacy is important for stakeholders in order to successfully represent themselves.

Arguably the most significant finding in this research relates to the theoretical framework. Based on the literature, I had expected that legitimacy of stakeholder would serve an important role alongside legitimacy of information and legitimacy of representation. However, in both the Delmarva and Lynnhaven case studies, the central role that perception of legitimacy of stakeholder played was pronounced. Interestingly, research participants in both case studies expressed concerns about data. However, it appears that in both cases, it was perception of legitimacy of stakeholders that had the most influence in determining the direction of the conflict resolution effort. In the case of Delmarva, stakeholders expressed that the breakdown between stakeholder camps occurred because of problems with data sharing and information management. However, at the root of the breakdown was the perception of delegitimization among

environmentalists. Likewise, but in contrast, sense of inclusion of stakeholders in maps/mapping in the Lynnhaven conflict resolution process led to more productive engagement among stakeholders.

Considerations for Conflict Resolution Practice... and Beyond

I submit that as conflict resolution practitioners, we should consider paying closer attention to maps and mapping in our work, not unlike we do with other forms of communication. Practitioners are trained to strive to create a conflict resolution environment of parity among stakeholders. They attempt to “level the playing field” so that stakeholders are not disadvantaged while they attempt to lobby for their interests. Results from this research indicate that evaluating equity, i.e. ensuring an “even playing field,” among stakeholders regarding perception of legitimacy in maps/mapping is an important consideration for conflict resolution.

Looking deeper, perception of legitimacy of maps/mapping comes into play because, as has been seen in this research, how stakeholders perceive the legitimacy of each other’s maps and mapmaking is relevant. Moreover, there appears to be some indication that stakeholder engagement with each other over maps may be related to how they engage concerning the conflict resolution effort overall. In other words, their perceptions of legitimacy of maps/mapping appears to matter when it comes to the conflict resolution effort. The case studies above are indication of this.

Indeed, as seen from the key findings above, the social side of maps/mapping is both significant and often underestimated. In fact, perception of legitimacy of stakeholder

was identified in this research as playing the central role amongst the three types of legitimacy in the theoretical framework. In fact, legitimacy of stakeholder appears to underpin the other two, i.e. legitimacy of information and legitimacy of representation.

Thus, below are some considerations for putting into practice some means intended to help level the geospatial playing field. This is done to minimize disadvantage in terms of perceptions of legitimacy in maps/mapping. The intent is to ensure stakeholders' voices are appropriately represented in the mapping, and that no one has been inappropriately delegitimized, i.e. because of who they are (legitimacy of stakeholder), what data they use (legitimacy of information), or how they present their geospatial picture (legitimacy of representation).

First, a practitioner must ask: How important will maps/mapping be in the conflict resolution effort? If the answer is "not very," then one should ask why it will not be important. If the answer is because the conflict does not have a relevant geospatial component to it, then one can presumably stop concerning oneself with maps/mapping in that effort.

However, if maps/mapping will play a role, one might ask questions such as: Who makes the maps? Who controls the data? How are the maps made? What do they mean? Whose voice/ story/narrative do they represent? I submit that the conflict resolution practitioner needs to understand maps/mapping as they would other forms of communication used in their conflict resolution effort or activities. As a side note, one might consider developing a relationship with a mapping specialist or office, such as a

local geography department, for support, especially if the maps and mapping used are complex.

If mappers are involved in the conflict resolution effort itself (such as were in both Delmarva and Lynnhaven), consider asking them to review with you the maps, GIS, and any other geospatial materials to be used. Ask them to explain them. Ask about the metadata, especially for maps with a lot of complex data. It might be helpful, both to better understand the mappers' perceptions, as well as to learn what can or cannot likely be accomplished or available in terms of maps/mapping to support the conflict resolution effort. For example, are the mappers open to making adjustments, either in making changes to the maps themselves or in their willingness and capability to alter the means of engagement? Can and will they make arrangements to project the images up on the wall so all can see and discuss, or provide small group paper copies, i.e. how interactive can stakeholders be regarding maps/mapping (a function identified above as a critical recommendation by research participants)? I would submit that almost any type of map can be made "participatory" or interactive if those involved choose to make it so. How open are they (the mappers) to working with the group? If they are government representatives, does their interpretation of "authority to map" help or hinder the conflict resolution effort? If problematic, can it be resolved or mitigated?

One must not assume that all stakeholders approve of the maps/mapping to be used. For example, they may question the relevance, validity, and/or correctness of the data, as many participants did in the Delmarva and Lynnhaven case studies. However, one must also not assume that all stakeholders have thought through the maps/mapping to

be used. Of key concern is whether stakeholders understand how the conflict is framed in the maps/mapping and how they themselves (i.e. the stakeholders) are represented.

A possible approach to this part of leveling the geospatial playing field might be to caucus the stakeholders and ask them to describe their side or situation using the intended map/s. Observe if they struggle with any aspect of doing so. How do they frame their version of the conflict using the map? Can they? Or can they not, for example because data important to the telling of their story is not represented? Are there other issues with the map, e.g., poor layout? Is there an issue with map literacy?

It might be helpful to arrange some time in advance so that stakeholders can prepare for map use. In other words, do they need to take time to evaluate the map/s used to ensure their interests are adequately represented and that they themselves can address them appropriately using the maps provided? Do the maps need to be adjusted, edited, or different (even multiple) versions provided?

During the conflict resolution effort, social dynamics concerning maps/mapping should be monitored. Of particular importance, based on the experiences with the above case studies, is facilitating appropriate perception of legitimacy of stakeholder. For example, as was found in the research, frequent and shared communications, such as “check-ins,” especially concerning data, are indicators of legitimacy of stakeholder in the group. Examples of things to look for include but are not limited to such questions as: Do particular stakeholders dominate the map/s? Are stakeholders expressing frustration with each other regarding the maps/mapping? Are stakeholders walking away “from the table” due to perceptions of illegitimacy concerning maps/mapping? Or are stakeholders

engaging openly, constructively, over the map/s? Adjustments to maps/mapping may need to be made to ensure an even geospatial playing field and to maximize interaction among stakeholders.

Others Involved in Maps/Mapping Associated with Conflict Resolution

Many others, aside from conflict resolution practitioners, work with maps/mapping in conflict resolution related situations. After all, the abundance of literature associated with maps/mapping in conflict and conflict resolution referenced in the above literature review (Chapter 2) is from the field of geography. For geographers (including cartographers and others in similar fields), I believe that the above guidance to conflict resolution practitioners is enough of an introduction to at least raise awareness of some of the considerations needed for appropriate maps/mapping in conflict resolution. However, while I recommend above that conflict resolution practitioners reach out to local geography departments for expert advice on maps/mapping, I make a parallel recommendation here for geographers, i.e. develop relationships with local conflict resolution departments for their expertise.

I would like to add a few points of consideration for those serving as managers for projects or programs responsible for conveying geospatial information to the public. I particularly mean endeavors where misunderstanding could generate or exacerbate conflict, for example crisis or disaster response. Of course, the less time available and the more information to be conveyed, especially in a high-emotion situation, the greater is the probability for misunderstanding, as is the case with any other form of

communication under such circumstances. Some ideas intended to help avoid or mitigate such misunderstandings include the following:

- Use simple, clear map designs in order to reduce confusion. Then, when there is confusion, identification and explanation should be simpler.
- Use as few different map designs and formats as possible, preferably after determining one/s that work best for the audience. This will reduce time spent designing maps as well as explaining them.
- Conduct a pilot study of a map you intend to use. This can be as simple and quick as sharing it with a few people outside the office to get their feedback and see how they interpret it (e.g., those bold red lines may be read as “Scary” rather than the intended “Pay attention to this).” Make any needed changes.
- Consider the dynamics of information flow. What would be ideal for your project/ program? Think beyond traditional government approaches to mapping, i.e. unidirectional map provision. If you are reasonably certain there might be reaction from the public (e.g., questions, anxiety, push-back), then perhaps establish mechanisms for incorporating such engagement into the official process. Examples include: 1) add a hotline for questions on the map website; 2) add a comments section on the map website; 3) make the map interactive, or publish an online GIS so that viewers can explore the data themselves; 4) include metadata that clearly explains the basics about the data (e.g., who collected it, when, where, why, how); 5) plan public engagements where the situation can be discussed using the maps.

- Ask for more money. Many of the above options are resource intensive.

Budget and request adequate funding to support your efforts. As was noted above by several of my research participants, more focus and money should be dedicated to maps/mapping in conflict resolution related activities.

To conclude this section, ensuring that maps and mapping in a conflict resolution (or related) effort are appropriate can be viewed as a means of helping to level the playing field for stakeholders, as well as ensuring effective communications between stakeholders. There currently is a wide range of thought about what is considered “appropriate” or “effective.” However, and as demonstrated in this research, there is considerable interest and ability among various types of people in ensuring that they – and their interests – are represented in maps/mapping. Conflict resolution practitioners, and others, may wish to take this into consideration for their work.

Shortcomings of the Research

Arguably the most significant shortcoming of this research was the lack of focus given to the evaluation of narrative. The concept of narrative is important to multiple aspects of perception of legitimacy in maps/mapping, as discussed in the literature review above, e.g., the messaging role of maps, boundary groups, Ways of Knowing (WoK), empowerment of voices. Inclusion of this topic might have led to a more complete understanding of perception of legitimacy of maps/mapping than was achieved. The amount of input the above methodology could provide concerning this topic was overestimated. However, future research that includes narrative-specific questions and

applies a narrative lens to investigate maps/mapping in conflict resolution would likely add much to our understanding. Second, this research focused on two quite similar types of case studies, as discussed above in Chapter 3, “Methodology.” It is possible that this similarity impacted the results and their interpretation and, therefore, further research in a contrasting study would be prudent as a next step.

Future Research

The wealth of valuable insights gathered and ideas generated from this project serve as encouragement that there is a considerable and wide range of further research that can, and should, be conducted regarding, or related to, perception of legitimacy in maps/mapping in conflict resolution. Two areas were already addressed in the shortcomings section above. The first is to test this methodology on other, particularly dissimilar, case studies to discover what insights they could offer. Second, investigation using a narrative approach is expected to provide additional rich and nuanced understanding.

Additionally, study of the relationships between legitimacy of stakeholder, information, and representation seems important to pursue, particularly in terms of impact on conflict resolution efforts. It might also be useful to evaluate perceptions of legitimacy in maps/mapping at different points and during different activities of a conflict resolution effort, e.g., contending, problem-solving.

Exploration using other theoretical approaches would surely be valuable. I focused on a few, such as WoK, boundary groups/objects, and frame theory. However,

there are many others related to knowledge management, data science, social theory, critical thought, and beyond that should be explored. Evaluation research would be another area that likely would prove fruitful in terms of research and helpful for informing more appropriate map/mapping use, as well.

Conclusion

This research provided considerable insight into perceptions of legitimacy of maps/mapping in conflict resolution. Results suggest a relationship between how stakeholders perceive maps/mapping legitimacy and the conflict resolution effort in which they are engaged. The study added insights to the theoretical framework, emphasizing relationships amongst the various types of legitimacy involved in maps/mapping and the core role of legitimacy of stakeholder in shaping interactions. I hope that this research might be useful in supporting conflict resolution professionals in their efforts to ensure equity among stakeholders during conflict resolution efforts where maps/mapping is a component.

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