Geographic specificity and positionality of public input in transportation: a rural transportation planning case from Central Texas

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Current transportation planning processes often incorporate public input, but the types of engagement techniques can affect the ability of practitioners to meaningfully include local ideas. This study incorporates literature integrating communicative rationality with participatory mapping, supported by a case study focusing on two public engagement techniques. A transportation planning process in Central Texas is evaluated in terms of the geographic specificity and positionality of comments received from open-ended responses on a questionnaire and a facilitated mapping session, and reviews this input for relevance to developing a transportation plan. Although all input received from the public can be valuable in the process, location-based comments may be more actionable by transportation planners. Participants' perceived roles likely affect their level of engagement, which planners can facilitate to maximize the quality of involvement. Planners are advised to understand the positionality of project stakeholders and professionals, designing involvement methods considering geographic specificity appropriate for each project.

Keywords: engagement; public input; transportation planning; PGIS; qualitative GIS

Introduction

Public engagement in transportation planning is filled with at least as many missed opportunities as there have been home runs. Citizens can become disenfranchised in the process after participating in transportation plans, but not having seen results of their contributions integrated. Some even feel transportation agencies are comfortable meeting minimum legal requirements of consultation by accepting comments but not using them, which is essentially one-way communication (Prevost, 2006). In recent years, however, transportation planning in the United States has become more diverse in terms of the modes of emphasis, and responsive in how agencies seek input from the public. Relatively new technologies such as social media and public participation geographic information systems (PPGIS) are deepening the planners’ toolbox for meaningfully reaching the public, triggering calls for new standards in implementation (Camay, Brown, & Makoid, 2012) and evaluation (Sieber, 2006; Wagner, 2013).

Though participatory GIS (PGIS) and PPGIS have been developing for over 15 years (Nyerges & Aguirre, 2011), there is a dearth of studies evaluating the application of geographically specific public engagement methods in transportation planning. Barndt established a framework for evaluating PGIS, including the importance of defining the

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level of spatial accuracy appropriate to success of a project (Barndt, 2002). Many case examples in recent years use online mapping systems to allow the participant to choose their own mapping scales, such as an entire region or a city block (Kingston, 2007). Developed carefully, paper maps can also be effective for participants to effectively comment on their environment and planned proposals (Brown, 2012), while avoiding possible alienation of participants lacking digital tools (Sui, Goodchild, & Elwood, 2013). Brown extends a broad review of the literature with a spatially explicit platform for evaluating accuracy for existing physical phenomena (2012), but does not consider how to define the location of an envisioned built environment that does not yet exist, such as the case in planning participation. This study begins to fill that gap by evaluating two public engagement methods in the same planning process: responses to open-ended questionnaires and maps from a facilitated mapping exercise. Though both information sets are qualitative in nature, the latter also constitutes a participatory GIS (Elwood, 2009).

Three questions are posed in this study: (1) What are the issues in participatory mapping specific to transportation? (2) How can planners recognize and balance practitioner and stakeholder positionality and values with participatory mapping? (3) How can geographic specificity be considered in transportation planning public engagement? This study employs review of applicable literature with a case of the Blanco County Transportation and Economic Development Plan in Central Texas, tracing the process of input from two contrasting participation methods through finalization of the plan. Different actors in a planning process take with them values gathered from diverse experiences and educations, predictably resulting in diverse positionalities and notions of insider versus outsider roles (Merriam et al., 2001). Through direct participation in the planning process and its planners, this study connects the collaborative knowledge production between local citizens, practicing planners and a researcher, employing selective deployment of the participants’ own language (Lake & Zitcer, 2012).

Communicative rationality in contemporary transportation planning
Public participation methods, often considered good practices, require a traditionally objective and numerical field of transportation analysis to embrace (sometimes awkwardly) qualitative methods of personal interviews and opinion analysis. Democratic and representative underpinnings guide engagement methods in most Western countries, often yielding engagement techniques such as ‘voting’ on planning scenarios or use of a citizen panel to guide the planning process.

The origin of transportation planning as a field of study and employment grew parallel to a philosophical perspective in the mid-twentieth century that decisions are best made with empirical data, known as logical positivism (Ayer, 1959) or more often in planning circles as instrumental rationality (Willson, 2001). This perspective is needed when analyzing known population growth impacts on a transportation system, for instance. However, Willson describes a challenge of this viewpoint as one which “…tends to be a reductive process that narrows possibilities rather than expanding them” (Willson, 2001). This view of decision-making was challenged with humanistic ideas that incorporate the importance of relative viewpoints, including the value of human dignity and freedom, even though it may not be ‘scientific’ (Davies, 2001).

The field of planning has in some ways blended these concepts with variations of post-positivism that retain foundations in scientific method, while incorporating other
ways of knowing (Allmendinger, 2002). Contemporary planners often find themselves playing a dual role; one which seeks to provide solid answers with empirical data, and another that listens to stakeholders, elected officials, and the public at large (Evans-Cowley & Griffin, 2012). Conflicts between the two roles are inevitable, and part of planning in an open, democratic society. Willson proposes that “Communicative rationality may help transportation planners understand and resolve the dichotomous way that they often think about the rational and political dimensions of their work,” defining the perspective as enriching “… public and political discourse by reorienting planning to a form of reason based on consensual discussion” (Willson, 2001). In her paper on participatory planning and means–ends rationality, MacCallum has added a qualification to Willson’s communicative rationality paradigm, noting a risk of translating participation into a traditional plan can weaken adherence to participatory ideals (2008). She suggests, in some cases, planners may need to relinquish their concept of traditional planning products in order to fully embrace the potential of communicative processes.

Background on theory of public engagement in planning and reality of agency practices demonstrate a shortfall less in how many people are reached, and more in how the results of these practices are integrated in transportation plans. This study takes an example of two public engagement methods used in a rural transportation plan and employs critical analysis techniques that may be useful to increase the quality of feedback provided to a planning team, without increasing the quantity of limited participation budgets and timeframes. Contemporary planning processes routinely employ a variety of public engagement techniques, sharing knowledge and often knowingly seeking to distribute power to those most likely affected by the planning decisions. The medium of public engagement can also be as powerful as the message.

**Public engagement methods and evaluation**

The International Association for Public Participation identifies no less than 16 example tools on its public participation spectrum, ranging from fact sheets to delegated decisions (IAP2, 2007). The toolbox continues to grow rapidly with new engagement technologies and expanded planning partnerships. However, few researchers have explored how to identify appropriate public engagement methods for any given planning goal, and fewer still offer methods to evaluate effectiveness of techniques.

Prevost evaluated public outreach in the Dulles Corridor Rapid Transit Project Environmental Impact Statement of the Virginia Department of Rail and Public Transportation by analyzing the location of comments and the department’s mailing list, supporting several assumptions about public participation, including a finding that respondents closer to the project were commenting in opposition to that project (Prevost, 2006). This finding engages a dual importance of the positionality of a planning participant; that of the role, values, and perspective, and also the geographic location that helps shape them.

Wagner recently proposed three principles to guide evaluation of participation: accessible, engaging, and outcome oriented (Wagner, 2013). Both online and face-to-face engagement methods can be used to achieve these principles, but many details of the methods of engagement can determine their effectiveness. Orienting methods towards action, or “outcome-oriented” in transportation planning requires several pieces of information: What is the transportation problem? Where is it located? Who does it affect? Recent developments in the use of PGIS are promising developments that provide a structure to public involvement that may be more likely to lead to action (Bailey & Grossardt, 2009).
Participatory mapping and geographic information systems

Participatory mapping can be as simple as asking citizens to mark issues on maps at public meetings or can employ more sophisticated online geographic information systems with social discussions to affect a plan (Bamberg, 2013). GIS has traditionally been considered a quantitative tool, though its abilities to visualize and investigate social phenomena fulfills an important epistemological function in research and practice (Pavlovskaya, 2009). PGIS can be incorporated into a planning project with a variety of methods of engagement, ranging from paper maps to online GIS viewers, to co-producing materials with community partners. PGIS need not require extensive skillsets, nor cutting-edge software, but can fill a role to examine spatial phenomena with epistemological and methodological flexibility (Elwood, 2009).

One advantage of digital PGIS is that the designer can require participants to enter detailed information about the phenomena that is mapped by a participant. On the other hand, some of these systems tend to be complicated, creating a barrier to participation (Brown, 2012). Sieber emphasizes the importance of accuracy of contributed spatial information, as well as transparency of assumptions in how data is generated and included in resulting products (2006). Whether paper based or online, Brown emphasizes participatory mapping should not “… force or even encourage responses from participants for spatial variables that are beyond the intellectual or experiential capacity of the participant” (Brown, 2012). PGIS techniques chosen can define who the participants are and their level of power in knowledge production about a place (Elwood, 2006). Paper-based mapping can be simpler for participants, but can place more of a burden on the analyst of the results. Methods of inclusion guide not only the process, but ideally, the product of planning, and the available toolbox for participation continues to grow.

Recent advancements in public participation GIS (PPGIS) are bridging some of the challenges in geographically specific participation. Schlossberg and Brehm developed a method to facilitate georeferenced data collection of local street challenges by citizens with personal digital assistants, exploring a zone between laypersons and transportation experts to improve transportation outcomes (Schlossberg & Brehm, 2009). This type of improvement re-positions citizens as creators of planning information, rather than bystanders, recipients, or even victims.

Some experiments have included detailed spatial annotations and online discourse (Bamberg, 2013), and others focus on simplifying public input for action with a smartphone interface (Schlossberg, Evers, Kato, & Brehm, 2012). Bailey and Grossardt proposed public participation GIS can help bridge a significant lack of public engagement in transportation planning they dubbed the “Arnstein Gap,” in which citizens are informed about the process, but given little opportunity to collaborate and truly affect planning (Bailey & Grossardt, 2009). They employed a collaborative online mapping framework that involved both citizens and professional planners, identifying challenges and opportunities for implementing such an approach, and identifying the need for structured public involvement to work towards spatial justice. Nyerges and Aguierre extended the PPGIS analysis approach with a four-step process: the quality and scale of public participation, mapping the participant analytic activity, development of a ‘grapevine technique’ to study participant deliberations, and content analysis of written comments (Nyerges & Aguirre, 2011). Most PPGIS studies combine descriptive statistics with geographic analysis and review of content, but a full integration of qualitative analysis techniques is less common.
Perhaps one of the more powerful aspects of PPGIS is that it often involves translation and visualization of personal knowledge into a medium that is widely understood and respected in transportation planning. Elwood’s research with Chicago, Illinois-based community groups revealed that

many of the powerful actors and institutions whom they seek to influence treat GIS-based data and maps as illustrations of what is real or true about a place, and as evidence of an expert (and therefore, legitimate) portrayal of that place. (2009, 70)

PPGIS serves a dual purpose as providing a consolidated voice to potentially many separate actors, and depicting results in a manner more easily conveyed and respected by decision-makers.

Qualitative analysis methods
Transportation planning has traditionally been rooted in quantitative methods, focused on the understanding of demographic and land use impacts on transportation behavior (Hanson & Giuliano, 2004). These methods can be used to answer a host of questions related to who (Li et al., 2007), how many (Hernandez & Haas, 2013), where (Salas-Olmedo & Nogués, 2012), and with advanced modeling, even when (Guo & Srinivasan, 2005) questions in transportation. McCray and Brais found that transportation planning’s usual data-sets leave significant gaps in terms of understanding social exclusion and justice issues, and added questionnaires, group discussions, and facilitated mapping to understand the “why of demand or unsatisfied demand” (McCray & Brais, 2007). Qualitative methods have also been recently used to gain insight on the travel mode choices of older adolescents using content analysis of focus groups (Simons et al., 2013), and an ethnographic approach to look deeper into recreational bicyclists’ views on cycling for transportation (Mullan, 2013).

Evaluating participation from a Central Texas plan
This study is naturalistic, in that data-sets were taken from an actual planning process, the Blanco County Transportation and Economic Development Plan. Blanco County is a rural area of Central Texas with a population of 10,497 in the year 2010 (U.S. Census Bureau, 2013). Blanco County is located about 50 miles west of Austin, Texas, and contains three small cities, extensive agricultural rangeland, two state parks, and a growing tourism industry. The county is currently experiencing growth from communities nearby Austin and San Antonio, Texas, and local and regional agencies partnered to develop the plan collaboratively. Blanco County representatives and the Capital Area Council of Governments (CAPCOG) acquired support from the Texas Department of Transportation and the Texas A&M Transportation Institute to develop the plan, which employed a variety of public engagement techniques.

The planning team developed a public involvement strategy that recommended development of a local project advisory committee, development of a website and cohesive look for project materials, the use of traditional and social media outlets, a questionnaire delivered in paper and online forms, and public meetings that included a mapping exercise. The stated objective of the project’s public involvement plan was to
The participation methods offered ranged in engagement strength above the middle of Arnstein’s ladder of citizen participation (Arnstein, 1969), principally climbing to consultation and selective partnership through a project advisory committee.

Early discussions with the advisory committee confirmed that many residents in the county have very limited Internet access. The need to lay broadband-capable connections throughout the county was discussed as an economic development issue to consider in the planning process. Therefore, the participation strategy focused on personal interaction and paper-based records, though the website was kept up to date by the planning team for providing information for those that could access it. However, the mapping exercise was facilitated in a public meeting, and no online tool was created. The planning team facilitated and used input taken from unstructured means, including individual conversations and e-mail, only the two structured methods are evaluated in this study: the questionnaire and facilitated mapping exercise.

**Questionnaire**

In order to understand the community’s concerns on transportation and economic development, the planning team developed and administered a 28-question instrument focused on “... developing transportation and economic development proposals in the draft plan” (Capital Area Council of Governments, 2014, p. A–1). The questionnaire was disseminated at public meeting, at least five publicly accessible locations, and online. One hundred and eighty-two persons responded in total, over 1% of the entire county’s population.

Demographic questions provided some background on how representative the respondents were of the county’s population. As compared to the 2010 Census (U.S. Census Bureau, 2013), questionnaire respondents were older (76% over 55 vs. 36% Census), and 90% of the respondents were racially Caucasian or white, mirroring the census. Respondents were also wealthier than the population, with 42% of respondents reporting a household income over $100,000 per year, as compared to 23% of the county, using 2007–2011 American Community Survey 5-Year Estimates (margin of error about 2%). This mismatch of higher participation from older and wealthier county residents is a bias in participation, observed both locally (Capital Area Metropolitan Planning Organization, 2010) and in other developed Western nations (Renn, Webler, Rakel, Dieneel, & Johnson, 1993). This affect is logical, in that older and wealthier participants have more resources to participate; it is also ironic, in that younger participants are more likely to live with the results of the plan for a longer time.

The questions were designed to be general in nature, administered early in the planning process. Many of the questions sought opinions on existing issues in transportation and economic development in the county. As an example of a question focused on transportation, the results of the 182 respondents to question 16 follow as shown in Figure 1. The question asked for respondents’ top three categories of transportation improvements dealt with one of nine issues that were identified by the local project advisory committee and others. Though the responses may be useful to identify
generalized areas of improvement, this question does little to tell planners where the specific issues are located, the length or magnitude of the problems.

The last two items on the questionnaire were open-ended, asking “What Transportation issues not mentioned in this survey do you think is important for the future of Blanco County?” and the same question rephrased for economic development. These two questions provided the data source for this study’s later analysis of geographic specificity and content.

**Participatory mapping**

As part of a public meeting on the plan, CAPCOG staff facilitated a mapping session of 32 participants who could come and go over the course of three hours with county maps printed table-sized as a base map for their comments on three themes: safety, mobility, and economic development. As a case study, these categories generated by the planning team are retained for analysis, rather than employing grounded theory or a similar approach used when seeking broader knowledge than this case focused on local public engagement (Shadish, Cook, & Campbell, 2002). These hand-written annotations were mapped in a GIS by CAPCOG staff to improve legibility for reporting and sharing the comments. Facilitators did not require mapping contributors to contribute demographic or other statistics; Figure 2 depicts a portion of the map with the transcribed comments.

Table 1 tabulates comments received through both the open-ended questions on the questionnaire and the facilitated mapping exercise. The author coded 25 topical nodes using NVivo 10 software (QSR International, 2013) and collapsed them into CAPCOG’s three-topic structure. Not surprisingly, open-ended comments rarely referenced geographically specific locations, but all of the mapped comments were tied to a place. More interesting is the balance in topics that the commenters conveyed; roughly a third of the comments related to safety, approximately half relating to transportation or mobility, with the balance covering economic development and/or quality of life.

Participatory mapping promoted interactions between participants and planning staff: a face-to-face interaction, which is a challenge to achieve with online PPGIS methods. Since the large (both in size and scale) maps were laid down on doubled-up tables,
Figure 2. Subset of mobility issues mapped by public meeting participants as mapped by CAPCOG (Capital Area Council of Governments, 2013. Roadway Mobility Issues Combined Public and Advisory Committee Input [map] Austin, TX: Capital Area Council of Governments).
Table 1. Topic assignment and geographic specificity by source.

| Topic                                      | Questionnaire open-ended comments | Facilitated mapping |
|--------------------------------------------|-----------------------------------|---------------------|
|                                            | # of individual comments | Percent | # Geo-specific | % geo-specific | # of individual comments | Percent | # Geo-specific | % geo-specific |
| Safety                                     | 38 | 27% | 2 | 5% | 19 | 39% | 19 | 100% |
| Transportation/mobility                    | 83 | 60% | 2 | 2% | 25 | 51% | 25 | 100% |
| Economic development/quality of life       | 18 | 13% | 0 | 0% | 5 | 10% | 5 | 100% |
| Total                                      | 139 | –   | 4 | 3% | 49 | –   | 49 | 100% |
participants faced each other and facilitators, as opposed to the posture of working at a vertical wall. This allows participants to have their own space around the map, comfortably seated, and others cannot easily read their comments at the oblique angle of a table. Through a simple design of public involvement interaction, this arrangement fostered productive input from the participants.

By digitizing the comments, CAPCOG allowed wide sharing of the clarified comment maps with those involved on the Internet site (Capital Area Council of Governments & Texas A&M Transportation Institute, 2013).

**Discourse analysis of public input and planning results**

Most contemporary planning projects engage the public both synchronously, such as in a public meeting and asynchronously, by addressing comments directly or indirectly within a plan’s content. The following discourse analysis takes the latter approach, by sampling a few of the rich written comments received in the survey and facilitated mapping exercise, and tracing their impact, if any, on the approved plan.

In some instances, questionnaire respondents appealed to the planning team with insight extending personal values, such as an accessible home front door to community values, in the following case, a network of improved sidewalks connecting downtown businesses, homes, and institutions. The following comment was received following a prompt requesting ideas on economic development issues:

> I believe we need to improve our sidewalks and parking so visitors will want/feel invited to park their car and walk around. It is like a sidewalk to your home – you showing your guest the way into your home. [questionnaire respondent]

This comment positions the respondent as a non-expert by beginning with “I believe…,” but then offers a metaphor for the relationship between pedestrian infrastructure and economic development in a manner few experts could convey. Positionality of the planners, public participants, and indeed, researchers deserves attention in the design and evaluation of planning engagement (Merriam et al., 2001; Rose, 1997). Each participant brings their own value judgments to bear in a process, some hidden, while others are more out front. Rather than obscure this reality, positionality is a part of engagement from all sides, and sharing this reality with participants can foster honest engagement.

Another respondent provided vague geographic cues, and takes a more objective approach by pointing out that the issue of sidewalk completeness is a core transportation issue contributing to the community’s safety:

> City streets of Johnson City and Blanco in some parts are too narrow and have NO sidewalks … not safe for the children or cars when turning corners-near mishaps all the time. [questionnaire respondent]

The previous responder comments appeal to objective needs in the community, but the questionnaire prompts did not require geographically specific comments. Since the questionnaire forms were anonymous, it was not possible for project planners to follow up with discourse to determine specifically where the needs for sidewalks were greatest. Planners nonetheless engaged with state department of transportation staff and others to review sidewalk needs at a broad level. This type of engagement could be considered a
parallel process, akin to an electrical circuit that includes redundant wiring to keep one fault from breaking current between multiple devices. It does not rely on a particular connection, but there is also no visible link between the energy source and result; in this case, the questionnaire respondent and planning document.

In contrast to the questionnaire, the facilitated mapping exercise connected tied personal and community desires for the future to a mapped location. By attributing a large paper map with written comments in the course of a public meeting, the planning team received more information about where the respondent felt was the most important location for sidewalk improvements. A public meeting attendee wrote the following annotation with a clear line marking a specific roadway crossing of the Blanco River: “Bridge has no sidewalks for pedestrian and bicycle traffic.” This type of clear message was integrated in the plan through its proposed Pedestrian/Bicycle, Tourism and Transit Improvements Map with a marker on the same bridge with a label in the legend of “Reconstruct Bridge w/Sidewalks.” To use the electrical metaphor once more, this would be an example of a serial participation connection in planning. Since the planning project scope did not include a detailed inventory of sidewalks, this improvement would have been unlikely to be included without a direct and geographically specific comment from the public.

Qualitative analysis of public comments requires reading and comprehension for understanding, and NVivo 10 software was used for topic classification and discrete statistics. Including both the questionnaire’s open-ended comments \((n = 139)\) and mapped annotations \((n = 49)\), the top themes addressed the stated planning topics of transportation and economic development.

Review of individual responses offers greater understanding of respondents’ point of view. In many instances, they connect multiple topics such as safety, mobility, and multi-modalism. Though some comments may be more implementable than others, the full comments reveal more about participant thinking about transportation than revealed in the structured questions. Following are some examples of responses to the open-ended question “What Transportation issues not mentioned in this survey do you think is important for the future of Blanco County?” Stated race and age category are provided in brackets.

[Caucasian, over 65]: Keeping bikers off two lane roads in the hills. I have come close to hitting three different bikers over the years because they ride in the middle of the road & you don’t see them when you come over a hill. It is very scary for this to happen.

This statement implies value assumptions of what and whom roadways are intended to serve, indicating positionality without offering a solution. As an anonymous survey response, this reveals both the opportunity for forthcoming responses that may be held back in a group setting and the inherent challenge of planning to find some level of consensus on important topics in the face of divergent viewpoints.

In some cases, responses provide some geographic specificity without having to designate a specific corridor:

[Native American, 25–40] Public transport from Blanco to San Antonio or Austin

Though brief, this comment could be actionable. In nine words, it describes what is needed to improve transportation and where. If used early in the planning process, comments like these can catalyze discussion within and between stakeholders and
professional staff. Depending on the planning timeframe of a particular process, comments like these can be retained and analyzed with others to use for later plan updates and new projects.

Discourse analysis in a planning process takes time and, to some extent, training. Classifying topics through grounded theory can minimize bias (Rosa, 2007; Yu, Jannasch-pennell, & Digangi, 2011), but can also tend to obscure the connection between the message sent and how it can fit directly into a plan.

Since the participants are not bound by the solution categories which planners regularly find themselves in, such as highway or transit planning, they offer solution-based comments that have merit for their needs, but are ‘out-of-the-box’ in terms of traditional government sector transportation planning:

[Asian, 41–55] A 24 h taxi cab service

Though all of the comments were potentially helpful for the transportation plan, most were related to general problems without a specific location that could be prioritized for improvement.

[Caucasian, 41–55] repair of bumpy roads and improved sidewalks

This questionnaire was designed by CAPCOG to provide early guidance on transportation topics. Through the use of content analysis, planners could conceivably facilitate open-ended comments on questions designed to elicit geographically specific responses. Although the usefulness of the questionnaire for the economic development aspects of the plan is not evaluated in this study, the application of traditional questionnaire instruments need careful consideration for how the results will be used, with thoughtful design to make the results valuable.

Conclusions

Using qualitative analysis in an active transportation planning process, this study reviews the relevance of geographic specificity and positionality in public engagement methods. Since this study uses results of a natural case study with materials developed by planners for public input, not research, the findings are limited in their applicability to other situations. The mapping exercise and questionnaire were designed for different purposes, and taken together they provided participants with choices for involvement and gave planners a more rounded perspective of input.

Following a review of previous studies, including processes with geographic input components and analysis of results from the Blanco County Transportation and Economic Development Plan, three original questions in this study are considered:

What are the issues in participatory mapping specific to transportation?

Since transportation, by definition, deals with movements of goods and people over space, transportation problems are both tied to an observed location (such as a congested freeway), and the origins and destinations of the problem (like far-flung housing or concentrated employment centers). Because of this, planners involving the public with any kind of participatory mapping need to carefully consider issues of geographic scale, appropriate existing conditions layers for context, and how to depict the transportation
network itself. A static regional map showing major arterials is unlikely to receive detailed feedback on neighborhood sidewalk conditions, and it would be difficult to identify the sources of freight bottlenecks without mapping industrial complexes and freeway interchanges.

Many of these issues can be anticipated by incorporating early feedback from stakeholders and professionals on the topics specific to a given plan. Given the right context, the entire process can be co-produced with local stakeholders playing a role in mapping and formulating planning solutions (Barndt, 2002).

**How can planners recognize and integrate practitioner and stakeholder positionality and values with participatory mapping?**

Perhaps, since transportation planning can be a high-stakes venture with long-term impacts, issues of equity are often associated with the big-picture issues of project costs and impacts as a completed project (Plotnick, Romich, Thacker, & Dunbar, 2011; Ungemah, 2007). Rather than focus on the ends of a plan, the means deserve attention as well. As previously mentioned, the growth of transportation investments post-World War II paralleled the theoretical paradigm of logical positivism. Many current senior transportation planners and engineers were schooled in these methods, and more recent graduates may more likely value stakeholder involvement as a true part of the planning process, as opposed to merely a government requirement.

Participatory mapping, and its quasi-synonym PPGIS, can be used to bridge the rationality of logical positivism and quantitative models with rational discourse, and the very real effects of transportation projects that cannot be reduced to numbers. Planning professionals tend to be comfortable with maps because they identify where issues are, rendering the problems discoverable by a site visit or digital reconnaissance. Geographically referenced comments tie what may be a public opinion or a verifiable fact to a rationally answerable issue. Workable participation methods are not often best invented during a planning process, but well in advance, using guidance frameworks, such as Schlossberg and Shuford’s techniques-oriented matrix of public and participation (Schlossberg & Shuford, 2005).

Before a given planning project is fully scoped, planners should visit with the anticipated planning and implementing team and local stakeholder representatives to identify both their individual concerns and value-based assumptions of what a successful project would look like. Planners might identify a mismatch between the professionals’ approach and the local stakeholders’ issues, which could lead to important questions that redirect which planning problems are most important.

Finally, positionality can be revealed through several techniques of shared voice between the planners and local participants. Though this study employs selective deployment of participants’ comments, Lake and Zitec also describe the use of empathetic evocation, dialogic collaboration, and uninterpreted transcription (2012); each of which can be used to increase the transparency of works by reflexive practitioners and researchers.

**How can geographic specificity be considered in transportation planning public engagement?**

Planners and public involvement specialists have an opportunity to refine and include public engagement methods that are geographically specific, and may be more
implementable in transportation plans. In addition to group mapping sessions or online map-based participation tools, more traditional methods can be tailored to provide geographic context to commenting. Rather than wait until plans are advanced enough to provide detailed proposals to react to, professionals can design engagement methods that help answer where as much as who and why questions in transportation planning. Methods can be as simple as marking a base map at a public meeting, or as sophisticated as an integrated, online platform that addresses complex policy issues and specific transportation solutions (Lowry, Nyerges, & Rutherford, 2008).

In addition to traditional mapping methods, new technologies in PPGIS, VGI, and group process techniques need additional examples to learn from in order to advance the participation profession. Collaborations between researchers and practitioners can help advance these tools and methods toward improving transportation plans with sincere public engagement.

As with all public involvement efforts, the local community should be understood before determining a set of public engagement methods. Planning theory is rooted in both quantitative methods through logical positivism and humanistic considerations of the inherent value of people and their independent perception. This study reveals that content analysis and geographic analysis of facilitated input are potential methods for improving transportation planning with personal and real perceptions of transportation issues and opportunities. The consideration of geographic specificity and transportation solutions from the participants’ perspective can lead to reflexive collaboration and a higher level of discourse in public engagement than that seen in the past.

Further research on the impacts and outcomes of PGIS should consider study design in light of Sieber’s discursive goals, including “... empowerment, expanded participation, social capacity and inclusion, equity and redistribution, and increased democracy” (2006, p. 501). Additionally, the continued advancement and access to digital tools and ubiquitous information may catalyze further inquiry into the nature of participation, following hybrid epistemologies (Elwood, Goodchild, & Sui, 2013; Jung & Elwood, 2010).

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References

Allmendinger, P. (2002). Towards a post-positivist typology of planning theory. Planning Theory, 1, 77–99.
Arnstein, S. R. (1969). A ladder of citizen participation. Journal of the American Institute of Planners, 35, 216–224.
Ayer, A. J. (Ed.). (1959). Logical positivism. New York, NY: The Free Press.
Bailey, K., & Grossardt, T. (2009). Toward structured public involvement: Justice, geography and collaborative geospatial/geovisual decision support systems. Annals of the Association of American Geographers, 100, 57–86. doi:10.1080/00045600903364259
Bamberg, J. (2013). Engaging the public with online discussion and spatial annotations: The generation and transformation of public knowledge. Planning Theory & Practice, 14, 39–56. doi:10.1080/14649357.2012.738306
Barndt, M. (2002). A model for evaluating public participation GIS. In W. J. Craig, T. M. Harris, & D. Weiner (Eds.), Community participation and geographic information systems (pp. 346–356). London: Taylor & Francis.
Brown, G. (2012). An empirical evaluation of the spatial accuracy of public participation GIS (PPGIS) data. Applied Geography, 34, 289–294. doi:10.1016/j.apgeog.2011.12.004
Camay, S., Brown, L., & Makoid, M. (2012). Role of social media in environmental review process of national environmental policy act. Transportation Research Record: Journal of the Transportation Research Board, 2307, 99–107. doi:10.3141/2307-11
Capital Area Council of Governments. (2014). Blanco county transportation and economic development plan. Johnson City, TX: Author.
Capital Area Council of Governments, & Texas A&M Transportation Institute. (2013). Blanco county transportation and economic development plan materials. Retrieved August 01, 2013, from http://www.blancocountyplan.org/?page_id=14
Capital Area Metropolitan Planning Organization. (2010). CAMPO 2035 regional transportation plan appendices. Austin, TX: Author.
Davies, T. (2001). Humanism (e-Edition.). London: Routledge.
Elwood, S. (2006). Negotiating knowledge production: The everyday inclusions, exclusions, and contradictions of participatory GIS research. The Professional Geographer, 58, 197–208.
Elwood, S. (2009). Multiple representations, significations and epistemologies in community-based GIS. In M. Cope, & S. Elwood (Eds.), Qualitative GIS A mixed methods approach (pp. 57–74). London: SAGE.
Elwood, S., Goodchild, M. F., & Sui, D. (2013). Prospects for VGI research and the emerging fourth paradigm. In S. Elwood, M. F. Goodchild, & D. Sui (Eds.), Crowdsourcing geographic knowledge: Volunteered geographic information in theory and practice (pp. 361–375). New York, NY: Springer.
Evans-Cowley, J. S., & Griffin, G. (2012). Microparticipation with social media for community engagement in transportation planning. Transportation Research Record: Journal of the Transportation Research Board, 2307, 90–98. doi:10.3141/2307-10
Guo, Z., & Srinivasan, K. (2005). Investigating the effect of user behavior factors and transportation control measures on day-to-day network evolution and trip time reliability. Transportation Research Record, 1926, 152–161. doi:10.3141/1926-18
Hanson, S., & Giuliani, G. (Eds.). (2004). The geography of urban transportation (3rd ed.). New York, NY: Guilford Press.
Hernandez, P. D., & Haas, P. J. (2013). Estimating workforce needs for high-speed rail in California and the United States. Transportation Research Record: Journal of the Transportation Research Board, 2328, 25–31. doi:10.3141/2328-04
IAP2. (2007). IAP2 public participation spectrum. Retrieved June 26, 2013, from http://www.iap2.org.au/documents/item/84
Jung, J.-K., & Elwood, S. (2010). Extending the qualitative capabilities of GIS: Computer-aided qualitative GIS. Transactions in GIS, 14, 63–87. doi:10.1111/j.1467-9671.2009.01182.x
Kingston, R. (2007). Public participation in local policy decision-making: The role of web-based mapping. The Cartographic Journal, 44, 138–144. doi:10.1111/j.1467-9671.2007.013459
Lake, R. W., & Zitcer, A. W. (2012). Who says? authority, voice, and authorship in narratives of planning research. Journal of Planning Education and Research, 32, 389–399. doi:10.1177/0278394612455666
Li, J., Embry, P., Mattingly, S. P., Sadabadi, K. F., Rasmidatta, I., & Burris, M. W. (2007). Who chooses to carpool and why? Examination of Texas carpoolers. Transportation Research Record: Journal of the Transportation Research Board, 2077, 156–165. doi:10.3141/2077-20
Lowry, M. B., Nyerges, T., & Rutherford, G. S. (2008). Internet portal for participation of large groups in transportation programming decisions. Transportation Research Record: Journal of the Transportation Research Board, 2077, 325–343. doi:10.3141/2077-20
MacCallum, D. (2008). Participatory planning and means-ends rationality: A translation problem. Planning Theory & Practice, 9, 325–343. doi:10.1080/14649350802277852
McCray, T., & Brais, N. (2007). Exploring the role of transportation in fostering social exclusion: The use of GIS to support qualitative data. Networks and Spatial Economics, 7, 397–412. doi:10.1007/s11067-007-9031-x
Merriam, S. B., Johnson-Bailey, J., Lee, M.-Y., Kee, Y., Ntseane, G., & Muhamad, M. (2001). Power and positionality: Negotiating insider/outsider status within and across cultures. International Journal of Lifelong Education, 20, 405–416. doi:10.1080/02601370120490
Mullan, E. (2013). Exercise, weather, safety, and public attitudes: A qualitative exploration of leisure cyclists’ views on cycling for transport. SAGE Open, 3, 1–9. doi:10.1177/2158244013497030
Nyerges, T., & Aguirre, R. W. (2011). Public participation in analytic-deliberative decision making: Evaluating a large-group online field experiment. *Annals of the Association of American Geographers, 101*, 561–586.

Pavlovskaya, M. (2009). Non-quantitative GIS. In M. Cope, & S. Elwood (Eds.), *Qualitative GIS: A mixed methods approach* (pp. 13–38). London: SAGE.

Plotnick, R. D., Romich, J., Thacker, J., & Dunbar, M. (2011). A geography-specific approach to estimating the distributional impact of highway tolls: An application to the Puget sound region of Washington state. *Journal of Urban Affairs, 33*, 345–366. doi:10.1111/j.1467-9906.2011.00551.x

Prevost, D. (2006). Geography of public participation: Using geographic information systems to evaluate public outreach program of transportation planning studies. *Transportation Research Record: Journal of the Transportation Research Board, 1981*, 84–91. doi:10.3141/1981-14

QSR International. (2013). *NVivo 10*. Retrieved August 01, 2013, from http://www.qsrinternational.com/products_nvivo.aspx

Renn, O., Wehler, T., Rakel, H., Dienel, P., & Johnson, B. (1993). Public participation in decision making: A three-step procedure. *Policy Sciences, 26*, 189–214.

Rosa, J. D. (2007). *A step towards sustainable transportation behaviour: Understanding automobile ownership and mode choice through qualitative research* (Thesis). Waterloo: University of Waterloo.

Rose, G. (1997). Situating knowledges: Positionality, reflexivities and other tactics. *Progress in Human Geography, 21*, 305–320. doi:10.1191/030913297673302122

Salas-Olmedo, M. H., & Nogués, S. (2012). Analysis of commuting needs using graph theory and census data: A comparison between two medium-sized cities in the UK. *Applied Geography, 35*, 132–141. doi:10.1016/j.apgeog.2012.05.004

Schlossberg, M., & Brehm, C. (2009). Participatory geographic information systems and active transportation. *Transportation Research Record: Journal of the Transportation Research Board, 2105*, 83–91. doi:10.3141/2105-11

Schlossberg, M., Evers, C., Kato, K., & Brehm, C. (2012). Active transportation, citizen engagement and livability: Coupling citizens and smartphones to make the change. *URIASA Journal, 24*, 65–74.

Schlossberg, M., & Shuford, E. (2005). Delineating “Public” and “Participation” in PPGIS. *ERISA Journal, 16*, 15–26.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference* (2nd ed.). Boston, MA: Houghton Mifflin.

Sieber, R. (2006). Public participation geographic information systems: A literature review and framework. *Annals of the Association of American Geographers, 96*, 491–507.

Simons, D., Clarys, P., De Bourdeaudhuij, I., de Geus, B., Vandelanotte, C., & Deforche, B. (2013). Factors influencing mode of transport in older adolescents: A qualitative study. *BMC Public Health, 13*, 323. doi:10.1186/1471-2458-13-323

Sui, D., Goodechild, M., & Elwood, S. (2013). Volunteered geographic information, the exaflood, and the growing digital divide. In D. Sui, S. Elwood, & M. Goodechild (Eds.), *Crowdsourcing geographic knowledge: Volunteered geographic information in theory and practice* (pp. 1–14). New York, NY: Springer.

U.S. Census Bureau. (2013). *Census 2010*. Retrieved July 25, 2013, from http://factfinder2.census.gov

Ungemah, D. (2007). This land is your land, this land is my land: Addressing equity and fairness in tolling and pricing. *Transportation Research Record: Journal of the Transportation Research Board, 2013*, 13–20. doi:10.3141/2013-03

Wagner, J. (2013). Measuring performance of public engagement in transportation planning. *Transportation Research Record: Journal of the Transportation Research Board, 2397*, 38–44. doi:10.3141/2397-05

Willson, R. (2001). Assessing communicative rationality as a transportation planning paradigm. *Transportation, 28*(1), 1–31. doi:10.1023/a:1005247430522

Yu, C. H., Jannasch-pennell, A., & Digangi, S. (2011). Compatibility between text mining and qualitative research in the perspectives of grounded theory, content analysis, and reliability. *The Qualitative Report, 16*, 730–744.