2006

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reviewed paper

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In the United States, public involvement has been mandated in transportation infrastructure projects since 1969 through the National Environmental Policy Act (NEPA) and its associated protocols for Environmental Impact Statements (EIS) and, more recently, Environmental Justice. Moreover, since most large transportation infrastructure investments involve public investment, there is an obligation on the part of designers and planners to respect the wishes of the public regarding aspects of the proposed development such as its form and location.

1 BACKGROUND TO PUBLIC INVOLVEMENT

The Transportation Equity Act for the 21st Century, or TEA-21, enacted in 1998, *(1)*, following the Intermodal Surface Transportation Equity Act (ISTEA) of 1991 *(2)*, defines the "public" as "citizens, affected public agencies, representatives of transportation agency employees, freight shippers, private providers of transportation, representatives of users of public transit, providers of freight transportation services and other interested parties." More recently the Federal Highway Administration (FHWA) has expanded this definition to include underrepresented groups "such as low income or minority households and the elderly" (*3*). In the last decade public involvement has been mandated for all metropolitan and statewide planning processes (TEA), and it has been integrated explicitly into a variety of programs such as Context Sensitive Design (4,5) and the Transportation and Community and Systems Preservation (TCSP) program (6).

Ideally, public involvement facilitates the understanding and incorporation of community values into the plans and designs for new infrastructure (7). This feedback permits the engineer or planner to assess accurately the level of understanding the public has acquired regarding the project. A positive signal occurs when the public begins to supply useful and insightful comments regarding a proposed activity. Because they better understand costs and benefits, as interpreted by the public, the professionals work more productively and accurately toward satisfactory trade-offs. This knowledge interchange can in turn help to avoid and resolve public opposition to particular aspects of a proposed project, and even whether the project should be pursued in the first place. Construction delays are minimized and consequently, more time and money is spent on building projects that the public really supports. In the long run meaningful public involvement increases public confidence in the sponsoring agencies and public officials in general; this is sometimes termed improved "civic capacity" (8). For many reasons, then, public involvement should be prioritized.

2 PROBLEMS WITH PUBLIC INVOLVEMENT

However, the ideal is not often seen. Frequently, small sets of pre-formed options are prepared in advance by consultants or engineers and then presented at public forums. Feedback on these options is then gathered in some random verbal form and used in some generally unspecified way to determine which one should be built. This limited involvement and restricted-choice paradigm, which we term Decide, Announce and Defend (or DAD), reinforces the suspicion that many stakeholders exhibit toward public planning processes. This suspicion can manifest itself in hostility toward consultants and planners at public forums, or, worse, in a feeling of pointlessness: that since the options are already decided by those in power there is no point in participating in public forums (9). While this typifies a worst-case scenario, it is easy to see why responsible authorities have been reluctant to initiate public input processes. In some cases they have seen them more as an unproductive requirement rather than as an opportunity to improve the design product (10). This self-fulfilling prophecy ensures that satisfaction with the planning process remains low on all sides (11,12,13). The situation is worsened by the wide variety of stakeholder groups whose participation is mandated. Many of these groups have competing goals and objectives. Under these circumstances there may be a suspicion that officials will use sophisticated technologies, such as visualization, to obscure options and so override the original goals of increased public satisfaction and better service provision. Without adequate structuring of public involvement such advanced methodologies will not necessarily relieve stakeholder suspicions, either of responsible highway agencies or of each other (14).

Therefore, despite the fact that since ISTEA public involvement in the transportation planning process is espoused as a desirable and necessary goal (7,15), its realization is a more complicated matter. As far back as the early 1980's, transportation professionals were predicting the inevitability of greater public involvement, and the need for better training of engineers to accommodate that potential (16). The contrast was drawn between the 'hard' sciences of engineering and planning and the 'soft'sciences of psychology and sociology. The problem was one of professionals being trained to develop the correct technical answer, and not being trained to solicit or process input from nonprofessionals (17,18). While transportation research continues to call for public involvement in large-scale planning exercises, it sometimes fails to include detailed consideration of that aspect while describing thoroughly all other phases of the planning effort (19). Alternatively, if there is an organized effort to gather public input on a planning design, the input may be ignored either because it is seen to somehow interfere with the process of gaining acceptance of the plan itself (20) or it becomes characterized as a failure in that it led to 'loss of management control' (21,p.98).

Once the commitment to public involvement is made, problems still persist. Sometimes the main disagreement might not be between the public and the professional, but among various members of the public, who have a variety of interests in a given project (22). Those disagreements can even become formalized, so that they reproduce themselves over and over again in the form of a Citizens' Advisory Committee in a form of permanent dysfunctionality (23). Perhaps in reaction to this, efforts have been made to identify the 'proper' public for a given project (21).

These dynamics create a negative feedback cycle for those charged with public involvement. Professionals face a dilemma: long-term engagement in an extended planning process taxes the patience and time reserves of most citizens, resulting in poor levels of engagement or dysfunctional interactions. Thus the recommendation is sometimes made to limit the scope of public involvement to specific recommendations and issues (23,24,25). However, focusing citizen attention on specific, nearterm goals and projects often means the practitioner must invest more time in the details of those projects because the public demands more information and considers more issues in making a decision (26). Frequently, professionals are surprised that public groups do not 'run themselves', that is, the participants in a public meeting do not spontaneously arrive at a unitary decision. In these cases a frequent post hoc recommendation is to engage the services of a facilitator or other process leader when working with the public.

3 THE ARNSTEIN LADDER

A significant question that emerges in practice is the question of the 'level' or 'quality' of engagement with the public. While Arnstein (27) famously pointed out the question of degrees of involvement many years ago, it remains a perplexing problem (28). Figure 1 shows the Arnstein Ladder.

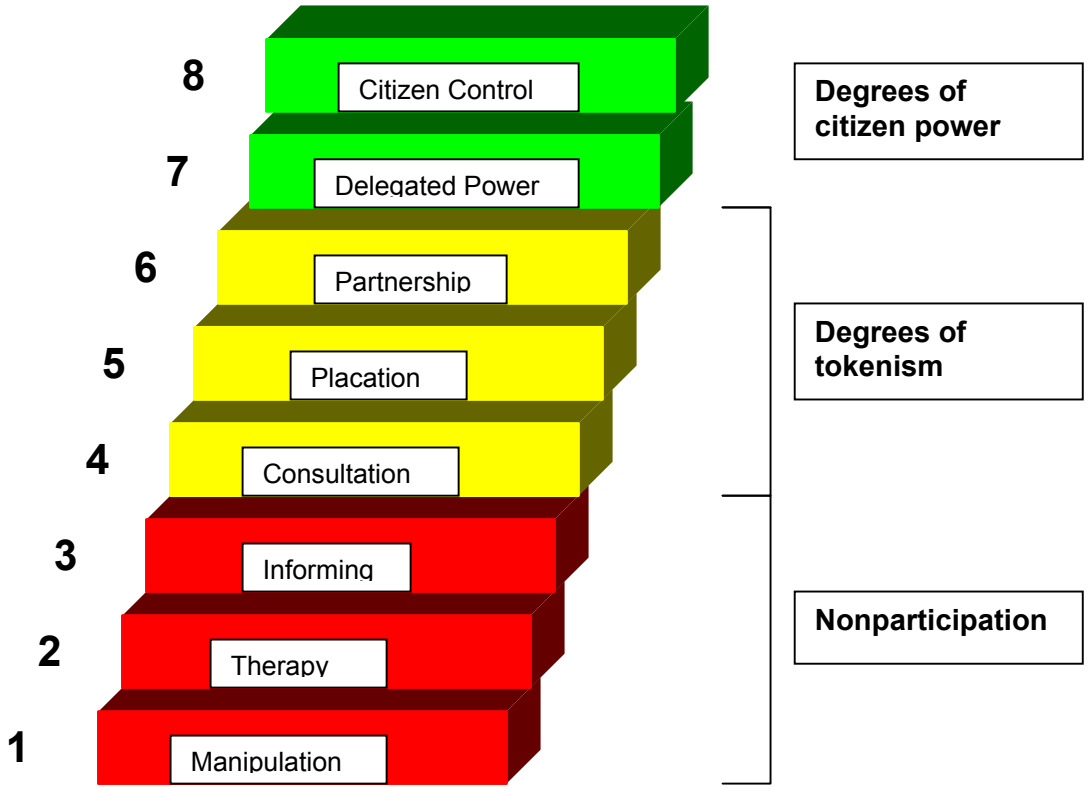


Figure 1. Arnstein's *Ladder of Citizen Participation* (1969)

Although arguably somewhat tongue-in-cheek, Arnstein's Ladder continues to be cited by planners (28,29,30). This indicates that it resonates with planners as an effective way of characterizing levels of public involvement.

4 CHARACTERIZING CONFIDENCE IN PUBLIC INVOLVEMENT IN TRANSPORTATION PLANNING

The results of this historically poor relationship between citizens and transportation professionals are evident in public attitudes towards transportation projects. Since 2003 the research team has been investigating this question. Using the SharpeDecisons electronic polling system in SPI protocols, the team has polled a range of professional and public meetings dealing with transportation improvements. The Arnstein Ladder, Figure 1, is shown, and the following questions are asked:

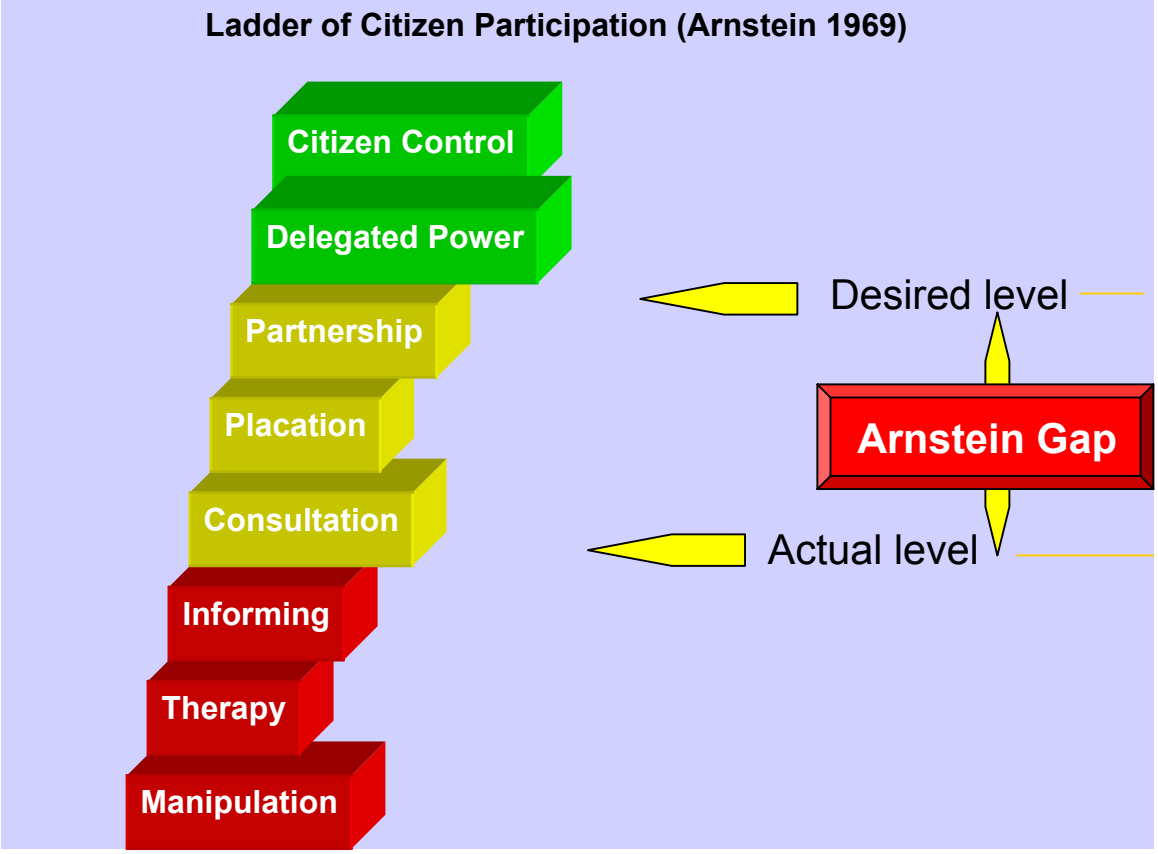
1. From your experience, how would you characterize public participation in transportation planning processes using this Ladder?
2. Where should public participation in transportation planning processes be located using this Ladder?

Each question was polled anonymously in turn. Responses were coded using integer numbers 1 through 8 corresponding to steps on the Ladder (Figure 1). The software allows responses to be collected and aggregated in real time. This database currently contains over 300 responses from various forums in KY and AZ, including citizens and State and private sector transportation professionals. So far the results of this vote are strikingly similar among these groups and between the states. The mean scores are:

Question 1: 3.8, which is between "informing" and "consultation," although closer to "consultation."

Question 2: 6.3, which is slightly above "partnership," towards "delegated power.

Figure 2. The Arnstein Gap



The difference is 2.5 steps on the Ladder. We call this difference between the perceived and desired positions the Arnstein Gap (31). This is shown in Figure 2. The Arnstein Gap clearly measures the difference between where public participation in transportation planning is situated in the public eye, and where it should be in the eyes of the respondents. While it is clear that the situation is not ideal, it is interesting to note that actual public confidence in these processes is not in fact at rock bottom as indicated by the terminology "manipulation" and "therapy". It falls somewhere between "informing" and "consultation." Moreover, in no case so far does the public indicate it prefers full "citizen control." This finding suggests that the public clearly recognizes a need for expert domain on the part of engineers and planners. The closest named step on the Ladder to the ideal point is "partnership." The problem is that the first number is lower than the second, indicating that the public – and the professionals polled - would like to see a system that is more responsive to public needs. It is here that transportation professionals must work at increasing satisfaction with process and product. Regardless of rhetoric, then, the Arnstein Gap is the metric by which the existing deficiency of public involvement can be measured.

Unfortunately, public involvement tends to be conducted on an ad-hoc basis with little or no theorization of how to integrate the public's wishes into the designer's systems. Under these conditions, the Arnstein Gap is not adequately addressed. Without working to close the Arnstein Gap using more analytic methods to solicit participation and to incorporate it into designs and plans, the public's rather negative view of public involvement is not likely to improve.

5 CONTEXT SENSITIVE DESIGN (CSD)

CSD is aimed at respecting the values of individual communities and regions rather than imposing a uniform design template over the landscape. The idea behind this is to improve public satisfaction with the process and the designs. However, CSD is a principle and to be achieved it requires a methodology that allows professionals to access public values and opinions prior to the presentation of specific design options. This way, public desires can be integrated into the design options prior to their evaluation. This means that, to realize its potential benefits, CSD requires a structured approach to implementation. Structured Public Involvement addresses this need and has demonstrated its success.

6 STRUCTURED PUBLIC INVOLVEMENT

Since 1999 the research team has been developing and applying a protocol called Structured Public Involvement or SPI (32,33,34,35,36,37). Theoretically SPI research is situated at the intersection of decision theory, cultural geography, geographic information science and planning. In practice SPI is aimed at understanding how groups make sense of information using specific geospatial and geovisual media. Key questions include how do groups use and deploy GIS and urban 3D and Virtual Reality visualizations; which aspects of these technologies are useful and to whom; and how the sociotechnical system, comprised of many actors with sometimes competing interests and differing understandings of the tools, creates knowledge from these tools. Methods embedded within the SPI framework include Casewise Visual Evaluation (CAVE) and the Analytic Minimum Impedance Surface (AMIS). Since this work deals primarily with real planning or design questions it requires intensive collaboration with a wide range of stakeholder groups to design, test and implement suitable methods.

SPI research has already shown its impact. Successful applications include participatory interstate corridor routing (37), rural highway design in central KY (36); a transit-oriented development in Louisville, KY (32, 34); noisewall design in KY and AZ; and now, the Ohio River Bridges project. SPI has demonstrated its performance on several occasions. For example, in 2001 during the rural highway study, citizens were asked to characterize their satisfaction with the SPI process on a scale of 1 (totally unsatisfied) through 10 (totally satisfied). The mean score was 8.6, which was a higher score than any of the specific design options polled (32). In another case involving bridge design, public participants rated satisfaction with the SPI process at 7.5 while the most preferred design option registered a mean score of 5.7 on the same scale of satisfaction.

These evaluations are significant for several reasons. First, the scoring was conducted anonymously in accord with SPI protocol. Second, the team conducted these evaluations at public meetings after design options had been evaluated. This process demonstrated clearly to the public that their opinion counted because the research team had no way of knowing beforehand which options would be preferred or what the mean scores or standard deviations would be. This data was displayed to the participants in real time. The anonymous evaluations indicate that SPI is achieving a significant measure of procedural justice, where procedural justice is defined as the meaningful inclusion of stakeholder viewpoints resulting in increased satisfaction with the planning and design process.

This data shows that, through SPI, planners and engineers can generate high satisfaction with process even if none of the potential design options are ideal. Other indications of increasing public confidence generated through SPI include steadily increasing attendance at open public meetings using SPI protocols and requests from engineers, planners and designers exposed to SPI for more use of the protocol (33, 35).

One issue with public confidence in planning and design processes is the very long timeframe over which trust is built, and the relatively short timeframe over which it can be eroded by unresponsive or poorly designed public involvement. This means that methods aimed at overcoming the skepticism indexed by the Arnstein Gap, such as SPI, are necessary and welcome but even in cases where these improve the quality of involvement on an individual project, much remains to be done. Consistent and equitable public participation remains an ambitious goal.

During the development and delivery of these SPI protocols the research team has developed an understanding of the role of, and the relationship between, transportation professionals and the public; between planners, engineers and designers, architects and landscape architects; between various involved organizations such as anti-growth groups, non-profits, MTO's, and a range of public group as well as individual citizens. This knowledge of the public involvement sphere and experience in design and delivery of successful CSD projects strengthens the team's proposal.

Overall, the prospects for improving what has been a highly problematic domain (38) using SPI appear promising. Current applications include major civil engineering projects such as the Ohio River Bridges Project and smaller, context-sensitive infrastructures such as noisewalls in Arizona.

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