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Relationship of Citizen Assembly Formats and Resource Access to Consensus Quality in Energy Transition Debates

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Abstract

The global urgency to mitigate climate change requires transformative energy policies, yet such transitions often face substantial public resistance and political gridlock. Citizen assemblies have emerged as a prominent democratic innovation designed to overcome these barriers by fostering deep deliberation and building consensus among diverse groups of laypeople. However, the quality and durability of the consensus generated by these assemblies vary significantly across different implementations. This paper investigates the structural and procedural factors that explain consensus quality, focusing specifically on citizen assembly formats and the extent of resource access provided to participants during energy transition debates. Through a comprehensive comparative analysis of multiple assembly cases, this study conceptualizes how different organizational structures, such as plenary sessions versus small-group deliberations, intersect with the availability of cognitive, informational, and temporal resources. The findings indicate that while decentralized small-group formats promote egalitarian participation, their ability to yield high-quality consensus is strictly contingent upon symmetric access to expert knowledge and sufficient time for information processing. Furthermore, resource constraints disproportionately impact participants from lower socioeconomic backgrounds, thereby skewing the deliberative output and degrading the overall legitimacy of the consensus. By systematically evaluating these variables, this research provides critical theoretical and empirical insights into the design of democratic innovations, offering actionable recommendations for policymakers seeking to facilitate equitable and effective energy transitions.

Keywords: Citizen Assemblies; Energy Transition; Consensus Quality; Resource Access; Citizen Assembly Formats

1. Introduction

The imperative to transition from fossil fuel-dependent energy systems to sustainable, renewable alternatives constitutes one of the most pressing governance challenges of the contemporary era. While the technical and economic pathways for this energy transition are well-documented, the sociopolitical dimensions remain fraught with complexity [1]. Localized opposition, often characterized by the not in my backyard phenomenon, alongside broader ideological polarization, frequently stalls the implementation of critical infrastructure projects such as wind farms, solar arrays, and high-voltage transmission lines [2]. In response to these democratic bottlenecks, policymakers and democratic theorists have increasingly turned to deliberative democratic innovations, most notably citizen assemblies, to navigate deeply contested policy terrain [3]. Citizen assemblies convene randomly

selected, demographically representative cohorts of lay citizens to learn about, discuss, and propose solutions to complex public issues.

Despite the growing proliferation of citizen assemblies in climate and energy governance, the outcomes of these processes exhibit profound variance. In some instances, assemblies produce highly robust, sophisticated, and widely accepted policy recommendations, reflecting a high quality of consensus [4]. In other cases, the resulting consensus is fragile, superficial, or skewed by dominant voices, failing to translate into legitimate or actionable public policy [5]. This discrepancy raises a fundamental research question: what explains the variation in consensus quality within citizen assemblies addressing energy transition debates? While existing scholarship has extensively examined participant selection mechanisms and the broader political impact of deliberative outputs, there remains a critical gap in understanding the micro-level and meso-level structural conditions that shape the deliberative process itself.

This paper argues that the quality of consensus generated in citizen assemblies is fundamentally determined by two interrelated factors: the organizational format of the assembly and the level of resource access afforded to the participants. Assembly formats encompass the structural design of deliberation, including the balance between large plenary sessions and intimate small-group discussions, the role of facilitation, and the temporal sequencing of the learning and deliberative phases [6]. Resource access, conversely, refers to the informational, cognitive, and logistical support provided to citizens, ranging from comprehensive background materials and direct engagement with subject matter experts to adequate time and compensation for participation [7].

The primary objective of this research is to systematically unpack the mechanisms through which these formats and resources interact to influence the depth, inclusivity, and resilience of the resulting consensus. By focusing specifically on energy transition debates, a policy area characterized by high technical complexity and profound normative trade-offs, this study isolates the critical variables that enable lay citizens to bridge deep divides [8]. The paper proceeds by reviewing the relevant theoretical literature on deliberative democracy and energy policy, followed by a detailed methodology outlining the comparative case study approach. Subsequently, the data collection and analytical procedures are presented, leading to a comprehensive discussion of the empirical findings and their implications for the future design of democratic institutions.

2. Literature Review and Theoretical Framework

2.1 Deliberative Democracy and the Goal of Consensus

The theoretical foundation of this study is grounded in deliberative democracy, a paradigm that emphasizes the role of rational, inclusive, and egalitarian discourse in political decision-making. Unlike aggregative models of democracy that rely merely on voting and the aggregation of predetermined preferences, deliberative democracy posits that preferences can be transformed through reasoned argumentation and exposure to diverse perspectives [9]. A central, albeit debated, goal of deliberation is the achievement of consensus. In the context of citizen assemblies, consensus does not necessarily imply absolute unanimity on all granular details, but rather a meta-agreement on core principles, trade-offs, and policy directions that all participants find rationally acceptable and legitimate [10].

High-quality consensus is characterized by its epistemic and democratic value. Epistemically, a high-quality consensus reflects a comprehensive understanding of the factual complexities and trade-offs inherent in the policy problem. Democratically, it requires that the agreement was reached without coercion, manipulation, or the marginalization of minority viewpoints [11]. Evaluating consensus

quality therefore requires analyzing both the substance of the final recommendations and the procedural fairness of the dialogue that produced them.

2.2 The Complexity of Energy Transition Debates

Energy transition debates serve as an ideal crucible for testing the efficacy of deliberative formats and resource provision due to their inherent complexity. Transitioning to a low-carbon economy involves multidimensional challenges, including technological feasibility, economic cost distribution, ecological impacts, and social justice concerns [12]. Citizens are often asked to weigh abstract, long-term global benefits against immediate, highly localized costs. Furthermore, the energy sector is historically dominated by technocratic expertise, which can create significant barriers to entry for lay citizens attempting to engage in meaningful policy discussions [13].

Consequently, deliberating on energy transitions requires participants to rapidly assimilate complex scientific and economic data while simultaneously navigating deeply entrenched values regarding landscape preservation, economic security, and climate responsibility. The cognitive load placed on participants is immense, making the structural design of the assembly and the provision of adequate resources absolute prerequisites for avoiding cognitive overload and ensuring equitable participation [14].

2.3 Citizen Assembly Formats as Structural Determinants

The organizational format of a citizen assembly dictates the spatial and interactional dynamics of the deliberation. Existing literature identifies several critical components of assembly formats, with the division between plenary and small-group sessions being the most salient [15]. Plenary sessions, where all participants gather to hear expert testimonies or vote on final recommendations, are essential for establishing a shared informational baseline and fostering a collective identity among the assembly members. However, plenary environments often inhibit participation from less confident individuals, leading to a disproportionate dominance of the discourse by highly educated or extroverted participants [16].

Small-group deliberations, typically consisting of six to ten participants guided by a trained facilitator, are designed to counter these exclusionary dynamics. In these settings, citizens have the opportunity to test arguments, ask clarifying questions without fear of judgment, and engage in the iterative process of reciprocal perspective-taking. The rotation of group membership throughout the assembly further prevents the formation of entrenched cliques and ensures cross-pollination of ideas. The hypothesis drawn from this literature is that assembly formats that heavily utilize facilitated small-group structures will yield higher democratic inclusivity, a necessary component of high-quality consensus.

2.4 The Critical Role of Resource Access

While format provides the structure for interaction, resource access provides the substance necessary for meaningful deliberation. In the context of highly technical energy debates, information asymmetry between lay citizens and subject matter experts is a profound obstacle. Providing access to balanced, accessible, and comprehensive informational resources is crucial for leveling the playing field [17]. This includes not only written briefing materials but also the opportunity to directly interrogate a diverse panel of experts representing various academic, industrial, and activist perspectives.

Moreover, resource access extends beyond mere information to encompass temporal and logistical resources. Time is perhaps the most critical and frequently under-provisioned resource in democratic

innovations. Complex cognitive processing and the negotiation of conflicting values cannot be artificially accelerated. Assemblies that operate under severe time constraints often produce superficial agreements based on lowest-common-denominator compromises rather than genuine consensus [18]. Additionally, providing financial compensation and caregiving support ensures that individuals from lower socioeconomic backgrounds can participate fully, thereby preserving the demographic representativeness and legitimacy of the assembly.

3. Methodology and Research Design

3.1 Research Framework and Case Selection

To investigate the impact of assembly formats and resource access on consensus quality, this study employs a comparative case study design analyzing three recent citizen assemblies focused on national and regional energy transition policies. The selection of cases was guided by a maximum variation sampling strategy regarding the independent variables of interest while holding the policy domain constant. The selected assemblies varied significantly in their duration, their reliance on small-group versus plenary sessions, and the extent of expert and informational resources provided to participants.

Table 1: Overview of Citizen Assembly Case Studies

Case Identifier	Assembly Format Emphasis	Resource Access Level	Duration (Days)	Participant Count
Assembly Alpha	Small-Group Intensive	High (Extensive Expert Access)	12	100
Assembly Beta	Plenary Dominant	Medium (Standard Briefings)	6	150
Assembly Gamma	Balanced Format	Low (Limited Time and Materials)	4	50

The structured comparison of these three cases allows for the systematic isolation of structural and procedural variables. Assembly Alpha represents an ideal-typical model with extensive temporal resources and a heavy emphasis on decentralized deliberation. Assembly Beta relies more on traditional centralized information dissemination, while Assembly Gamma represents a highly constrained deliberative environment.

3.2 Conceptualization and Measurement of Variables

The dependent variable in this study is consensus quality. Measuring the quality of consensus requires a multidimensional approach that captures both the substance of the agreement and the procedural fairness of its derivation. Consensus quality is operationalized using three distinct indicators. First, epistemic robustness is measured by analyzing the final policy recommendations for internal consistency, technical feasibility, and the integration of multiple distinct perspectives. Second, democratic inclusivity is measured through post-assembly participant surveys assessing the perceived fairness of the process and the extent to which participants felt their voices were heard and integrated into the final output. Third, preference transformation is evaluated by comparing pre-deliberation and post-deliberation survey responses to determine the extent to which participants modified their initial positions based on the arguments presented.

The independent variables, assembly format and resource access, are operationalized through detailed process tracing of the assembly agendas and organizational documents. Assembly format is measured by calculating the ratio of time spent in facilitated small groups versus large plenary sessions, as well as evaluating the specific pedagogical techniques employed by facilitators. Resource access is measured by assessing the volume and accessibility of preparatory materials, the diversity and

availability of expert witnesses, the total hours allocated for unscripted deliberation, and the provision of logistical support to participants.

3.3 Participant Profiles and Sampling Strategy

Ensuring the validity of the comparative analysis requires an examination of the participant profiles across the three cases. All three assemblies utilized a stratified random sampling methodology to recruit participants, commonly referred to as sortition. This process involves sending out thousands of initial invitations to randomly selected addresses and subsequently filtering the positive respondents to match the demographic profile of the broader population based on criteria such as age, gender, educational attainment, geographic location, and baseline attitudes toward climate change.

Despite the uniform recruitment strategy, the actual retention and active participation rates during the assemblies can be influenced by the resource access variables under investigation. By analyzing the demographic metadata of the participants alongside the qualitative transcripts of their contributions, the research design accounts for potential confounding variables related to individual-level characteristics and focuses the analysis squarely on the structural determinants of the assembly environment.

4. Data Collection and Analysis

4.1 Survey Instruments and Qualitative Coding

The empirical data for this study was collected through a mixed-methods approach, combining quantitative survey data with rigorous qualitative analysis of deliberative transcripts. Quantitative data was gathered using standardized pre-deliberation, mid-deliberation, and post-deliberation surveys administered to all participants across the three cases. These surveys utilized Likert-scale questions to assess participants' self-reported comprehension of the energy transition issues, their trust in the provided expert materials, their perception of the facilitators' neutrality, and their overall satisfaction with the final consensus documents.

In addition to the survey data, extensive qualitative data was generated by transcribing the audio recordings of both plenary sessions and a representative sample of small-group deliberations. These transcripts were subjected to a rigorous thematic coding process using a standardized coding dictionary. The coding framework was designed to identify instances of reasoned justification, reciprocal listening, the introduction of novel information into the debate, and moments of explicit consensus-building or conflict resolution. The coding process also tracked the distribution of speaking time among demographic groups to objectively measure deliberative equality.

Table 2: Descriptive Statistics of Consensus Quality Indicators

Case Identifier	Epistemic Robustness Score (1-10)	Inclusivity Index (%)	Preference Transformation Rate (%)
Assembly Alpha	8.7	92	68
Assembly Beta	6.2	74	41
Assembly Gamma	4.5	58	22

4.2 Analytical Procedures

The quantitative survey data was analyzed using descriptive statistics to identify macro-level trends in participant satisfaction and preference modification across the three cases. Inferential statistical models, specifically multivariate regression analysis, were employed to determine the correlation between the self-reported adequacy of resource access and the perceived legitimacy of the final consensus.

For the qualitative data, an iterative process of grounded theory was utilized to uncover the micro-dynamics of how assembly formats influenced the trajectory of the energy debates. By mapping the flow of arguments from their initial introduction in expert plenary sessions through their dissection in small-group settings, the analysis traces the exact pathways through which structural variables impact cognitive processing.

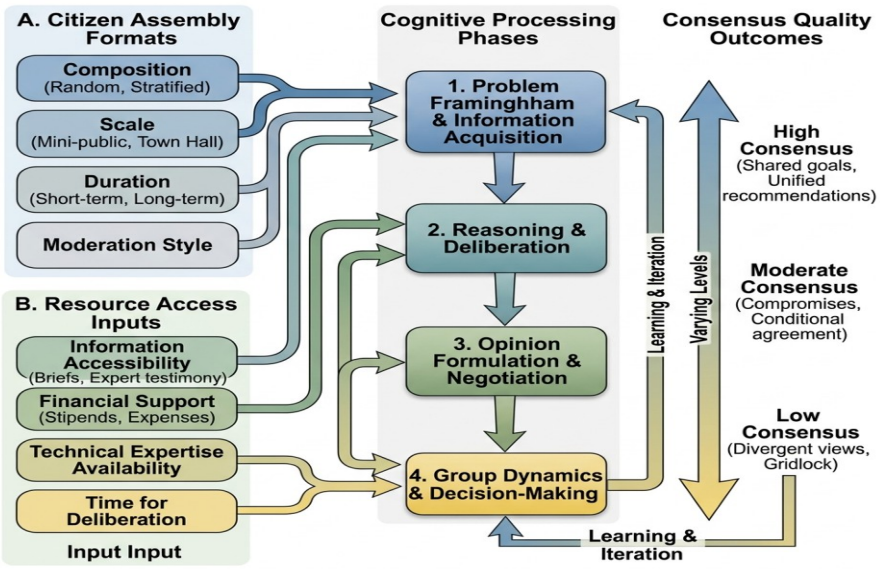

Figure 1: Comprehensive Schematic of Deliberative Process and Resource Access Impact Mechanism

The combination of these analytical procedures provides a robust, triangulated understanding of the deliberative environment. The survey data establishes the broad outcome variances, while the qualitative transcript analysis uncovers the causal mechanisms driving those variances, specifically highlighting how the intersection of time, expert knowledge, and interactional format shapes the evolution of collective agreement.

5. Results and Discussion

5.1 The Impact of Assembly Formats on Deliberative Dynamics

The empirical analysis reveals a profound relationship between the organizational format of the citizen assembly and the resulting quality of consensus. Assembly Alpha, which dedicated approximately seventy percent of its schedule to facilitated small-group discussions, demonstrated significantly higher levels of democratic inclusivity and preference transformation compared to the other cases. The transcript data from this assembly indicates that the small-group format provided a psychologically safe environment for participants with lower formal educational backgrounds to articulate their concerns regarding the economic costs of the energy transition. In this setting, technical jargon introduced by experts was organically translated into accessible language through peer-to-peer dialogue, enhancing overall comprehension.

Conversely, Assembly Beta, which utilized a plenary-dominant format, exhibited a distinct concentration of speaking time among a subset of highly educated, predominantly male participants. In these large settings, the debates often mirrored traditional adversarial political discourse rather than collaborative deliberation. The consensus generated in Assembly Beta, while technically sound due to the heavy reliance on expert testimony, lacked the deep, internalized support of the broader participant

base. Many participants in the post-survey reported feeling that the final recommendations were somewhat imposed upon them by the more vocal members, highlighting a failure in the democratic inclusivity dimension of consensus quality [19].

5.2 The Critical Influence of Resource Access

While format structuralizes the interaction, the findings demonstrate that resource access fundamentally determines the epistemic boundaries of the consensus. Time emerged as the single most critical resource. Assembly Gamma, constrained to a mere four days of deliberation, suffered from severe cognitive bottlenecking. Participants were overwhelmed by the complexity of energy grid infrastructure and renewable subsidy mechanisms. The transcript analysis shows that in the absence of sufficient time to process this information, participants heuristically reverted to their pre-existing ideological biases, resulting in a low preference transformation rate and a shallow, highly generalized final consensus document.

The provision of diverse, interactive expert access also proved essential. In Assembly Alpha, participants had the opportunity to call upon neutral specialists during their small-group sessions to clarify specific factual disputes. This immediate access to tailored information prevented debates from derailing into factual dead-ends and allowed the groups to focus on navigating the underlying value trade-offs.

Table 3: Correlation Analysis of Resource Provision and Deliberative Outcomes

Resource Variable	Correlation with Epistemic Robustness	Correlation with Inclusivity Index	Statistical Significance
Time Allocation	0.84	0.76	High
Expert Interactivity	0.79	0.62	High
Preparatory Materials	0.55	0.41	Moderate

As demonstrated in the correlation analysis, both time allocation and expert interactivity are strongly correlated with the achievement of a robust and inclusive consensus. The provision of static preparatory materials, while helpful, was significantly less impactful than dynamic, interactive resource access.

5.3 Synthesizing Formats and Resources for Consensus Quality

The synthesis of these findings suggests a clear interaction effect between assembly format and resource access. A highly decentralized, small-group format is ineffective, and potentially detrimental, if not supported by adequate temporal and informational resources. Without expert guidance and sufficient time, small groups risk pooling ignorance or amplifying shared misconceptions. Conversely, abundant resources delivered exclusively through centralized plenary formats fail to penetrate the cognitive barriers of the broader participant base, resulting in technocratic agreements that lack broad democratic legitimacy.

High-quality consensus in energy transition debates is achieved only when intensive small-group deliberation is coupled with extensive, interactive resource provision. This combination allows lay citizens to systematically deconstruct complex policy challenges, rigorously test alternative solutions against competing community values, and forge agreements that are both scientifically viable and socially resilient. Policymakers designing future assemblies must recognize that economizing on time or expert access fundamentally undermines the core utility of the deliberative process.

6. Conclusion

This paper has systematically investigated the structural and procedural determinants of consensus quality within citizen assemblies addressing the complex challenges of the energy transition. By

comparing multiple cases with varying organizational formats and levels of resource provision, the research demonstrates that the capacity of lay citizens to reach robust, equitable, and actionable agreements is not inherent to the assembly model itself, but is strictly contingent upon its specific architectural design. The empirical evidence overwhelmingly indicates that prioritizing facilitated small-group formats, coupled with generous allocations of time and direct, interactive access to diverse subject matter expertise, is essential for mitigating the cognitive and social barriers inherent in energy policy debates.

When participants are granted the necessary resources to navigate technical complexities in an egalitarian setting, they exhibit a remarkable capacity for preference transformation and nuanced problem-solving. Conversely, assemblies constrained by brief durations, plenary-dominant structures, and limited informational support consistently produce superficial consensus documents that fail to bridge deep societal divides and risk exacerbating democratic disillusionment [20].

While this study provides critical insights, it is subject to certain limitations. The comparative case study approach, though rich in qualitative detail, relies on a limited sample size, which may restrict the broad generalizability of the specific quantitative correlations across vastly different political cultures. Furthermore, evaluating the long-term durability of the consensus generated by these assemblies once participants re-enter the broader polarized public sphere remains an ongoing challenge for deliberative scholars. Future research should focus on longitudinal tracking of assembly participants and the eventual policy uptake of deliberative recommendations by formal legislative bodies. Ultimately, as the global community confronts the escalating demands of climate change mitigation, optimizing the design of democratic innovations like citizen assemblies will be paramount in forging the durable public consensus necessary for a just and effective energy transition.

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