Comparing PET And ACF To Explain The Clean Air Act Amendments Of 1990

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Abstract—The 1990 Clean Air Act Amendments (CAAA) revolutionized U.S. air pollution policy through market-based reforms like acid rain cap-and-trade. This paper compares Punctuated Equilibrium Theory (PET) and the Advocacy Coalition Framework (ACF) to explain the law's enactment, analyzing how competing problem definitions of air pollution as a public health crisis (environmentalists) versus economic burden (industry) shaped outcomes. Using congressional records, media, and coalition statements, the study tests two mechanisms: PET's crisis-driven policy windows (acid rain's ecological impacts) and ACF's coalitional adaptation (negotiated cap-and-trade). Results show that PET explains the timing of rapid post-crisis action, while ACF details the content via policy learning and bargaining. By integrating PET's focus on disruption with ACF's coalition dynamics, the study resolves a theoretical gap, offering a model for analyzing crisis-to-compromise policy shifts in polarized environmental debates.

Keywords—component;Punctuated Equilibrium Theory (PET), Advocacy Coalition Framework (ACF), Clean Air Act Amendments (CAAA), Pollution Emissions, Focusing Events, Coalition Resources, Policy-Oriented Learning, Pro-Regulation Coalition, Anti-Regulation Coalition.

I. INTRODUCTION.

The 1990 Clean Air Act Amendments responded to public concern over acid rain, ozone depletion, urban air pollution, toxic emissions, and air pollution's health risks, making it one of the most significant environmental policies in U.S. history. This analysis focuses on the 1990 Clean Air Act Amendments (Public Law 101-549), focusing on its cap-and-trade program for acid rain and stricter emission standards for pollutants like SO_2 and NO_x, using PET and ACF to explain how competing problem definitions shaped policy change, also on the legislative process and policy formulation of the bill, examining how political dynamics, scientific consensus, and competing advocacy coalitions influenced its passage.

Deborah Stone's causal strategies emphasize defining problems by identifying causes, assigning blame, and justifying government intervention. (Stone, 2012). The acid rain problem was framed differently by key actors, shaping the policy response.
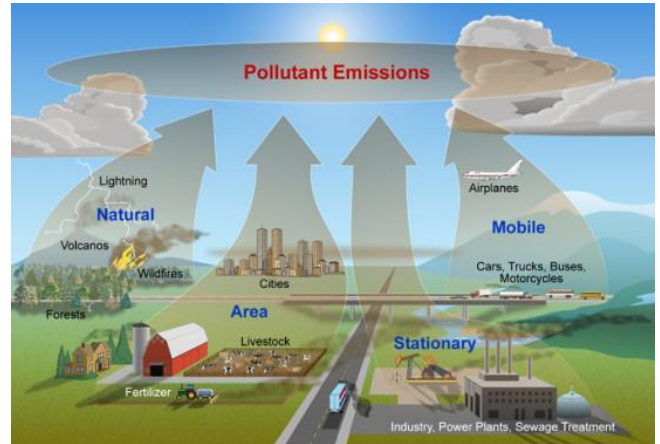

Figure 1: *Cause of Air Pollution Emissions.*

Environmentalists and Scientists presented the issue as a causal one, pointing to the harm that air pollution does to the ecosystem and human health. "Acid rain is not just an environmental issue; it's a public health crisis," stated Senator George Mitchell in 1988. This framing sparked political and public attention and made the issue seem urgent (Shabecoff, 1988).

On the other hand, industry associations and conservative legislators presented the matter as an economic one, contending that more stringent restrictions would result in job losses and increased expenses for businesses (ETS, 2024). "We recognize the need for stricter regulations, but we must balance environmental protection with economic growth," a utility company staff stated in 1989. The policy debate was driven by these opposing frameworks, with industrial organizations arguing for more adaptable, economical solutions and environmental advocates calling for more controls. By the mid-1980s, conclusive scientific evidence from NAPAP linked acid rain to SO_2 and NO_x emissions, enabling advocacy groups to redefine the issue as a human-caused crisis rather than a natural occurrence, shaping the policy debate (EPA, 2016)

The 1990 Clean Air Act Amendments emerged from a decade-long curve, NAPAP's 1980s acid rain studies linked pollution to industry, the 1987 Montreal Protocol spurred global urgency, and President Bush's 1988 environmental pledge converged with bipartisan Senate hearings in 1989. Industry resistance crumbled under scientific consensus and public pressure, culminating in the 1990s' swift passage of cap-and-trade, a crisis-driven breakthrough (PET) built on years of coalition bargaining (ACF). Over time, scientific consensus (NAPAP studies) and media coverage shifted the

framing from a localized issue to a cross-state environmental emergency, forcing policymakers to act. Despite this shift, policy process theories such as PET and ACF struggle to account fully for how problem definitions evolve within coalitions. For example, ACF does not clearly define the causal mechanisms behind coalition membership shifts, limiting its explanatory power in this case.

A. Research Question

How do Punctuated Equilibrium Theory (PET) and the Advocacy Coalition Framework (ACF) explain the enactment of the Clean Air Act Amendments of 1990 (Public Law 101-549), and what does their interplay reveal about the role of *crisis-driven policy windows* (PET) versus *coalition-driven negotiation* (ACF) in resolving competing problem definitions (e.g., public health crisis vs. economic burden) through causal narratives (Stone, 2002)?

II. LITERATURE REVIEW

The 1990 Clean Air Act Amendments (CAAA) have been widely studied as a case of major policy change in environmental regulation, specifically with regard to market-based solutions, federal intervention, and regulatory enforcement. Several policy process theories have been utilized in research on policy change in environmental governance; two of the most widely used to explain the passage of the CAAA are the Advocacy Coalition Framework (ACF) and the Punctuated Equilibrium Theory (PET).

Punctuated Equilibrium Theory (PET) has been widely applied to explain sudden shifts like the 1970 Clean Air Act, attributing change to focusing events that disrupt policy monopolies (True et al., 2006) see Baumgartner and Jones, 1993). Conversely, the Advocacy Coalition Framework (ACF) highlights gradual processes, such as policy-oriented learning and resource mobilization, as seen in ozone depletion policies (Weible & Sabatier, 2023). However, few studies integrate both frameworks to explain how crisis-driven *and* coalition-driven mechanisms interact in a single case, particularly in market-based environmental reforms like the 1990 Amendments. This gap reflects a broader lacuna in policy process theory: PET undervalues incremental coalitional adaptation, while ACF underestimates the catalytic role of crises (Weible & Sabatier, 2023).

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III. THEORETICAL FRAMEWORK

The Clean Air Act Amendments of 1990 serve as a critical case study to evaluate two competing policy process theories: Punctuated Equilibrium Theory (PET) and the Advocacy Coalition Framework (ACF). Each framework offers distinct assumptions and causal mechanisms to explain how environmental policy transitions from stagnation to reform, particularly in the face of competing problem definitions (Stone, 2012).

The Punctuated Equilibrium Theory (PET) posits that policymakers, controlled by bounded rationality, prioritize issues only when they escalate into crises, leading to prolonged policy standstill until focusing events disrupt entrenched policy monopolies (Weible & Sabatier, 2023). For the 1990 Clean Air Act Amendments, industry groups like coal plants and automakers had a long monopoly over air pollution policy, disregarding acid rain as not an urgent issue. This equilibrium was shattered in the 1980s when scientific consensus from the National Acid.

Precipitation Assessment Program (NAPAP) linked acid rain to industrial emissions, media coverage highlighted ecological devastation, and public outcry intensified (Congressional, 2022). President George H.W. Bush's political entrepreneurship broke the partisan headlock by proposing a market-based cap-and-trade system, offering a midpoint that industry could meet. The combination of these factors, scientific evidence, media amplification, and leadership, collapsed the policy monopoly, triggering swift, sweeping reforms. The fast enactment of the 1990 amendments after years of not taking action demonstrates PET's core premise that transformative policy change happens not incrementally but in abrupt bursts following crises that disrupt the status quo.

Conversely, the Advocacy Coalition Framework (ACF) highlights gradual processes, such as policy-oriented learning and resource mobilization, as seen in ozone depletion policies (Sabatier & Jenkins-Smith, 1993). The Advocacy Coalition Framework (ACF) explains the 1990 Clean Air Act Amendments through the interplay of two coalitions: a pro-regulation coalition (environmental groups, EPA scientists) advocating stricter controls and an anti-regulation coalition (industry groups) resisting economic burdens. ACF highlights policy-oriented learning as scientific consensus on acid rain's harms weakened industry resistance, pushing some actors to accept a market-based cap-and-trade system as a pragmatic alternative. External shifts, like President George H.W. Bush's 1988 election, further tilted power: his bipartisan leadership bridged coalitions, endorsing cap-and-trade to balance environmental and economic goals (Kahn, 2018).

Unlike PET's crisis-driven model, ACF emphasizes gradual change via coalition adaptation and negotiation. The final policy compromise, blending emission reductions with industry flexibility, reflects years of learning, coalition strategies, and incremental power shifts rather than sudden disruption (Christopher M., 2011). Both frameworks, however, intersect in their reliance on causal narratives (Stone,

2012). PET's focusing events depend on problem framing, such as acid rain as a health crisis, while ACF's coalitions use narratives to mobilize support using industry-framing regulation as economically harmful.

IV. RESEARCH DESIGN AND METHOD.

Each framework offers a distinct lens through which to understand the policy outcome of the Clean Air Act Amendments of 1990, and neither provides a complete explanation on its own. Punctuated Equilibrium Theory (PET) appears particularly adept at explaining the timing and magnitude of the policy change. The focusing event, the acid rain crisis, supported by the 1980s National Acid Precipitation Assessment Program (NAPAP) study, provided definite evidence linking SO_2 and NO_x emissions to environmental harm. Media coverage and international agreements like the 1987 Montreal Protocol amplified public concern, creating a policy window that overrode industry resistance and enabled the 1990 Clean Air Act Amendments (Environment, 2018). PET also explains how policy monopolies disruption continue until external pressures force change (Jones et al., 2003). Before 1990, industry groups, such as automobile producers, utility companies, and other big organizations dominated environmental policymaking, stopping stricter air pollution controls for their own benefit. However, the scientific evidence, shifting public opinion, and President George H.W. Bush's support for environmental action weakened industry influence. Rather than outright opposition, industry backed a cap-and-trade system, balancing regulation with economic flexibility.

The Advocacy Coalition Framework (ACF) highlights how coalitions adapt strategies over time in response to new evidence and political shifts. Initially, the industry ignored acid rain concerns, but surfacing scientific data led some actors to accept regulation, pushing for a cap-and-trade system as a compromise. Environmental groups also adjusted their framing and emphasized economic and public health costs to strengthen political support. ACF further emphasizes coalition mobilization, where lobbying, media campaigns, and strategic partnerships shape policy outcomes. Environmental groups like NRDC and the Sierra Club lobbied Congress and framed acid rain as a national crisis, while industry groups redirected efforts toward shaping policy rather than resisting it. The final cap-and-trade concession reflected long-term coalition strategies, demonstrating that negotiated outcomes, rather than a single event, drove policy change. Additionally, policy-oriented learning within these coalitions likely played a role, with learning from scientific research on the adverse effects of air pollution informing their policy proposals. The hypothesis would be that policy documents and advocacy materials from environmental groups increasingly referenced scientific findings on air pollution and its impacts. Therefore, PET helps explain the when and the how of significant changes, while ACF sheds light on the what and the why in terms of the content of the amendments and the influence of competing groups.

Causal Mechanism	Punctuated Equilibrium Theory (PET)	Advocacy Coalition Framework (ACF)
Focusing Events	Hypothesis: The acid rain crisis significantly increased public and political attention on air pollution, creating a window of opportunity for substantial legislative change in 1990. (Evidence: Media coverage trends, public opinion polls, congressional hearing records focusing on acid rain).	
Policy Monopoly Disruption	Hypothesis: Prior to 1990, industry interests held significant sway over clean air policy, but the influence of environmental advocacy groups and scientific evidence of environmental damage increased, leading to a weakening of the industry's policy monopoly and enabling more stringent regulations. (Evidence: Analysis of lobbying records, testimonies from different stakeholder groups, changes in committee membership and power relevant to environmental policy).	
Coalition Resources/Strategies		Hypothesis: Environmental advocacy coalitions effectively mobilized resources

		(funding, scientific expertise, public support) and employed strategies (lobbying, public awareness campaigns) to push for stronger clean air regulations in the lead-up to the 1990 amendments. (Evidence: Funding reports of environmental groups, analysis of their lobbying activities and public campaigns, media content analysis).
Policy-Oriented Learning		Hypothesis: Advocacy coalitions, particularly environmental groups, learned from scientific research on acid rain, ozone depletion, and the health impacts of air pollution and used this learning to advocate for specific policy solutions incorporated into the 1990 amendments (e.g., cap-and-trade). (Evidence: Policy documents referencing scientific studies, statements from coalition members about the influence of research, content analysis of advocacy group publications).

A. Key Actors

The 1990 Clean Air Act Amendments were driven by key actors in agenda-setting, policy formulation, and implementation, with PET and ACF highlighting different influences. PET focuses on those who broke the policy monopoly and opened the policy window, while ACF stresses coalition-building, resource mobilization, and long-term competition between pro- and anti-regulation groups, shaping the final policy outcome. For PET, several key actors disrupted industry dominance and enabled policy reform. President George H.W. Bush (Kahn, 2018), as a policy entrepreneur, broke Republican opposition by advocating a cap-and-trade system, securing bipartisan support for stricter regulations. NAPAP scientists provided evidence linking acid rain to industrial emissions, creating a focusing event that made inaction politically untenable. The media amplified the crisis, broadcasting visual evidence of environmental damage, and increasing public pressure. Congressional Committees on Environment & Public Works then became the legislative arena for change, holding hearings and shaping the final Clean Air Act compromise. Together, these forces compelled acid rain regulation onto the policy agenda, making the 1990 Clean Air Act Amendments inevitable (Congressional, 2022). ACF, policy change results from long-term competition between coalitions with shared beliefs. The pro-regulation coalition is the EPA environmental advocacy groups, and pro-environment legislators, pushed for stricter air pollution controls by stating scientific consensus and economic consequences. The EPA played a major role in advocating for air quality standards and executing cap-and-trade regulations, using NAPAP data to counter industry opposition. Environmental groups like the NRDC and Sierra Club mobilized public opinion, lobbied Congress, and used lawsuits to push for stronger regulations, ensuring that scientific findings shaped policy discussions. Senator Daniel Moynihan and Senator George Mitchell championed stricter air pollution laws, using their policymaking influence to negotiate a bipartisan midpoint. These groups secured passage of the 1990 Amendments, demonstrating ACF's emphasis on gradual, coalition-driven policy change.

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2) *Key Actors in the 1990 Clean Air Act Amendments*

Actor	Category	Role/Influence
• Environmental NGOs (NRDC, Sierra Club). • EPA Scientists. • Public Health Advocates.	Pro-Regulation Coalition.	Framed pollution as a public health/environmental crisis; mobilized public support; provided scientific evidence (NAPAP data).

• Industry Groups (National Coal Association, Auto Manufacturers). • Utility Companies.	Anti-Regulation Coalition.	Initially resisted regulations, arguing economic harm; later pivoted to shape policy (e.g., endorsing cap-and-trade).
• President George H.W. Bush. • Senator George Mitchell (D-ME). • Congressional Research Service (CRS).	Government/Neutral Actors	Bush brokered bipartisan compromise; Mitchell led Senate hearings; CRS provided neutral policy analysis.
• Major Media Outlets (e.g., *NYT*, *Washington Post*). • Public Opinion Polls.	Media/Public	Amplified acid rain's ecological impacts; shifted public sentiment, pressuring lawmakers to act.

3) Mode of Policy Learning.

Punctuated Equilibrium Theory (PET) and Advocacy Coalition Framework (ACF) offer different perspectives (Christopher M., 2011). PET assumes that learning is reactive, occurring only after a crisis disrupts the policy monopoly, forcing decision-makers to act. This was evident in the 1990 Clean Air Act Amendments, where policymakers disregarded acid rain warnings for years until the NAPAP study provided undeniable evidence, triggering sudden legislative action. In contrast, ACF views learning as gradual, occurring within competing coalitions over time. Industry groups initially resisted regulation but, as scientific evidence and public pressure grew, shifted to supporting cap-and-trade as a compromise. This reflects ACF's policy-oriented learning, where actors adapt strategies incrementally rather than reacting to crises. While PET explains the timing of policy change, ACF explains how coalitions shaped the final policy outcome through ongoing learning and negotiation. Figure 2 shows how the enactment of the Clean Air Amendment brough a tremendous decline in air pollution emissions .
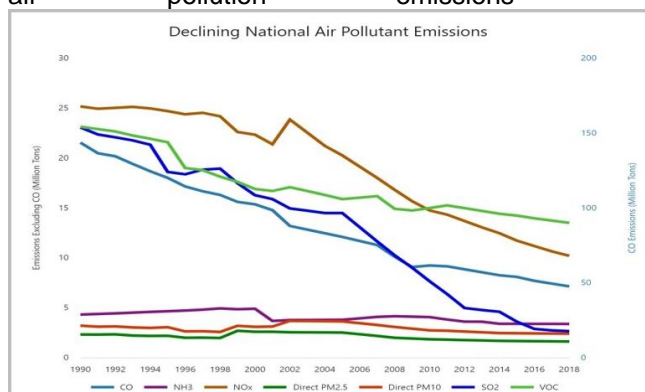

Figure 2: *Effect of Clean Air Act Amendment.*

4) Role of Policy's Content.

The 1990 Clean Air Act Amendments were shaped by key parts of policy content, impacting their political acceptance. The complexity of acid rain regulation, which involved multiple pollution sources, cross-state emissions, and scientific uncertainty, required a balanced approach between environmental protection and economic feasibility. The cap-and-trade system for SO_2 emissions provided a flexible, cost-effective solution, making implementation more viable. Political prominence also played a crucial role, as a public concern, media pressure, and President George H.W. Bush's environmental stance made nonaction politically costly. Bipartisan support emerged as Democrats pushed for stricter controls while Republicans favored market-based solutions, leading to the cap-and-trade compromise. The successful implementation of the policy was aided by its ability to gain industry support for cap-and-trade instead of command-and-control regulations, while effective enforcement mechanisms helped ensure compliance. This outcome aligns with ACF's view of policy change as a negotiated coalition process rather than PET's assumption of crisis-driven shifts alone.

RESULTS.

Both Punctuated Equilibrium Theory (PET) and Advocacy Coalition Framework (ACF) provide valuable insights into the 1990 Clean Air Act Amendments, though their explanatory power differs by stage in the policy process. PET explains why the change happened in 1990, highlighting the acid rain crisis, scientific consensus, and media pressure as focusing events that forced Congress to act. However, it overlooks the gradual coalition competition and learning that influenced policy design. ACF, in contrast, explains how the final policy outcome was shaped, showing how industry and environmental groups engaged in long-term negotiations, leading to a cap-and-trade compromise instead of strict pollution caps. Yet, ACF alone fails to explain why the policy window opened at that specific moment, as it does not emphasize external shocks. A mixed PET-ACF approach provides the most comprehensive explanation. PET accounts for the sudden policy shift, while ACF explains the negotiated outcome. Without the acid rain crisis, ACF would not explain why the change occurred in 1990, and without coalition learning, PET would not explain why cap-and-trade became the preferred solution. While PET explains the "when" of policy change, while ACF explains the "how," making them complementary rather than competing frameworks.

Data Types and Their Relevance to PET and ACF

Data Type	Examples	PET Relevance	ACF Relevance
Primary Documents	**Congressional hearings (1988–1990), NAPAP reports and Public Law 101-549**	**Shows sudden shifts (industry losing control).**	**Shows learning (industry adapting to new rules).**
Media Coverage	***NYT* articles on acid rain, TV news clips (1980s) and Gallup polls**	**Tracks crisis attention (acid rain headlines).**	**Reflects how groups frame issues ("health vs. jobs").**
Coalition Activities	**Sierra Club lobbying records and Industry statements on cap-and-trade**	**Signals industry giving in (cap-and-trade).**	**Tracks lobbying, strategies (environmental campaigns).**

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