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Effectiveness in NEPA decision making: in search of evidence and theory

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ABSTRACT

The National Environmental Policy Act (NEPA) of 1969 requires federal agencies to analyze the environmental impacts of proposed actions that could impact the human environment, as well as consult the public before determining whether to proceed. Despite many thousands of environmental reviews over a 50-year history, there remains limited understanding of what NEPA has achieved and the factors that contribute to effective environmental review. While NEPA has been the subject of many empirical studies, this scholarship only rarely makes use of theories that would help scholars predict whether and why environmental impact assessment processes are effective. To aid scholars in the ongoing effort to assess NEPA's effectiveness, we connect the literature on environmental impact assessment with social science concepts and theories that can improve scholars' ability to explain whether and why environmental impact assessment practices are effective.

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In the retrospective of public policy, impact analysis and assessment appear to me to be perhaps the most important innovation in decision making in recent decades. Yet, as of today, the actual impact of this procedure is far from readily apparent.'

Lynton Keith Caldwell 1991, p. 85.

Introduction

For the past five decades, the National Environmental Policy Act (NEPA) of 1969 has required the federal government to review all proposed actions that might generate significant environmental impacts, consult with the public and other stakeholders, and produce a final decision that responds to both scientific analysis and public concerns. NEPA has commanded considerable sway over actions proposed by federal agencies. Tens of thousands of NEPA reviews have been conducted over the years (U.S. Government Accountability Office, 2014), not to mention those conducted by NEPA's progeny in other states and in over 190 countries around the world (Morgan, 2012). While NEPA provides a coordinating framework for interagency cooperation on substantive laws such as the Clean Water Act and the Endangered Species Act, its central core activity is the analysis of environmental impacts, documented in an Environmental Impact Statement (EIS).

With the arrival of NEPA's 50th birthday in 2019, it is time to take stock of the effectiveness of agency decision making and environmental governance under NEPA. There is no denying that NEPA has significantly shaped how we make federal environmental decisions (Canter & Clark, 1997). But unlike other substantive environmental statutes, such as the Clean Air Act or the Clean Water Act, there have been few attempts to systematically document and explain NEPA's influence on environmental outcomes or on environmental governance (U.S. Government Accountability Office, 2014). In fact, there are divergent views about what constitutes an 'effective' environmental assessment process (Cashmore, Gwilliam, Morgan, Cobb, & Bond, 2004). On the

ground, NEPA is viewed by some as the standard for sound environmental decision-making, but by others as a symbol of overregulation; and scholars have proffered multiple – and often conflicting – approaches to defining effectiveness of the impact assessment process. In fact, the absence of robust empirical research on the effect of NEPA reviews, as well as the lack of consensus on what is meant by NEPA effectiveness, keeps the political criticisms of NEPA administration alive to this day (Karkkainen, 2002).

Moreover, it is unclear what factors influence NEPA decisions and the review process. Empirical studies to date have been largely atheoretical, with limited exploration of the causal mechanisms that support or undermine an effective impact assessment process (Zhang, Kørnøv, & Christensen 2013). As a result, we have insufficient information about how policy makers, public managers, and other stakeholders might improve the process. Scholarship on NEPA effectiveness would benefit from greater inclusion of theoretical insights from public administration that provide explanation for how and why individuals, public organizations, institutions, and networks of policy actors interact to produce – or fail to produce – effective outcomes.

In this article, we ask: What do we know about the effectiveness of NEPA decisions and review processes to date? How have scholars defined ‘effectiveness’ in the context of environmental impact assessment? And finally, what theories and perspectives can help scholars and practitioners understand the factors that produce effective NEPA processes and how they influence NEPA decisions? In posing and answering these questions, we seek to advance scholars’ decades-long search to document and measure the effectiveness of NEPA decision making, as well as to advance NEPA scholarship and practice as the ‘Magna Carta of environmental policy’ (Cooper & Canter, 1997) enters its 50th year of implementation.

NEPA background

NEPA was passed in 1969 with broad bipartisan Congressional support, and then-President Nixon signed the bill into law on the first day of 1970, marking the start of the ‘environmental decade’ (Coglianese, 2001). NEPA’s passage was prompted by growing concern that the infrastructural and technological progress that had brought prosperity to the country – such as a national highway system and rapid advances in agricultural production and mineral extraction – were causing significant and irreversible environmental harms. By requiring federal agencies to assess the environmental impacts of their decisions, NEPA provided the nation’s first comprehensive framework for integrating environmental concerns into economic development and infrastructure decisions (Caldwell, 1998).

In its initial inception, NEPA was based on a comprehensive-rational model of decision-making. Before undertaking major actions, federal agencies were required to collect information from scientists and stakeholders about expected impacts of and alternatives to planned actions. This information would then be used to choose the alternative that minimized environmental harms (Caldwell, 1991). Subsequent court decisions have clarified that NEPA is a procedural statute: it does not require agencies to choose any particular course of action, only that they analyze alternatives, consult with experts and the public, and then explain the basis for their decision (Lazarus, 2011). NEPA is thus often referred to as a ‘look before you leap’ law – procedural rather than substantive in nature, and ex-ante rather than ex-post (Karkkainen, 2002).

NEPA applies to all federal agency actions that have a significant impact on ‘the human environment.’ This includes direct, indirect, and cumulative impacts, with the result that NEPA applies to federal plans, such as national forest land and resource management plans; to federal projects, such as highways and federal facilities; and to federal programs, such as BLM’s solar energy plan for six southwestern states. NEPA also applies to private actions that require federal permits, including mining projects on federal lands, or pipelines that require federal permits (Karkkainen, 2003).

Hundreds of thousands of proposals each year are potentially subject to NEPA review, although only approximately 200 proposals currently undergo complete Environmental Impact Statement (EIS) review. In the 1980s, the number of annual EISs topped 1000, but subsequent procedural guidance has streamlined the process. Today, the vast majority of proposed actions qualify for Categorical Exemptions from NEPA review. Roughly 50,000 proposals each year are subject to a preliminary Environmental Assessment (EA) and determined to be below the threshold of ‘having a significant effect on the human environment’ (40 CFR 1508.4),

sometimes after modifications to the initial proposal (Schiffer, 2003). Only in rare cases do these proposals proceed to full EIS review. And even when proposals undergo the full EIS analysis, analysis is entirely *ex ante*; the impact assessment process does not include any follow-up monitoring of project impacts (Karkkainen, 2002).

Instead, the EIS process is a focal point for agencies to engage with the public as part of the environmental decision-making process. Public stakeholders are invited to comment on proposed actions during the scoping period and on draft EISs before they become final. Many agencies invite stakeholders to participate at additional junctures in the process. NEPA has also become a coordinating framework for the implementation of other environmental laws that apply to federal projects. While a single federal agency is designated as the 'lead' in NEPA processes, it is common for federal agencies to consult with each other and work together in the preparation of the EIS, either as formal cooperating agencies or as informal participants.

NEPA is widely viewed by practitioners and environmental advocates as crucial for promoting environmental protection, transparency, and accountability. Conversely, many critics contend that the administration of NEPA creates unnecessary costs and delays. Neither NEPA's proponents nor its critics, however, currently benefit from systematic empirical evidence about NEPA's effects – positive or negative. It is time to take stock of the NEPA process, assessing not only what NEPA has achieved, but clarifying what it means for a statute like NEPA to be effective and identifying key drivers of effectiveness that policy makers and practitioners can use to improve the process.

Literature on effectiveness in NEPA decisions and review processes

Most of the empirical literature on NEPA effectiveness has been practitioner-based, deriving useful lessons from a limited number of cases (Greenberg, 2013). Until recently, NEPA scholarship was largely disconnected from relevant public management and public policy scholarship. Thus, while NEPA has received considerable empirical study over the past 50 years, we have limited understanding of what NEPA has achieved, what constitutes an effective NEPA decision process, or the factors that might improve NEPA review over time. Below, we review this literature, summarizing what scholars know about the effectiveness of the NEPA process.

We precede this review by noting that there are significant conceptual and methodological challenges to the empirical study of NEPA effectiveness. First and foremost is the complexity of assessing the effectiveness of NEPA decisions and processes based on substantive outcomes (e.g. the resulting impacts of a permitted action on the condition of the environment, on cultural resources or on levels of public health). Such outcome measures are the staple of most public policy performance accounting. In the case of NEPA, however, agency decision makers need not accept the most environmentally benign alternative. Indeed, the process prompts agencies to compare and weigh the environmental, social and economic trade-offs between short term, long term and cumulative effects. This makes it difficult to define NEPA effectiveness *solely* in terms of its substantive environmental effects, since environmental effects are one of multiple competing objectives that agencies must consider in the decision-making process.

The next challenge is the considerable diversity of contexts in which NEPA is implemented. NEPA applies broadly to multiple policies and impact arenas, from critical habitat designation to transcontinental pipelines. This can make cross-case comparisons difficult and limit scholars' ability to generalize broadly from a small number of similar cases. Additionally, NEPA reviews are dynamic processes that occur over time, requiring long time frames and in-depth study if analysts are to assess how NEPA decisions shape outcomes on the ground.

Data availability poses an additional challenge: while EISs and other NEPA documents are technically public, there is no systematic repository for NEPA documents, and they are often inaccessible for research purposes. EPA has archived EISs since 2012, but scholars interested in EAs, public comments, or earlier EISs must search the internet or submit FOIA requests to individual agencies to obtain documents (Ruple & Capone, 2016). As a result, even as advances in 'big data' analytics offer new methods for analyzing the text within NEPA documents, barriers to data access can limit the use and applicability of these tools – or at least, require analysts to engage in time-consuming data collection strategies before analysis can be undertaken.¹

Despite these significant challenges, there is a small body of empirical research that analyzes NEPA's effects, which we summarize below.

Empirical evidence of NEPA effectiveness

The earliest NEPA effectiveness studies were written to guide practitioners through the steps in the EIS process. As the implementation process began to unfold, however, scholars became concerned that environmental review had strayed from its initial, idealized model of well-informed, rational decision-making (Cashmore et al., 2004). This gave rise to a body of scholarship assessing the adequacy of the NEPA process and its ability to influence agency decisions and environmental outcomes in practice.

The majority of these studies proceed by focusing on document quality, comparing the quality or comprehensiveness of the EIS against observable benchmarks developed by subject matter experts. Often, quality assessments are limited to a particular aspect of the EIS – such as its analysis of impacts to wildlife (Chang, Nielsen, Auberle, & Solop, 2013), its treatment of cumulative impacts (Cooper & Canter, 1997), or its treatment of climate change (Stein 2010). Other studies have analyzed overall EIS document quality against benchmarks established by the U.S. Environmental Protection Agency (Tzoumis, 2007; Tzoumis & Finegold, 2000). Consistently, studies show that the quality and comprehensiveness of EISs fall short of the benchmarks and standards recommended by experts or selected by environmentally-minded scholars (Greenberg, 2013).

EIS documents and analysis, however, are only one part of an overall process that informs – and, presumably, influences – agency decisions. A persistent criticism of the NEPA process is that its procedures can serve to legitimize – rather than inform – agency decisions (Keysar & Steinemann, 2002). A handful of studies examine whether NEPA exerts observable influence on agency decisions, producing mixed results. A 1984 assessment of NEPA's effects on agency behavior found that NEPA provided leverage for environmentalists inside and outside agencies to use the review process to push for better outcomes (Taylor, 1984). Conversely, in a review of over 200 EISs concerning wilderness designation, Ginger and Mohai (1993) find that NEPA had little to no impact on U.S. Bureau of Land Management decisions, leading the authors to conclude that the Bureau saw NEPA as a legal requirement rather than an opportunity to inform their decision-making.

Survey and case study analyses also suggest that NEPA has limited influence over agency decision-making (Canter & Clark, 1997; Keysar & Steinemann, 2002; Stern, Predmore, Mortimer, & Seesholtz, 2010). Other studies, however, find that the EIS process can have measurable impacts on agencies' decisions: Ruple and Capone (2016), for example, compare draft and final EISs, and find that the process produces measurable reductions in projects' expected environmental impacts. Clearly, NEPA's influence varies across contexts, but these studies suggest – rather than explicitly analyze – the underlying causal factors.

Another common research approach to NEPA effectiveness assesses practitioners' perceptions of the NEPA process. Here, the unit of analysis shifts from individual EISs to the process as practiced in a given jurisdiction. NEPA practitioners widely view the process as effective, although practitioners are often less focused on narrowly measured outcomes and more likely to value NEPA as a decision-making process that allows agencies to consult with a wide range of actors (Canter & Clark, 1997; Stern et al., 2010; Stern & Predmore, 2011). A 1997 study, for example, found that practitioners widely valued NEPA as a framework for cross-agency collaboration and public engagement (Canter & Clark, 1997). More recently, a survey of over 3,000 U.S. Forest Service employees suggests that NEPA's value is multi-faceted: it can help the agency avoid negative environmental consequences, but it can also help to satisfy diverse stakeholders and aid in avoiding litigation (Stern & Predmore, 2011). While practitioners generally value the process, views on what NEPA is meant to achieve can vary substantially, even within a single agency (Stern, Blahna, Cervený, & Mortimer, 2009).

The diverse empirical scholarship on NEPA effectiveness suggests that effectiveness is complex, contested, and multi-faceted. Moreover, the largely atheoretical approach to NEPA scholarship has produced conflicting findings: on the one hand, EIS report and analysis quality is low, but on the other hand, practitioners identify multiple beneficial outcomes from the NEPA process. One way to reconcile these conflicting findings is to more carefully parse the multiple, competing definitions of 'effectiveness.' Below, we review conceptual developments in defining effectiveness in the context of environmental impact assessment, drawing not only on literature assessing the U.S. NEPA process, but also on scholarship analyzing environmental review in other jurisdictions globally.²

Effectiveness defined

Defining effectiveness has been a continuing challenge for environmental review scholars and practitioners (Cashmore, Richardson, Hilding-Ryedvik, & Emmelin, 2010). Since the late 1990s, however, scholars have progressed in cataloguing useful dimensions of effectiveness (Bartlett & Kurian, 1990; Lawrence, 1997; Morgan, 2012). Early investigations focused on procedural compliance to ensure the process ‘works as intended and meets the purposes for which it is designed’ (Cashmore et al., 2004; Sadler, 1996, p. 37).

While early scholars focused on procedural effectiveness, others began to examine whether the NEPA process was *substantively* effective. Sadler (1996) defines substantive effectiveness as the extent to which the assessment process achieves its intended objectives. Cashmore et al. (2004) further elaborate on substantive effectiveness, and conclude that since NEPA’s purpose is multifaceted, substantive effectiveness is by definition multi-dimensional. Drawing on practitioners’ understanding of the NEPA process, Cashmore et al. (2004) suggest that the NEPA process is substantively effective when it has a discernible effect on environmental outcomes, as well as when it has a positive effect on sustainable development. Of course, these substantive impacts are difficult to assess, given that the NEPA process requires ex-ante, rather than ex-post, assessment of environmental impacts. Recently, scholars have defined and measured substantive effectiveness by assessing changes to expected environmental impacts from a project’s initial proposal to the agency’s final record of decision. If the final project approved by the agency is expected to reduce environmental harms like air pollution and water pollution, these changes can reasonably be attributed to the NEPA process (e.g. Capone & Ruple, 2017; Ruple & Capone, 2016).

Other scholars have also conceived of a wider range of potential dimensions of effectiveness. Normative effectiveness is defined as the extent to which the resulting decisions or outcomes meet normative expectations, such as environmental or democratic standards (Chanchitpricha & Bond, 2013; Stoegelehner, Brown & Kørnø, 2009). Transactive effectiveness, in contrast, is concerned with the costs of the process both in terms of time and expense (Sadler, 1996). Bond, Morrison-Saunders, and Howitt (2013) contributed two more dimensions of effectiveness: knowledge and learning on the part of all stakeholders, and pluralism, suggesting that what constitutes effectiveness among the other dimensions will vary, given the diverse perspectives of actors engaged in the process.

Chanchitpricha and Bond (2013) embrace the multi-faceted nature of environmental impact assessment effectiveness, defining effectiveness to include (a) the extent to which it works procedurally; (b) the degree to which available resources are used transactively to inform decision-making and satisfy stakeholders; (c) the degree to which it achieves its intended aims substantively; and (d) the degree to which stakeholders normatively learn and change their views over time as policy is implemented. They develop specific criteria for measuring these four dimensions of effectiveness and link them to the four stages in a logic model (input, process, output and outcome).

These efforts to define environmental impact assessment effectiveness and recognize its multiple dimensions echo – but do not explicitly draw on – efforts by public administration scholars to determine whether and how agencies perform effectively (e.g. Rainey & Steinbauer, 1999). However, while the environmental review literature writ large recognizes that effectiveness is contested by different stakeholders, it has yet to grapple with how to reconcile this contestation, and empirical studies have yet to operationalize multiple and competing notions of what makes environmental impact assessment effective. Consider, for example, a NEPA process whose project proponent wishes to proceed quickly, an environmental activist who wishes to minimize environmental impact, a community group concerned about local impacts, and a lead agency interested in satisfying all stakeholders and avoiding future litigation. Public administration scholarship suggests that when there is no single dominant expected outcome, and participants’ objectives are divergent and contested, an effective process will be one in which agency officials are able to engage democratically to produce maximum public value, considering and weighing the needs and preferences of multiple stakeholders (Nabatchi, 2012; Van der Wal, Nabatchi, & De Graaf, 2015).

Factors that shape effectiveness

As scholars have gained a more multifaceted understanding of effectiveness, there has been growing interest in identifying the key causal factors that produce effective outcomes. Empirical studies suggest several important

drivers of effectiveness, including the use of effective public participation processes (Mulvihill & Baker, 2001), governance mechanisms (Arts et al., 2016), and the dominant discourses and attitudes of practitioners (Runhaar, van Laerhoven, Driessen, & Arts, 2013; Stern et al., 2009).

Larger-n empirical efforts to explain environmental impact assessment effectiveness to date have resulted in long lists of ‘critical factors,’ with limited use of public management or other social science theory to shape expectations about how these factors might interact, operate differently in different contexts, or be modified by practitioners to produce better results. For example, in the recent work of Zhang, Kørnøv, and Christensen (2013), the authors reviewed two years of peer-reviewed papers on environmental review processes and identified over 200 critical factors. Understandably, the authors conclude that more theoretical work is needed. The remainder of this paper fills this theoretical gap and suggests a research agenda.

Reconnecting NEPA scholarship with public administration theory

Despite a ‘theoretical awakening’ in defining effectiveness (Morgan, 2012), there has been limited theoretical development of causal factors that lead to effectiveness, a gap that undermines systematic study of whether and why environmental impact assessment is effective (Cashmore et al., 2004). We argue that better connection with public administration theory could help remedy this problem.

There are plenty of theories drawing from public administration scholarship that explain why environmental impact assessment would not be effective. Principal-agent and capture theories, for example, explain why agencies might self-deal and thwart NEPA’s legislative intent. Political economic theory explains how more powerful interests might prevail despite a rigorous alternative analysis. Critical Marxism claims that the NEPA process simply legitimizes the state’s agenda. Street-level bureaucracy scholarship suggests that front-line workers’ motivations and concerns might differ from policy makers’ objectives. These potential criticisms are not new. Indeed, the framers of NEPA tried to take them into account with an action-forcing mechanism that would bring to light the potential effects of development proposals on the human environment. Still, after 50 years of experience, we lack systematic understanding of whether and how the NEPA process overcomes these challenges, and what it achieves in practice.

Constraining self-interest and political influence are among the major provinces of the state. There are several theoretical perspectives used by public administration scholars that can help analyze the state’s ability to effectively overcome these challenges. Here we focus on theories of individual decision-making, organizational behavior, institutionalism, and pluralism. Over the years, many NEPA scholars have approached effectiveness explicitly or implicitly from these perspectives, but rarely have they advanced theory beyond its descriptive force; use of these perspectives in empirical work has lagged behind theory development. Figure 1 summarizes the most frequently developed and cited theories, described below.

Individual decision-making

The classic rational actor perspective on public decision-making reigned prior to and during the early decades of NEPA implementation and study (Simon & March, 1976), and was the perspective that most informed NEPA’s initial development. Armed with all the pertinent facts, a federal agency decision maker would make a rational choice among proposed project alternatives, based on a thorough technical analysis of their environmental impacts. As Caldwell put it, ‘the objective of the assessment is to enhance the rationality or reasonableness of the ultimate decision’ (Caldwell, 1991, p. 81). Thus, the primary purpose of the EIS was to provide information to the decision maker. Assure that the analytic process was complete and correct, and the decision would be an informed one.

This positivist, scientific decision-making approach was bolstered by an underlying utilitarian and social welfare view of the state. A rational, informed decision would take multiple potential impacts into account through interdisciplinary study and public input. It would also be a ‘good’ decision that would ‘avoid harm to human society and more latterly to the biosphere’ (Caldwell, 1991, p. 82). Politics would be taken out of the equation. Implicitly, the rationalist approach still dominates the empirical literature on NEPA effectiveness,

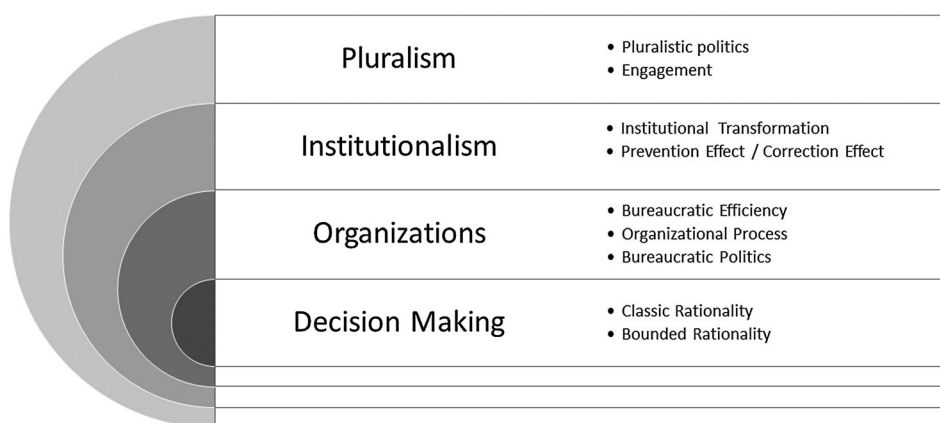


Figure 1. Theories for how NEPA works.

particularly studies that operationalize NEPA effectiveness by analyzing the scientific quality or rigor of EISs (Chang et al., 2013; Cooper & Canter, 1997).

This comprehensive rational decision-making theory has been heavily criticized (Morgan, 2012), and in the social sciences has been largely displaced by a more constrained view of bounded rationality that recognizes the limitations of imperfect technical information, imperfect analytic processes, and the many constraints placed on public decision makers. This post-positivism was expressed in resurgent public administration theories such as incrementalism and pragmatism (Lindblom, 1959). Later, cognitive science and behavioral economics further diminished the classic rational decision-making calculus by demonstrating numerous cognitive biases affecting individual decision-making (Kahneman & Tversky, 2013). Cognitive biases can also affect decision making in public organizations, when decision makers misperceive risks or are inconsistent in assessing tradeoffs between competing objectives (Viscusi & Gayer, 2015). Today, it is widely recognized that the federal agency decision makers implementing NEPA are rarely fully autonomous or isolated from social and political influences; even their own cognitive processes are no longer assumed to be fully rational in their weighing of costs and benefits (Bond & Pope, 2012; Greenberg, 2013).

Over time, scholars observed that fully informing public decision makers is rarely possible nor does it guarantee an optimal decision. NEPA scholars began to focus on the review process itself: a 'better' decision would result as proposed projects are modified to better safeguard environmental and other public interests (Van Doren, Driessen, Schijf, & Runhaar, 2013). This approach is adopted implicitly, if not explicitly, by scholars who measure NEPA effectiveness in terms of changes between the initial proposed course of action and the alternative selected in final decision document (e.g. Ruple & Capone, 2016). Such studies do not assume that the final decision is optimal, but they do expect that the process tends to produce changes that improve final decisions.

Individual decision-making perspectives thus provide two potential sets of theoretical assumptions, which in turn suggest two different approaches to assessing the effectiveness of NEPA. The classic rationalist approach assumes an apolitical and comprehensively rational decision maker. This approach implies that to be effective, the NEPA process should result in a final decision that maximizes welfare. Since decision makers rely on the information in the EIS to make their decisions, quality and comprehensiveness of the EIS are crucial factors driving effectiveness. With a boundedly rational decision-making frame, in contrast, welfare maximization is impossible, and effectiveness can be defined in terms of incremental improvements that would not have occurred but for the NEPA process. This approach to effectiveness is both substantive and procedural since both the final outcome and the process used to achieve that outcome matter. Drivers of effectiveness thus include not only quality of the analysis, but also adequacy of the procedures used to make decisions.

Organizational theories

Organizational theory is a cornerstone of public administration scholarship, and NEPA scholars often focus on organizational procedures, which are easier to observe than actual outcomes and are assumed to correlate with substantive effectiveness. Three organizational theories are particularly relevant for NEPA study. First, bureaucratic efficiency is a central tenet of public administration theory (Osborn & Gaebler, 1993; Simon & March 1976). This perspective dates to a long-held and much-disputed assumption that public administration could and should be insulated from politics, such that administrators' primary objective is to implement politicians' decisions as efficiently as possible. In its purest form, efficiency theory holds that the efficient use of resources and organization of tasks leads to effectiveness. Thus, an effective NEPA process is one that is administered with efficient use of agency staff time and other resources.

While scholars today generally recognize that administrators have substantive responsibilities beyond efficiency, efficient use of agency resources remains an important element of bureaucratic effectiveness. This perspective is reflected in conceptual work on the transactive effectiveness of impact assessment processes, such as the timeliness or administrative costs of the NEPA process (Baker & McLelland, 2003; Sadler, 1996). To our knowledge, however, no studies have analyzed bureaucratic efficiency as an independent variable that drives transactive effectiveness of the NEPA process.

Second, organizational process theories emphasize the role of standard operating procedures (SOPs) on organizational decision-making (Allison, 1971). An early conception of NEPA effectiveness found in the literature is that of 'procedural compliance' (Sadler, 1996). The underlying logic of procedural effectiveness is that NEPA is a procedural law, and as such, compliance with NEPA's regulatory requirements – such as the requirement to consult with relevant agencies and with the public – is the primary purpose and a sufficient end in itself. There is also an assumption, consistent with rational decision theory, that if NEPA is carried out as prescribed, the final decision will take environmental concerns into account.

SOPs may also exert direct influence on agency outcomes by formalizing agency values. While SOPs are generally resistant to change (Downs, 1967), they are developed over time by agency personnel via social and professional norms, subject to legal mandates and operational constraints. Early NEPA scholars advanced an 'internal reform theory' that NEPA's interdisciplinary review requirements prompted federal agencies to hire diverse professionals (e.g. ecologists, archaeologists, biologists, landscape architects) capable of developing new SOPs that internalize environmental values (Culhane, 1974; Fairfax & Andrews, 1979). The influence of diverse professionals on NEPA effectiveness has not yet been empirically tested, however.

Third, the governmental politics model posits that agency actors shape final decisions by negotiating their different interests within an agency's incentive structures (Allison, 1971). Termed organizational politics theory by Bartlett and Kurian (1990), this approach builds on Lindblom's partisan mutual adjustment theory, suggesting that agency personnel will use their power and autonomy to advance their preferred outcomes and influence decisions in impact assessment processes. Extending the internal reform theory according to this logic, effectiveness is achieved by equalizing political power among agency actors to assure that environmental and public concerns are fully considered. The governmental politics theory is illustrated by a set of rich empirical studies that use extensive survey and interview data to demonstrate that Forest Service employees hold multiple, competing views on what NEPA should achieve, with employees competing to exert influence over outcomes (Stern et al., 2009, 2010; Stern & Predmore, 2011).

Organizational theories share several features: they tend to define effectiveness either in procedural terms or by the preferences of agency personnel; and they identify organizations' processes and attributes as a key driver of outcomes. While conceptual studies of the environmental impact assessment process widely recognize that these organizational factors shape outcomes, empirical study of the connection between agency process and effectiveness is rare.

Institutionalism

Broadly, institutional theories focus on the way we organize public work through laws, rules, and informal norms. Institutions shape the actions that policy actors are required, forbidden, or allowed to take; they also

specify the consequences that follow from actors' actions and that provide incentives for particular kinds of behaviors (Baldwin, Chen, & Cole, 2018). Institutional analysis recognizes that laws and rules combine with actors' individual interests to shape behaviors and policy outcomes. In the past several decades, social scientists have demonstrated the importance of institutional design in influencing values, behavior and decision-making within organizations (March & Olsen, 2010) and achieving important outcomes, most notably sustainable resource use within communities (Ostrom, 2007).

While public administration scholars increasingly recognize the potential for institutional arrangements to shape policy processes and outcomes, institutionalism has had limited influence on environmental impact assessment scholarship to date (Baldwin et al., 2018). Bartlett (1990)'s institutional transformation theory posits that NEPA's mandates, rules, and norms have enabled practitioners to develop a shared and socially constructed culture, with agreed-upon principles and ethics that incentivize more environmentally accountable and decisions across federal agencies (Bartlett & Kurian, 1990).

Similarly, Runhaar and Driessen (2007) identify two potential long-term pathways to effectiveness, driven by environmental review institutions. A 'prevention effect' occurs when project proponents minimize environmental impacts in anticipation of the review process; proponents have an incentive to minimize environmental impacts even before the assessment process commences. Alternatively, a 'correction effect' occurs when project proponents revise their initial proposed alternative to increase its likelihood of becoming the preferred alternative. These indirect effects of the process focus on the changed behavior of the proponent, not the agency decision maker, in response to the institutional incentives imposed by the review process.

Institutionalism offers a potentially useful approach for theorizing how the NEPA process shapes outcomes indirectly and over time. Moreover, institutionalist theories are compatible with multiple dimensions of effectiveness. Institutional scholars recognize that different participants have different interests in a given policy process and have posited multiple outcomes of interest – including environmental outcomes and the realization of public value (Ostrom, 1990). To date, however, limited empirical scholarship explores institutional factors as drivers of effectiveness. More conceptual and theoretical development is needed to posit clear expectations about how institutions or institutional transformation shapes particular types of effectiveness.

Pluralism

One of NEPA's innovations, building on the Administrative Procedures Act of 1946, was to require that federal agencies be more transparent and devote resources to interactions with the public. Public participation has received growing attention in empirical work (Glucker, Driessen, Kolhoff, & Runhaar, 2013), and scholars posit two main ways that public participation shapes effectiveness. First, external reform theories suggest that agency interactions with the public and other stakeholders can shift internal agency values, lead to incorporation of public concerns, and contribute to 'democratic effectiveness' (Culhane, Friesema, & Beecher, 1986; Stoeglehner et al., 2009). Pluralistic politics theories, for example, posit that external pressures from interest groups shape internal agency deliberations, either directly or indirectly through the courts (Culhane et al., 1986; Fairfax & Andrews, 1979). Similarly, political contestation theory holds that competition among interest groups allows the politically powerful to exert disproportionate influence on agency decision (Morgan, 2012). Public participation theory, in contrast, suggests that the public and other stakeholders shape decisions not through pressure but by informing agencies' analysis and deliberations (Glucker et al., 2013).

A second set of pluralistic theories could be termed engagement theories that extend the role of the state beyond that of final decision maker. Here the state creates, convenes, and facilitates the review process as a public arena, sharing this stage with project proponents, other government agencies, diverse stakeholders, scientists and technical experts, and the public at large (Elling, 2009). Through public deliberation, participants gain mutual understanding, modify their positions, and leverage technical analysis to negotiate an integrative alternative that is substantively, technically, socially and politically feasible. Negotiation theory, based on Habermasian communicative rationality (Morgan, 2012), emphasizes deliberation and consensus building among the participants. Another engagement theory stresses policy learning and the co-construction of

knowledge (Cashmore et al., 2010; Sabatier & Jenkins-Smith, 1999). Preliminary evidence suggests that the NEPA review process can lead to organizational learning over time (Jones & Morrison-Saunders, 2017).

Pluralistic theories of effectiveness tend to highlight that effectiveness is a concept with multiple dimensions. External reform theories conceive of effectiveness as an observed change between initial and final decisions that can be attributed to the public's involvement. While a growing body of literature seeks to characterize the effectiveness of public participation within the environmental impact assessment process (Baker & McLelland, 2003; Bond & Pope, 2012; Brombal, Moriggi, & Marcomini, 2017; Mulvihill & Baker, 2001), few studies have explicitly connected public participation to overall effectiveness of the process (National Research Council, 2008). In a few instances, however, scholars have conceived of effective participation in terms of stakeholders' influence on final outcomes (Ginger & Mohai, 1993; Hoover & Stern, 2014).

Engagement theories, however, offer a more nuanced, and potentially more challenging, approach to effectiveness, suggesting that an effective process involves not only an improved decision, but a decision that is improved as a result of deliberation and negotiation among participants; and a process that allows for change and improvement not just within individual NEPA processes but cumulatively over time and across decisions as agencies gain capacity to improve the process. Engagement theories also offer at least some potential traction for the problem that different actors may have different ideas about what constitutes an effective process. By engaging with multiple stakeholders, it may be possible for actors to negotiate mutually acceptable outcomes that produce public value. Engagement theories thus offer significant potential to advance a more complete understanding of NEPA effectiveness.

The above review shows that just as there are multiple stages in the NEPA process, so too there are multiple ways to define effectiveness and theorize about the factors that might shape effectiveness of the NEPA process. While we recognize and embrace NEPA as a complex, nested set of processes, as depicted in Figure 1, we also recognize that analysts interested in assessing the NEPA process may wish to focus their attention on more narrowly defined aspects of the NEPA process. Table 1 summarizes the range of theories described above, identifies leading definitions and key drivers of effectiveness, and connects these theoretical approaches with stages in the NEPA process and potential research questions.

A research agenda for studying effectiveness in NEPA decisions and processes

The above review suggests that the NEPA decision making process is not a single event, but rather a nested sequence of processes. Individuals engage in decision-making on the basis of available scientific evidence. However, this decision making does not occur in a vacuum but takes place within organizations with cultures, norms, and SOPs that have developed over time. These organizations in turn interact with other public agencies and stakeholders according to laws, rules, and other institutions developed over time. And these interactions are shaped not only by laws and rules but through processes of democratic engagement in which decisions are negotiated by actors with diverse objectives. As Figure 1 illustrates, NEPA is thus not only a law but a nested set of processes, with distinct theoretical perspectives that could help inform and predict different dimensions of effective NEPA.

Table 1 provides a preliminary conceptual framework that identifies different theory-driven definitions of effective NEPA decisions. These include the 'optimal' and 'improved' decisions based on decision making theory; 'feasible,' 'compliant' and 'balanced' decisions generated by organizational theory; 'accountable' decisions derived from institutional theory; and 'democratic' and 'integrative' decisions drawn from pluralistic theories of political contestation and engagement. In addition, the table notes key factors that according to these different lines of theory would most influence the specified nature of NEPA decisions along with where and what aspects within the NEPA review process scholars would look for evidence of these causal logics. Finally, the table introduces key research questions derived from these different theoretical claims (that are further elaborated below).

We recognize that not all research questions will require researchers to measure or control for all factors or incorporate all theories into their inquiry. We are not suggesting that 'NEPA effectiveness' would be the simple summation of these different facets of effective decisions. Instead, we encourage scholars to use this framework to place their particular research question or line of inquiry within the larger NEPA process, in an effort to build

Table 1. Defining NEPA effectiveness through theory.

Theory	Leading definition of effectiveness	Key factors influencing effectiveness	Focal aspects of the NEPA process	Potential research questions
Rational decision-making	Optimal decision based on full information and absent political influence	High quality information and use of science in analysis influences unitary decision maker	Information gathering Analysis of alternatives Agency decision making procedures	How do agencies use scientific information in decision making?
Boundedly rational decision-making	Improved decision from initial proposal	Quality of the underlying science and analysis informs decision maker; Adequate decision-making procedures available		
Bureaucratic efficiency	Feasible decision based on efficient process	Efficient use of resources and organization of tasks yields sufficient basis for decision making	Agency decision making procedures Agency SOPs and personnel	How do agency attributes shape NEPA effectiveness?
Organizational process	Compliant decision made in accord with formal rules, established norms and SOPs	Diversified agency staff assures compliance with necessary process requirements; Organizational capacity sufficient for the task		
Bureaucratic politics	Balanced decision reflects values of diverse professional civil servants	Diversified agency staff negotiate internally with equalized power.		
Institutionalism	Accountable decision encompasses environmental effects in accordance with legal requirements	NEPA rules, norms and values influence project proponents' proposals to take environmental impacts into account before or during review	Judicial review of agency decisions Agency interactions with project proponents and stakeholders	How do institutional arrangements shape actors' incentives and behavior in NEPA processes?
Pluralistic politics	Democratic decision addressing external interests	Stakeholders inform, influence and/or politically contest agency decisions	Agency interactions with project proponents and stakeholders	Does deliberation and negotiation lead to more effective NEPA processes? If so, what organizational and institutional factors support deliberation and negotiation?
Engagement theory	Integrative decision reflects deliberation and learning among stakeholders	Agency officials deliberate with proponent and diverse stakeholders to produce mutually beneficial outcomes; Participants learn over time	Agency interactions with project proponents and stakeholders over time	

understanding not only whether NEPA achieves a given result, but also how particular decisions occur. For scholars interested in substantive environmental effects, for example, it may be useful to consider the many factors that lead to agency decisions and outcomes; hypothesize the most critical drivers that shape substantive impacts; and then design studies that test whether changes to these drivers might shape substantive environmental impacts.

In doing so, we call on NEPA scholars to recognize and incorporate recent social science advances in our understanding of decision-making, organizational behavior, institutions, and pluralistic decision-making. These advances have helped public administration scholars begin to accumulate more durable knowledge of how policy administration occurs and identify factors that make public decision making processes more effective. These advances in social science scholarship are reflected in recent conceptual work on NEPA effectiveness but have not yet been taken up in empirical NEPA work. As a result, we have limited ability to generalize study findings across contexts, make sense of conflicting findings across NEPA studies, test theory and build a body of knowledge about how the NEPA process works in practice and the factors that might be adjusted to improve the process.

Moreover, given recent advances in data science, it may soon be possible to apply new methodological techniques to the study of NEPA effectiveness. These advances make it all the more urgent that empirical NEPA scholarship be built on a firm theoretical and conceptual foundation. Below, we suggest several areas for

additional empirical inquiry that build on and incorporate relevant theories from public administration and related disciplines; that speak to enduring and important questions within the broader disciplines of public administration, public policy, and decision-making; that are now or soon will be possible, given advances in data science and the ability to parse text from NEPA documents as data; and that would provide policy makers and practitioners with useful information about whether and why NEPA review processes and decisions are effective. Together, these research questions suggest a new research agenda for empirical NEPA scholarship.

How do agencies use scientific information in decision making?

Our understanding of individual decision making recognizes that individuals are boundedly rational, with constraints on any one individual or organization's ability to make decisions that incorporate all available data. Yet many areas of environmental policy – including NEPA – were built on the assumption that important decisions should be firmly grounded in complex scientific research, often ignoring cognitive or other constraints on agency's ability to translate scientific information into effective policy decisions. Empirical evidence suggests that the scientific analysis used to inform NEPA decisions may be imperfect, but we have limited information about the way agencies make use of the analysis contained within EISs and EAs, or how the quality of the scientific information shapes overall effectiveness of the NEPA process.

Empirical research could build on our current understanding of decision making process to answer important questions about the NEPA process: Does poor quality science lead to ineffective NEPA processes? Would better science improve NEPA effectiveness? What kinds of scientific information are most useful to decision makers, or influential on the process? How much weight do agencies place on scientific information relative to other information sources, such as public input? How do external factors – such as the legal and political environment – shape the way that decision makers use scientific information? What organizational and institutional factors shape the way science is produced and used? How does science affect deliberation and negotiation among actors?

In addition, NEPA provides a potentially fruitful suite of test cases of agencies' use of scientific information in public decision making, with potential not only to advance our understanding of the NEPA process, but also to use the NEPA process to improve our understanding of how science is used in decision making more broadly.

How do agency attributes shape effective NEPA decisions and processes?

A wealth of public administration and organizational theory literature tells us that agencies' attributes are critical to NEPA effectiveness. Some of the factors that might be expected to shape the effectiveness of the process include the resources that agencies bring to bear on the NEPA process; the shared culture and values of the agency, and the attitudes and capabilities of its employees; and the SOPs that agencies have developed over time to implement NEPA's legal requirements. We know that there is considerable variation on these organizational dimensions across agencies and over time. Yet little NEPA scholarship has examined how these factors shape outcomes of the NEPA process.

Empirical research drawing on organizational theory could be used to answer questions about how variation across federal agencies affects the NEPA process. For example, what is the relationship between agency resources and the quality, timeliness, or substantive outcomes of the NEPA process? How does an agencies' culture, values, and employee attitudes shape the effectiveness of the NEPA process? What SOPs have agencies used to improve efficiency of the NEPA process without undue impact on substantive effectiveness?

How do institutional arrangements shape actors' incentives and behavior in NEPA processes?

Despite growing interest in institutional analysis throughout the social sciences, few empirical studies have examined the way that institutions and institutional changes shape actors' behavior within policy processes. NEPA itself can be understood as a set of institutions that require federal agencies to engage in scientific

analysis, allow the public to comment on proposed actions, and provide consequences – e.g. judicial review – for agencies that fail to follow NEPA’s procedural requirements. These rules in turn change actors’ incentives in the NEPA process: project proponents are likely to consider environmental impacts earlier in the project, and agency officials will operate knowing that the public can monitor and participate in agency decisions, as well as bring litigation for improper procedure. Moreover, institutional theory suggests that NEPA participants – both within and across agencies – may develop and modify rules and norms over time – within NEPA’s legal constraints – that amount to a shared understanding of how environmental governance works.

Yet we know too little about how institutions, both formal rules and informal norms, shape environmental governance in practice. Following on the work of Lazarus (2011), for example, how do federal administrative procedure laws, such as judicial review, affect the NEPA process? Has the NEPA process fundamentally changed environmental governance? Have actors in the process developed shared norms that complement and supplement NEPA’s formal requirements? How do formal and informal institutional changes shape behaviors on the part of project proponents, agency officials, and other actors?

These questions are all the more critical considering that Congress, the courts, and even individual agencies frequently make changes to agency procedures and the NEPA process itself. For example, in the first few decades of NEPA implementation, NEPA was conducted by in-house personnel, and there was a focus on building agency capacity through diversified hiring, training of NEPA specialists, and building internal agency procedures. In the past twenty years, federal executive orders have required and encouraged agencies to contract out NEPA duties, internal staffing for NEPA review has diminished and the completion of EIS’s is increasingly contracted out to private sector environmental engineering firms. With a better understanding of how rules and rule changes shape outcomes and performance, policy analysts would be in a better position to determine how these changes affect the quality and timeliness of NEPA review and documentation, as well as how institutional changes shape agencies’ roles and needed capacity in the NEPA process.

Does deliberation and negotiation lead to more effective NEPA processes? If so, what organizational and institutional factors support deliberation and negotiation?

A growing body of public administration scholarship seeks to understand how agencies maximize public value and maintain accountability in deliberative, negotiated decision making processes. This scholarship recognizes that policy decisions are often negotiated on the basis of not only scientific concerns, but also on the basis of social, political, and economic considerations. Moreover, this scholarship recognizes that stakeholders can have significant and positive influence on policy decisions, but that this influence is dependent upon a range of factors – including the stakeholders that participate, the timing and nature of their participation, and regulators’ attitudes toward and interaction with stakeholders.

A small body of empirical NEPA scholarship has begun to assess the way that public participation affects the NEPA process but has yet to incorporate these insights from the public participation literature. A fruitful line of research might consider how agency officials structure, solicit, and use stakeholders’ inputs, as well as how public participation shapes outcomes. With multiple actors engaged in deliberation and negotiation, how do agencies assure that the trade-offs between environmental, social, and economic considerations are not simply politically expedient compromises? Under what conditions do such cooperative NEPA processes lead to unhealthful or suboptimal decisions? What best practices, agency capacities, and institutional factors can be brought to bear to assure both procedural and substantive effectiveness?

What are the relationships between different dimensions of effectiveness, and how do decision makers weigh trade-offs between these dimensions?

The literature has done much to identify individual dimensions of effectiveness, including substantive, procedural, transactive, and normative dimensions. But more work is needed to understand the relationships between these different dimensions. Are there trade-offs between these different dimensions of effectiveness?

How do decision makers weigh these trade-offs in practice? What are the relationships between procedural and substantive dimensions of effectiveness – does procedural compliance give rise to substantive effectiveness, or are other factors at play? And given contexts in which different actors have different and contested ideas about what the NEPA process is meant to achieve, how do decision makers reconcile these competing views?

Elected officials and project proponents often raise concerns over project delays due to environmental review, particularly for projects with political prominence. Scores of bills outline moderate to extreme measures to limit or streamline the NEPA process, with unknown effects on environmental outcomes or public participation. How do we improve bureaucratic efficiency without undermining the NEPA process? And are inefficiencies in the NEPA process due to structural impediments, organizational capacity, individual decision-making constraints or all of the above?

Conclusion

NEPA was drafted and enacted as the Magna Carta of U.S. environmental policy in an era when scholars and practitioners generally shared a presumption of rational decision-making. NEPA was designed to ensure that rational agency officials would be fully informed about environmental impacts of their decisions. By providing for public participation and interagency cooperation, however, NEPA also reflects more recent concerns that agency decision-making is subject to political influence in a pluralistic society and provides transparent mechanisms for public engagement that could, in theory, not only inform agency decisions, but also provide a check against political capture.

Despite NEPA's potential to improve agency decisions through a combination of information and deliberative engagement, empirical efforts to assess what NEPA has achieved continue to adhere to the original rationalist presumption of NEPA as a means of informing agency decision makers. This conception does not reflect the reality of environmental governance in the twenty-first century, nor does it reflect development in public administration scholarship that measures agency performance in terms of its ability to integrate multiple stakeholders' concerns into decisions that produce public value. One result is that scholars and practitioners lack full understanding of what the NEPA process achieves.

This lack of understanding is particularly problematic in the current political context, where policy makers have incentives to prioritize efficiency over other dimensions of effectiveness. NEPA's costs – agency resources and project delays – are visible to policy makers, but few who are not directly involved will observe benefits of the NEPA process, such as reduced pollution relative to an initially proposed project, or incorporation of multiple stakeholders' concerns in a democratic process. Effective policy making – including the reasonable desire to streamline the NEPA process – requires empirical analysis of the trade-offs between transactive and substantive effectiveness, and research that identifies ways to improve efficiency without giving short shrift to science and public comment.

With this Article, we call on NEPA scholars to produce much-needed scholarship to determine what and how the NEPA process achieves – not only its environmental effects, but also its effects on promoting democratic and effective decision making. We hope that scholars will participate in a research agenda worthy of the U.S.'s 50 years of experience with NEPA.

Notes

1. As this article goes to press, the authors are participants in a National Science Foundation-funded effort to develop a data analysis platform that would overcome existing data and methodological barriers to systematic study of the NEPA process.
2. Outside the U.S., EISs are referred to as 'Environmental Impact Assessments' (EIAs).

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