

Environmental impact assessments not the main barrier to timely forest management in the United States

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Environmental impact assessment (EIA) processes are commonly used by government agencies to evaluate the merits and environmental risks of natural resource management decisions. Citing EIA as red tape, decision makers from across the political spectrum are increasingly circumventing EIA to expedite implementation of necessary actions for climate resilience and clean energy. Few studies have quantified the extent that EIA is the main barrier to efficient implementation. We combine administrative data from the US Forest Service with survival analysis to show that, for most actions, the Forest Service takes as long or longer to award first contracts and roll out initial activities than to comply with the 1970 National Environmental Policy Act (NEPA), and that NEPA compliance accounts for approximately one-fifth of planned implementation time.

The passage of large climate spending bills in the United States (the 2022 Inflation Reduction Act, the 2021 Infrastructure Investment and Jobs Act) and policymakers' concomitant efforts to circumvent environmental impact assessment to expedite energy infrastructure development is a timely reminder that battles over policy benefits continue in agency decision making^{1–3} and that the effectiveness of legislative change depends on how the legislative change is implemented. Environmental impact assessment (EIA) is a generic term for a process by which governments consider the potential environmental impacts of their decisions⁴ and is the bedrock of environmental policy and law worldwide. Despite the benefits of EIA, such as gathering information and securing public legitimacy⁵, instances of minimizing or wholesale exempting long-standing procedures such as EIA to accelerate implementation are becoming more common in the United States and elsewhere⁶. Within the United States, the Council on Environmental Quality (CEQ) eliminated the cumulative impacts analysis required by the 1970 National Environmental Policy Act (NEPA) in response to President Trump's instructions to 'modernize' the federal EIA process (Executive Order 13807), Governor Newsom of California has used 'trailer bills' to site energy infrastructure with minimal environmental review⁷ and Congress during both the Bush and Obama administrations excluded certain

actions from EIA through the 2003 Healthy Forest Restoration Act and 2014 Farm Bill⁸. Although the CEQ restored cumulative effects analysis in NEPA soon after Biden entered office, Democratic leadership has tried to advance Senator Joe Manchin's energy-permitting reform legislation since the Inflation Reduction Act's passage. This legislation includes a one- to two-year deadline on most NEPA processes and decreases the statute of limitations on agency decisions by more than 90% (ref. 9). The 2023 Fiscal Responsibility Act included several of these provisions¹⁰.

Exempting and modifying EIA for the purpose of making faster decisions begs the question: to what extent is EIA the barrier to efficient implementation of government priorities? This brief provides evidence that the time it takes a major US public lands agency to implement decisions is not well explained by the time it takes to complete EIA. NEPA, which requires US federal agencies to disclose and analyse the potential environmental impacts of their actions (for example, projects, permits) using 'the best available science' and public input, is often the scapegoat of sluggish government decision making. Studies show that the most rigorous NEPA analyses take agencies such as the US Forest Service (USFS) an average (median) of 2.5–3.5 years to complete^{11–13}, but they lack clear implications without a reference point. Is 2.5–3.5 years a long or short time? Does EIA take too long? Is it red tape,

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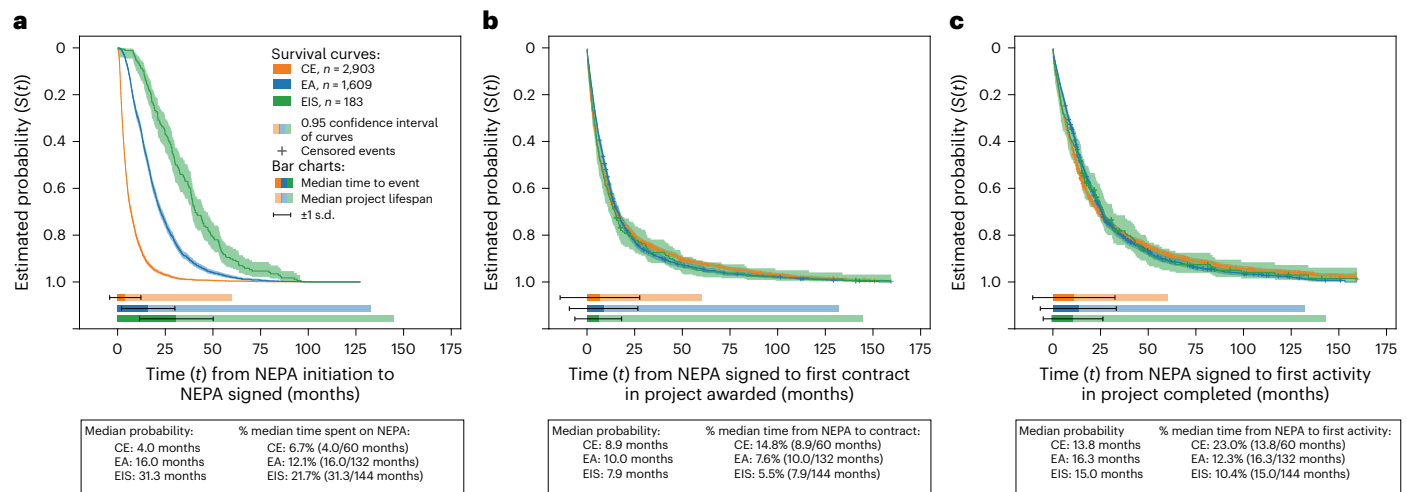


Fig. 1 | Time to complete NEPA, first contract and first activity for each category of analysis. a–c, Survival curves for each analysis type and event (completion of NEPA (a), completion of contract (b) and completion of first activity (c)) along with their 95% confidence interval (shaded regions). Horizontal bar charts depict the descriptive median time to completion (dark shaded region) and the action’s planned duration (light shaded bars), or lifespan, along

with the ± 1 standard deviation for the descriptive median time to completion. Median probabilities are used to calculate the percentage of time spent on a given task as a proportion of planned lifespan. Median probabilities are 0–4 months longer than descriptive medians. Descriptive summaries of time to completion and lifespan are provided in Supplementary Table 1.

‘the excess amount of delay above and beyond that generated by other factors’¹⁴, as some claim?

We use administrative data to compare how long it takes the USFS to complete the NEPA process relative to other necessary steps in implementation. Our analysis examines 4,695 actions involving fuels management, silviculture and invasive species from January 2009 to June 2021. USFS NEPA is an important case both because NEPA serves as an EIA model for many US states and countries, and because the USFS conducts more NEPA analyses than any other agency¹³ and is responsible for managing climate hazards such as wildfire across 8% of US landmass.

Except for decisions with statutory exemptions, NEPA and CEQ rules require agencies to consider and disclose the potential environmental impacts of all major federal actions through a ‘systematic, interdisciplinary’ analysis that can involve public participation¹⁵. If the action is likely to have significant environmental impacts, the agency must prepare an Environmental Impact Statement (EIS) that analyses the potential effects of the proposed action and a set of alternatives while soliciting and responding to public comment. If the action is ‘not likely to have significant effects’ or the ‘significance of the effects is unknown’, the agency prepares an environmental assessment (EA) that analyses the proposed action; public comment is not required but encouraged. If impacts are found to be significant, the agency prepares an EIS. However, if the impacts are insignificant or mitigation can reduce the impacts to an insignificant level, then a finding of no significant impact (first case) or mitigated finding of no significant impact (second case) is prepared. Finally, if an action fits within a category predetermined by the agency and CEQ to ‘not normally have a significant effect on the human environment’, the official can prepare a categorical exclusion (CE), which exempts the action from most analysis and public comment requirements¹⁶. Over 80% of USFS actions are processed as CEs¹¹.

On the basis of survival analysis of more than 4,500 silviculture, fuels and invasive species management actions, we compare the time it takes agency offices to comply with NEPA relative to other implementation tasks. Figure 1 shows the probability of an action’s NEPA decision being signed (Fig. 1a), first contract being awarded (Fig. 1b) and first activity being completed (Fig. 1c).

Results show that the NEPA process is typically faster than, or equivalent to, awarding first contracts and finishing first activities post-NEPA for the majority of landscape interventions. Median survival—the time at which the probability of the event occurring is 50%—is a standard summary statistic for reporting survival curves¹⁷. For actions processed as CEs (62% of actions), median survival is 4.0 months for completing NEPA compared with 8.9 months for awarding the first contract and 13.8 months for implementing the first activity. For actions processed as EAs (34% of actions), the median survival is 16.0 months for completing NEPA compared with 10.0 months for awarding the first contract and 16.3 months for implementing the first activity. The pattern differs for actions processed as EISs (4% of actions). Whereas first contracts (7.9 months) and first activities (14.8 months) have similar median survivals to actions processed as CEs and EAs, the median survival for NEPA completion is longer: 31.3 months (2.6 years). Results show that across decision types, EIA is a fraction of total implementation time. On the basis of probabilities estimated from the survival curves, officials spend 7% (actions processed as CEs) to 12% (actions processed as EAs) to 22% (actions processed as EISs) of an action’s total planned lifespan on NEPA compliance.

The 4% of actions processed as EISs are unique in that the NEPA process takes one to two years longer than awarding the first contract and implementing the first activity. Measures of project complexity suggest that a protracted assessment process is potentially prudent. Actions analysed as EISs have implementation horizons that exceed a decade on average (Fig. 1); as illustrated in Fig. 2, these actions tend to be more complex than actions eligible for CE or EA. Grouped by NEPA decision type, Fig. 2 plots the distribution of planned affected area (size) and number of activities. Whereas the median action processed as a CE or EA is 100 and 625 ha, respectively, the median action processed as an EIS is 1,363 ha. Likewise, actions reviewed through EIS have triple the number of activity types as actions processed through CE or EA.

Yet the NEPA process is not lengthy for all large actions. NEPA analyses for actions in the upper tenth percentile of affected area tend to take less than 20 months to complete, including for major infrastructure development (Fig. 2a inset). For example, the NEPA process for the Ruby Pipeline Project, which laid 675 miles of natural gas pipeline across four Western states with eight cooperating agencies, took a

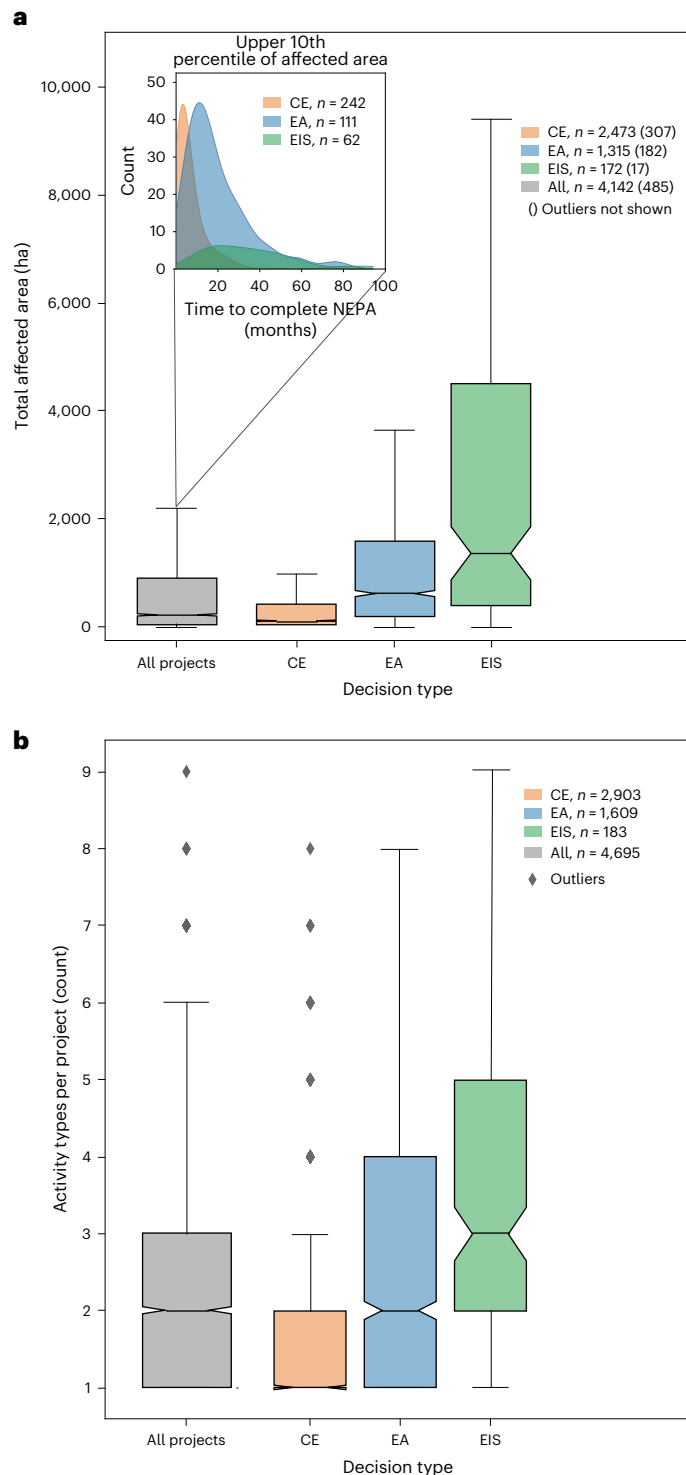


Fig. 2 | Action complexity by analysis type. a, b. Comparison of two metrics: size (a) and number of unique activity types (b). We calculate affected area (a) by summing hectares being considered for treatment through activities included in the FACTS database. We calculate the number of unique activity types (b) by summing the number of unique activity categories described for a given project in the Forest Activity Tracking System database. Box-and-whisker plots depict the interquartile range (boxes) and an outlier function (IQR × 1.5, whiskers). Descriptive summaries for each analysis type are provided in Supplementary Table 2.

little over a year (421 days). Similarly, the longest NEPA processes are not necessarily the largest. Among the upper tenth percentile of time to completion, treated area ranges from less than 1 to over 70,000 ha.

EIA exemptions are increasingly appealing to decision makers. Especially concerning are new pressures on politicians that hold pro-regulation views, who now have electoral incentives to hurry climate and energy decisions to claim credit for benefits that may take years to observe. Our results show that the USFS takes as long or longer to award first contracts and complete first on-the-ground activities than to complete NEPA processes for most actions and that EA and EIS processing accounts for approximately one-fifth of total planned implementation time. We find that for the rare major actions that require an EIS, the NEPA process takes an average of 2.6 years. Generally (but not always), actions analysed through EIS are larger in size, longer term and involve more activities—possibly justifying time spent on stakeholder engagement and effects analysis. Lengthy timelines for complex analyses may also reflect fits and starts in NEPA processing due to agency vacancies, poor data and staff management, changes in congressional budgets and evolving needs of cooperating agencies and stakeholders^{12,13,18}. Despite similarities in the NEPA process and EIA elsewhere, the applicability of our findings to international settings requires further research.

Calls for evaluating the performance of US EIA¹⁹ and administrative procedures²⁰ are increasingly strong for good reason: how the government sources and weighs information to comply with statutory processes involves equity^{21,22}, efficiency²³ and adaptability²⁴ concerns. However, EIA exemption is a politically convenient strategy with high risks under a changing climate future, historic inequity and government mistrust. We do not deny the importance of evaluating, funding, reimagining and modifying EIA—particularly to elevate community perspectives disadvantaged by existing procedural models. Our research on one of the largest producers of NEPA analyses—the USFS—calls attention to efficiency barriers that slow implementation after EIA. Altering contracting regulations, streamlining federal and state policies, revitalizing natural resource industries in rural places and investing in agencies’ technical and personnel resources may accelerate actions that promote clean energy and climate resilience without disenfranchisement. Curtailing robust, deliberative decision making may risk overlooking or underestimating potential environmental impacts and eroding public trust while failing to expedite the implementation of necessary actions.

Methods

We merge the Forest Activity Tracking System (FACTS) Common Attributes geodatabase²⁵ with the USFS Planning, Appeals, and Litigation System data on NEPA compliance dataset²⁶ and use survival analysis to analyse the time it takes agency offices to complete the NEPA process, award their first contract and complete their first activity; calculate the proportion of time spent on NEPA relative to the action’s planned lifespan; and examine the relationship between NEPA analysis type and action complexity. FACTS is the USFS database of record for prescribed burns, invasive species management and timber harvest²⁵, which account for a large share of USFS workload¹¹. The analyses include 4,695 actions (2,903 CEs, 1,609 EAs and 183 EISs) in the FACTS database with associated NEPA decision dates, initiated from January 2009 to June 2021.

We collected additional data to extend the end date of Fleischman et al.²⁶ from December 2018 to June 2021. Actions that have not yet received a NEPA decision are excluded from the analysis because they have no signed NEPA date and thus no start date to assign to second outcomes (awarding contracts, first activities). On the basis of the set of actions without a signed NEPA date in the original version (7-2021) of Fleischman et al.¹¹, we expect the number of unobserved actions in this analysis to be relatively small (less than 5% of the total observations in our analysis) and more heavily skewed towards later years in the analysis. A skew towards later years indicates that unobserved actions are progressing through the planning phase normally but that insufficient time has passed to observe any of the subsequent actions.

A small number of right-censored (incomplete) cases may increase uncertainty around the survival estimates for NEPA analyses but would not change the inferences we make by comparing timelines across different implementation tasks.

We use the Kaplan–Meier estimator, a non-parametric approach that estimates the survival probability, $S(t)$, or the number of observations persisting (for example, incomplete NEPA analyses) divided by the total number of observations ‘at risk’ (for example, all analyses) at time t (ref. 27). The Kaplan–Meier estimator is robust for handling censored events (projects that have not awarded a contract or completed an activity; $n = 314$ and 589 , respectively). Results from the survival analysis show the predicted probability of an event occurring as a function of elapsed time, either from NEPA initiation to NEPA signing or from NEPA signing to the event. The proportion of time spent on NEPA relative to the action’s planned lifespan is calculated using the median probability for time spent on NEPA relative to the median lifespan because median probability accounts for censorship. The median lifespan starts at the fiscal year of NEPA initiation and ends at the fiscal year of the last activity planned for the action.

We calculate affected area (Fig. 2a) by summing hectares being considered for treatment through activities included in the FACTS database. In our sample, 553 actions (12%) are either missing spatial information (520) or are in the Planning, Appeals, and Litigation System dataset but not the FACTS dataset (33). These are not included in Fig. 2a (400 (30) CEs, 109 (3) EAs, 11 EISs) or the median estimates. We checked distributions by decision type, activity and region to investigate whether missingness appears systematic and found no concerning patterns.

Mann–Whitney U tests (two-sided) indicate differences in size and activities according to analysis type (CE, EA, EIS) are statistically significant at $P < 0.01$. Box-and-whisker plots (Fig. 2) depict the interquartile range (boxes) and 95% confidence intervals of the interquartile range (whiskers). We remove outliers from the visualization in Fig. 2 and provide further detail here. CEs, 307 projects with an upper limit of 992.1 ha, are removed from the figure. For EAs, 182 projects with an upper limit of 3,712.7 ha are removed from the figure. For EISs, 17 projects with an upper limit of 10,660 ha are removed from the figure. Within Fig. 2a, the outliers for each NEPA type are removed before plotting the box plots. For ‘All projects’, the outliers for the sample as a whole are included but not shown. The upper limit in this case is 2,211.6 ha with 138 CE, 281 EA and 66 EIS projects not shown as dots above the whiskers.

Analysis was conducted in R version 4.0.4 (packages: survival 3.2-7) and Python version 3.8.13 (packages: pandas, numpy, datetime, matplotlib, seaborn, sksurv.nonparametric.kaplan_meier_estimator, survive.KaplanMeier).

Reporting summary

Further information on research design is available in the Nature Research Reporting Summary linked to this article.

Data availability

The datasets analysed in the study are publicly available in two locations: (1) Fleischman et al.¹¹, PALS: <https://conservancy.umn.edu/handle/11299/211669>; (2) FACTS Common Attributes File: <https://data.fs.usda.gov/geodata/edw/datasets.php>.

Code availability

The code for this manuscript is available at <https://github.com/SpaSESLab/Struthers-NEPA-Delays> and <https://doi.org/10.5281/zenodo.8072329>.

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Author contributions

C.L.S., K.M. and M.A.W. designed the research. C.L.S. led the writing of the manuscript. K.M. and M.A.W. conducted analyses. All authors contributed to the draft of the manuscript and subsequent revisions.

Competing interests

The authors declare no competing interests.

Additional information

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Study description

The study is observational and relies on quantitative data from the US Forest Service (USFS). We merge the Forest Activity Tracking System Common Attributes geodatabase (FACTS) (USFS, n.d.) with the US Forest Service Planning, Appeals, and Litigation Data on National Environmental Policy Act (NEPA) compliance dataset (PALS) (Fleischman et al., 2021) and use survival analysis to analyze the time it takes agency offices to complete the NEPA process, award their first contract, and complete their first activity; calculate the proportion of time spent on NEPA relative to the action's planned lifespan; and descriptively examine the relationship between NEPA analysis type and action complexity.

Research sample

The research sample includes all USFS actions (4,695) involving fuels management, silviculture, and invasive species from January 2009 - June 2021. The two datasets used are listed above. The PALS database includes information on the NEPA process. The FACTS database includes information on awarding contracts and activity timelines. USFS actions that do not involve fuels management, silviculture, and invasive species activities are not analyzed because the FACTS database does not record timelines concerning these actions. The research sample is representative of USFS decision-making on these issues and in the time period studied. USFS NEPA is an important case both because NEPA serves as an environmental assessment model for many US states and countries, and because the USFS conducts more NEPA analyses than any other agency and is responsible for managing climate hazards like wildfire.

Sampling strategy

This is an observational study where the universe of possible cases is complete. No sampling strategy was used.

Data collection

The two databases were downloaded by the researchers from the following websites:
Fleischman et al. 2021, PALS: <https://conservancy.umn.edu/handle/11299/211669>
FACTS Common Attributes File: <https://data.fs.usda.gov/geodata/edw/datasets.php>
The researchers were not blinded to the study hypotheses.

Timing

Data collection (downloading databases) was conducted in November 2021. The data in the study period include observations from 2009-2021.

Data exclusions

USFS actions that do not involve fuels management, silviculture, and invasive species activities are excluded because the FACTS database does not record timelines concerning these actions. Years prior to 2009 were excluded because of major policy changes to Categorical Exclusions (CEs) in 2008 and because the PALS record is generally more reliable in the late 2000s. USFS actions that have not yet completed the NEPA process are excluded from analysis because NEPA signed dates serve as the start dates for the other two completion outcomes (awarding contract, first activity).

Non-participation

No participants were included in this study.

Randomization

This is an observational study where the universe of possible cases is complete. No randomization was used.

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