SOCIETY & NATURAL RESOURCES
https://doi.org/10.1080/08941920.2020.1780358

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Problematic Exclusions: Analysis of the Clean Air Act's Exceptional Event Rule Revisions

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ABSTRACT
In 2016 the EPA revised the Exceptional Events Rule of the Clean Air Act (CAA) making important changes to what types of air quality events are considered exceptional. The rule allows "exceptional" air quality events to be excluded from the dataset used to determine air quality violations, specifically attainment and nonattainment. These exclusions allow air quality levels to remain *above* standards, yet simultaneously appear safe. This policy analysis focuses on the revisions and asks two questions. What are the negative consequences in how the rule defines exceptional events? Does this rule support the primary goal of the CAA? The paper analyzes four exclusion criteria, focuses in on air pollution from dust storms, and draws on a case study of Lamar, Colorado. It returns to the original questions to argue, first, that the rule allows common events to be excluded from the dataset, and second, works against the ultimate goal of the CAA.

ARTICLE HISTORY
Received 30 September 2019
Accepted 20 May 2020

KEYWORDS
Air quality; dust; environmental hazards—risk and health; environmental impact; environmental regulation; policy and law

Introduction

The Clean Air Act (CAA), originally passed in 1963, is of one of the most successful public health laws in the United States. By 2020, it is estimated that the 1990 amendments to the act will save a total of 4.2 million lives and that the law will continue to save 230,000 lives annually, if it remains intact (DeMocker 2003). The economic benefits of those same restrictions outpace costs by 30:1 (*ibid).* Reduction in particulate matter[1] from amended standards is critical to these achievements (Angelides 2011).

However, the 2016 Exceptional Events Rule (EER)—a recent addition to the CAA—alters these standards in important ways by excluding "exceptional" pollution episodes from the regulatory dataset. Areas are either designated as "in attainment" if standards are met, or "nonattainment" if pollution levels violate standards. Nonattainment causes a suite of mitigation requirements and financial costs to the areas with poor air quality. "Exceptional" air quality episodes can include rare events like volcanic eruptions or factory fires, but also much more common and frequent incidences like dust storms and wildfire smoke. Excluding events that violate standards means that populations are exposed to dangerous levels of pollutants, pollutants *above* air quality standards.

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Exceptional event exclusions fit within a larger theme within environmental regulation as to how to count—or not count—certain types of risk or environmental events. For example, regulators struggle with determining if dangerous pesticide drift events should be considered individually as "accidents" or cumulatively as system risk (Harrison 2006) and with how to determine what merits exclusion for environmental review processes (Moriarty 2004). Such regulatory exclusions—like these examples and the EER—can illuminate the tradeoffs and negative consequences of exclusions and how they may ultimately undermine their own regulations.

Examining the legal discourse of the rule is critical to understand how events are justified as exceptional and what type of exclusions the rule produces. This policy review examines the negative consequences of the "exceptional" categorizations, particularly how the rule excludes common and preventable events, as well as how the new rule aligns with the original goals of the CAA. Specifically, this analysis focuses on high wind dust events in the arid Southwest because they are harder to fit neatly into the exceptional criteria and show some of the unintentional consequences of the rule's categorizations and may represent a growing threat with socioenvironmental change.

Making and Revising the EER

The key motivation for the EER is the significant consequences that violations and nonattainment status carry for local and state governments. Nonattainment status carries impacts that can stretch across decades including increased monitoring requirements, federal intervention, and significant financial costs. Nonattainment consequences also raise the stakes on how pollution is measured and specifically how violating events can be excluded as exceptional. If violations can be excluded, nonattainment status can often be avoided. Therefore, the EER is not only about data, but also about avoiding regulatory action.

While the rule itself has only existed since 2007, debates over what should be done with "exceptional" data have a longer history in air quality management. Since the early years of the CAA, the EPA noted a need for flagging air quality data impacted by "exceptional events." In 1986, the EPA issued guidance for such events and created the Exceptional Events Policy, guidelines that were less formal than its rule counterpart. The only criterion pollutant discussed in this early iteration was particulate matter, and the PM_{10} indicator specifically, which resulted in multiple amendments that created exclusions for dust rather than other ambient pollutants. In 1990, amendments allowed waivers for nonattainment violations due to "nonanthropogenic sources" of dust. In 1996, the EPA created the PM_{10} Natural Events Policy which added guidelines for excluding nonanthropogenic dust events. However, it was not until 2007 that the EPA finalized the EER.

The original 2007 rule lays out five examples of exceptional events (Treatment of Data Influenced by Exceptional Events, Federal Register 2007). Of the five examples, three clearly fit into infrequent events that are difficult to prevent: chemical spills and industrial accidents, structural fires, and terrorist attacks. Two, however, were more contentious. First, pollution crossing interstate and international boundaries—regardless of whether anthropogenic or natural—could count as an exceptional event. This hardly

fits into an obvious understanding of an exceptional event based on frequency like the three previous scenarios. Second, the rule identified a number of "natural events" as exceptional. Within the category of "natural" are events that range across the spectrum from solely earth processes (i.e. volcanic eruptions) to those with large human contributions (i.e. dust storms).

In 2016, less than a decade later, the EPA revised the rule largely due to pressure from stakeholders[2]. State regulators felt the burden for proving exceptionalness was too high and they wanted a better definition[3] for what qualified under the rule (Mead and Bullock 2015).

The new rule, while maintaining similar themes, altered the criteria for what counts as an exceptional event:

1. the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation,
2. the event was not reasonably controllable or preventable, and
3. the event was caused by human activity that is unlikely to recur at a particular location or was a natural event.
   - Treatment of Data Influenced by Exceptional Events (Federal Register 2016, 68217)

All three criteria must be met for an event to be designated as exceptional. However, attempts to offer a clear definition were complicated by contingencies that can be read in disparate ways by actors with different motivations. For example, what is reasonable to industry might not be reasonable to public health advocates. The lack of clarity of criteria was a focal point in some of the public comments. After receiving more than 30 comments on the draft rule[4], the EPA promulgated the new 2016 EER that aimed to address issues from stakeholders, including western state governments, industry representatives, environmental groups, and tribes.

Two generally opposing positions emerged. Industry representatives and state agencies supported a streamlining process that decreased the burden of proof to make the process easier. Texas, for example, reported that required designation materials cost several hundred thousand dollars *for each exceptional event* (EPA HQ OAR 2018). The environmental groups, however, argued that the changes proposed in the draft rule weakened important air quality regulations and ultimately increased pollution and risk. The broad definition of "natural" was a key concern and later the focal point of a legal case (Natural Resources Defense Council (NRDC) v. EPA 2018). The rule was enacted largely as proposed despite criticism.

Revised Exclusion Criteria

The specific language choices in the 2016 rule have critical impacts on how pollution is managed, and ultimately air quality in the United States. Importantly, they also produce negative consequences. This is especially the case in the arid West, where dust storms are frequent, dangerous, and often driven by land use practices. Exclusion justifications deserve scrutiny as they determine what data is designated as exceptional, and thus

removed. Exclusions ultimately determine which areas are designated nonattainment and where regulatory action is taken.

In the following section, I dive into four exclusion criteria of the 2016 EER to illustrate how the rule justifies exceptional events. Specifically, how might the rule be excluding events that are in fact quite ordinary? I show how changes in the rule—specifically to exceptional events criteria—have led to more events being deemed exceptional and then excluded.

A Clear Causal Relationship

The first criterion is that a "clear causal relationship between the specific event and the monitored exceedance or violation" be established. Exceptional event designations can only occur after a violation, and the state agency must establish that the event in question caused the violation. Establishing this is the most labor-intensive part of preparing demonstration materials for exceptional events.

The "clear causal relationship" criterion was designed to lessen the burden of proof for states and to allow more events to obtain exceptional status. The original rule required that the clear causal relationship show that the event was "in excess of" past events, asking for an analysis of the historic distribution of events. However, the change removes:

> the requirement for air agencies to provide evidence that the event is associated with a measured concentration in excess of "normal historical fluctuations including background" and replacing it with a requirement for a comparison of the event-related concentration to historical concentrations (Treatment of data influenced by exceptional events, Federal Register 2016, 68225).

In other words, an exceptional event no longer needs to be proven outside of historic ranges of variability (i.e. infrequent). The state only needs to show that the event caused the violation, not that it is rare. This revision lowered the bar for causal relationships to no longer require events be proven outside the historical range, or atypical. For example, under the original rule seasonal dust storms, like those experienced for more than 100 years in Houston, Texas, might not be considered exceptional because they are a predictable seasonal pattern. Under the new rule, the same seasonal storms would be excluded as long as they contributed to the violation. These small changes in the rule's language regarding a causal relationship significantly alter how the rule works and what events qualify. Ultimately, the revision leads to events that are not unusual based on historical distribution obtaining exceptional status.

Establishing a causal relationship is complicated when applied to most events that only contribute to a portion of pollution detected. What relative contribution represents a "clear causation relationship" between an event and a monitored exceedance? It is not as though areas experiencing a dust storm are particulate-free until a dust storm violates standards. These locations have baselines particulates from local dust as well as purely anthropogenic sources like industry and cars. A dust event is not always the sole cause of the violation, making attribution much more murky. Instead, violations include a mixture of particulates from the event in question and from baseline sources. For example, in Houston, refineries emit levels of pollution that often bring particulate

levels to just below the standards so additional particulate from dust leads to violations. However, those violations are attributed to dust despite high industrial contributions, and this classification ultimately hides industrial sources. If, hypothetically, areas experiencing dust decreased their baseline levels with controls on industrial emissions, passing dust storms might not cause violations and nonattainment designations. Thus, many of the violations with "a clear causal relationship" to dust also have a connection to anthropogenic pollution.

Reasonable Prevention

The second criterion is that an event is "not reasonably controllable or preventable," but a clear definition for either qualifier is not given. Logically, unpreventable events might reasonably be treated differently than anthropogenic pollution so that a community devastated by an explosion for instance does not feel the second pain of regulatory action. Yet in most cases, events are not so clearly unavoidable, and this revision raises questions about what counts as "reasonable" and by whose measure. A business might find something that curbs profits unreasonable, but impacted communities would disagree. Similarly, environmentalists might think restrictions on public land use is very reasonable, in fact preferable. The ultimate question becomes whose reason counts and based on what underlying logics and priorities.

It is worth noting that "reasonableness" is heavily relied on in many environmental regulations, not just the EER. Sometimes an ambiguous term can provide important flexibility so that a rule can be applied in different contexts to retain effectiveness in new, unanticipated situations. The goal of reasonableness is admirable; the trouble arises in its interpretation and implementation. The rule also states that "anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions" (68231). In other words, if reasonable controls were in place at an open pit mine, then the rule allows analysis to exclude the mine as a source. While questions are raised about what counts as "reasonably controlled," the second clause is just as important. As currently written, the EPA does not require the control itself to be effective. The rule continues:

> we believe that if reasonable controls were implemented on contributing anthropogenic sources at the time of the event and if, *despite these efforts and controls, an exceedance occurred,* then we would consider the human activity to have played little or *no direct causal role* in causing the event-related exceedance. (Treatment of Data Influenced by Exceptional Events, Federal Register 2016, 68231 *emphasis added)*

In other words, it is not the effect (i.e. a well-working control that limits emissions), but the intent (i.e. a control put in place) that determines its influence on the data. Under this rationale, an ineffective control could be added to an anthropogenic source—an open pit mine or smelting plant—and repeated violations would be erased. Adding "reasonable" controls essentially erases the cause as well as the event because without an anthropogenic cause, the event is considered natural and therefore unpreventable and exceptional.

Additionally, events originating beyond jurisdictional boundaries such as state borders are not considered "reasonably preventable." State regulators do not need to show

efforts to prevent such events, including future events. It is important to remember, too, that these are not just nuisance events. Violations expose people to unsafe levels of pollution, making the stakes of removing responsibility for meeting air quality standards high.

Evoking reasonableness, the rule explains why cross-jurisdictional events are not the responsibility of the downwind regulators.

> It is not reasonable to expect the downwind air agency (*i.e.,* the state or tribe submitting the demonstration) to have required or persuaded the upwind state, tribe, or foreign country to have implemented controls on sources sufficient to limit event-related air concentrations in the downwind state or tribal lands (Treatment of Data Influenced by Exceptional Events, Federal Register 2016, 68237)

This discussion of reasonableness is similarly questionable. For whom is it not reasonable that states and government entities work together on cross boundary issues? This passage actually discusses two different scenarios. Working across international lines between countries that have different air quality standards might be less reasonable. For example, the U.S. and Mexico not only differ in the amounts, but also the indicators, or sizes of particulates they regulate, meaning that a violation in the U.S. may not be a violation in Mexico. However, this is not the case between states in the U.S., as they have the same standards and fall under the same federal law. The rule is written so that it utilizes state boundaries as the important jurisdictions which may make sense politically, but not ecologically.

Ultimately, this assertion of reasonableness may be more a reflection of political will than whether preventions are possible or reasonable. Part of the messiness stems from the CAA leaving most of the enforcement to states. However, it is this management unit—the state—that makes cross-jurisdictional events unmanageable. Such a case is deemed "unreasonable" largely due to the mismatch between the political system designed to manage air quality and the air quality events themselves.

The assumption behind this treatment of cross-jurisdictional events is that the upwind state, the state at fault, will also be in violation, so removing the downwind state's violation will not remove the event in its entirety. Of course, it is true that a downwind state has limited authority over actions in an upwind state, hindering mitigation strategies. However, because of piecemeal monitoring system, this criterion can lead to the exclusion of entire events. For example, events originating in southern Utah where there are no PM_{10} monitors will only be detected in Colorado, but once Colorado removes the violation, the entire event is discarded. The Colorado Department of Public Health and Environment (CDPHE) has made many such requests. CDPHE requested exclusion for two events in 2010 in the southwestern Colorado based on back trajectory models that suggest "that significant source regions for dust transported into Colorado were located in arid regions of Arizona, Utah, and New Mexico" (Colorado Department of Public Health and Environment 2013, 2–3). These dust storms carry many consequences for human health (Crooks et al. 2016; Tong et al. 2017), transportation (Morganroth 2017), and water security through the dust accelerating snowmelt by changing snow albedo (Painter et al. 2010), yet the violations were excluded and so were many following ones in southwestern Colorado due to this criterion.

Recurrence Frequency

Discussing the exceptionalness of an event is difficult without evoking rarity, and simultaneously frequency. While the term exceptional is slippery in many ways because of its multiple, somewhat opposing definitions, when applied to an event, many may assume it refers to frequency. Moreover, the qualifying criteria of the rule itself discusses events that are unlikely to reoccur, tying frequency and reoccurrence to the core of exceptionality. Part of the criterion for anthropogenic events is that they are "unlikely to recur at a particular location," but what does that mean?

During public comment periods, stakeholders asked questions about accepted recurrence frequency[5]. For anthropogenic events, which are specifically required to be unlikely to reoccur to count as exceptional, the rule clearly outlines a recurrence interval of no more than two events over three years. Many readers interpreting "unlikely to reoccur" might be surprised to learn that approaching a yearly occurrence would still qualify as exceptional. The relationship between reoccurrence and exception is further stretched when applied to natural events.

The recurrence frequencies for natural events deviate significantly from the yearly average of the anthropogenic events. More specifically, in the rule recurrence only applies to anthropogenic events, not natural events. The rule goes a step further to "clarify in regulatory language that *natural events can recur, sometimes frequently*, without affecting the approvability of a demonstration for the identified natural event" (Treatment of Data Influenced by Exceptional Events, Federal Register 2016, 68217 *emphasis added).* The logic that an event can recur frequently and still be considered exceptional seems to contradict the very definition of exceptionality, or rarity. Ultimately, the rule allows a natural event to occur regularly, seasonally, you might say normally, and still be considered exceptional and removed from the regulatory sphere.

Naturalness

Critical to the criterion was the determination of type of event, specifically if an event is "natural" or "anthropogenic." The rule is written so that all events that are considered natural are exceptional. Of course, that logic has some gaps: exceptional and natural are not synonyms. Instead, events can be natural and common or any combination of frequency and human influence. The rule gives examples of "natural" events including wildfires, volcanoes, and dust storms and specifies that they are beyond the regulatory scope.

Part of establishing naturalness involves dissecting events, identifying anthropogenic and natural ingredients. While volcanoes can reliably be categorized as natural, both wildfire and dust sit at the human-nature divide. Currently, the largest driver of wildfires is human ignitions (Balch et al. 2017) and fire severity and frequency has been impacted by increasing temperatures due to anthropogenic climate change (Westerling et al. 2006) and forest management practices (Arno and Allison-Bunnell 2013), making fires in many ways hybrid, or natural *and* anthropogenic.

The same applies to dust storms. A dust storm needs both particulate matter that can be carried from one place to the next, and winds strong enough to carry them.

To make a dust storm an exceptional event, the rule requires states to categorize those ingredients:

> The meteorological phenomenon (i.e. wind) is purely natural and thus can be classified as a natural event, but the pollution from the event may be a mixture of natural sources (e.g. undisturbed soil) and anthropogenic sources (e.g. soil disturbed by human activity, emissions from sand and gravel facilities, etc.). The EPA generally classifies high wind dust events as "natural events" in cases where windblown dust is entirely from natural sources or where all significant anthropogenic sources of windblown dust have been reasonably controlled (U.S. EPA 2013, 5).

This excerpt shows that dust storms are divided into two key parts with wind considered unquestionably natural, and source of dust becoming the critical criterion for the event's naturalness. While climate scientists might take issue with wind being considered fully natural, it is the least complicated or problematic of the two elements. The source is the especially complex element.

Dust can come from many dispersed sources, rather than point sources which complicates assessing its causes. Additionally, in the Southwest U.S., determining the relative naturalness of a cause is difficult because of unique interactions between public land use and ecology. Public lands have a variety of uses (grazing, recreation, oil and gas development, mineral extraction, etc.) and carry legacies from previous land use, especially since the soils are fragile and take decades to recover from disturbance (Belnap 2003). The rule concedes that even if an event has anthropogenic sources it can be deemed natural if mitigation actions are in place, even if they *do not stop* dust emissions.

Case Study: Lamar, Colorado

To highlight the negative consequences of this rule, this analysis examines the case of dust[6] in Lamar, Colorado. Lamar is located on the eastern plains and is one of the poorer communities in the state (U.S. Census Bureau 2010). Lamar averages 15 inches of rain a year—significantly drier than the national average—and has experienced a string of severe droughts that have increased local water stress and contributed to dust issues. While the city made statewide news for a number of intense dust storms in 2013 (O'Connor 2013), this is not its first experience with dust. Southeastern Colorado, where Lamar is located, was a region hit hard by the Dust Bowl in the 1930s.

Yet, with this long history of dust in the region, why is it surprising or unexpected that dust events occurred? Why are these viewed as exceptional? The case of Lamar highlights how specifics of place and historical record should make dust an expected air quality issue to be managed rather than an exceptional one to be excluded. Furthermore, it also shows how exclusions that allow air quality levels to meet standards ignore drivers—like local land use practices—that could be altered but remain largely unregulated and unchanged. This case falls under the original rule[7]. However, since the burden of proof only decreased for what counts as exceptional, there can be high confidence that an event that qualified in 2013 would almost certainly qualify under the 2016 revised rule.

A number of severe dust storms hit Lamar in 2013, gaining media attention and resulting in seven exceptional event requests by the state of Colorado, four in the month

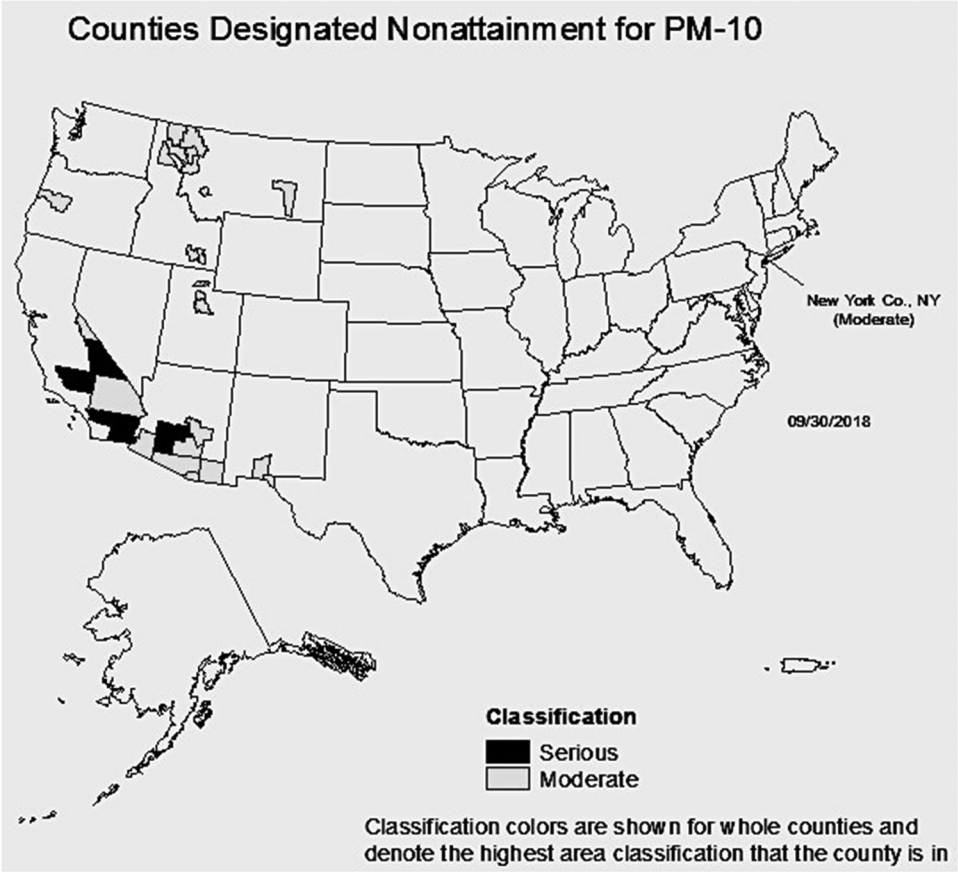

Figure 1. Map of PM_{10} nonattainment areas, September, 2018, from EPA Green book. https://www3.epa.gov/airquality/greenbook/mappm10.html.

of May alone. While this year represents one of the dustier years, it did not violate any of the air quality regulations: this makes 2013 particularly useful for examining the treatment of exceptional events. Exclusions significantly changed the dataset that year; the original range was from zero to more than 1220 $\mu g/m^3$ and the resulting range was capped at 160 $\mu g/m^3$, conveniently just under the standard. Importantly, these events fell under the original rule, not the revised one. The designation is a time intensive process, so it is too early to analyze the effects of the revised rule. However, the events described would all qualify for exclusions under the new rule as well.

The consequences of removing exceptional events and modifying the air quality dataset amplifies because they are used to determine regulatory action. Lamar was designated as in attainment despite the numerous dust storms that repeatedly violated standards. In fact, all of Colorado's counties are in attainment despite violations within the state (see Figure 1). Lamar had seven violations in one year, but data exclusions allowed it to appear as in attainment. Exclusions allow Lamar's air quality to appear safe. Further, without nonattainment, the state is not required to change any practices that might contribute to the air quality violation. According to the state's application, the violations were caused by "dry soil conditions over source regions with 30-day

precipitation totals below the threshold identified as a precondition for blowing dust; and (b) meteorological conditions that caused strong surface winds over the area of concern" (Colorado Department of Public Health and Environment 2015, 184).

However, some of the dust events could been avoided if agricultural practices were different, for example if no-tilling practices were used. While different government actors are working with farmers to *encourage* no and low-till practices, since tilling is largely associated with dust sources, these remain opt-in and voluntary rather than required changes (Colorado Department of Public Health and Environment 2015). Exclusions that keep air quality levels in attainment reduce pressure for required changes and ultimately reduces accountability.

Lamar highlights three of the four problematic elements of the exceptional event criteria discussed in this analysis. First, considering all of the storms *natural* is problematic since the surrounding area features high soil disturbance from agricultural practices known to produce dust. Second, these dust storms have a high *recurrence frequency*. Yet, since frequency only pertains to "anthropogenic" events, it does not factor into the assessment of these dust storms and they are able to be framed as exceptional rather than seasonal or expected. Third, since dust is treated as natural, it is not considered *reasonably preventable* and thus regulators are not required to enact changes to agricultural practices that might mitigate dust.

Dust storms are not just an issue in rural communities nor ones with intensive agriculture, but also an issue for many larger communities throughout the West, particularly with increasing aridity (Romm 2011; Tong et al 2017). Dust storm impacts are already emerging throughout the Western U.S. For example, the decreasing lake levels of the Great Salt Lake has led to an increased potential for severe dust storms in the densely populated Wasatch Front (Wurtsbaugh et al. 2016). This makes dust, as well as the rules and regulations that pertain to it, a very salient issue.

Dueling Priorities and Goals

This analysis asked two questions about the consequence of the new EER and how it impacted the aims of the CAA. Are these revisions leading to normal events being excluded? Yes, and often. Further, it is important that the regulation ultimately be evaluated by how it achieves the goal of the CAA, which is to improve air quality, primarily for protecting public health. Does the EER support this goal? Unequivocally no.

There is no interpretation of the EER, or its motivations, that prioritize public health, public welfare, and environmental quality. The exclusions allow states to remain in attainment with air quality levels of nonattainment. In this way, the rule might actually lead to decreased air quality because it removes incentives and requirements for mitigation efforts. Jurisdictions with poor air quality are allowed to maintain levels or even increase levels of pollutants, as long as they can be classified as exceptional.

Of course, there are cases of exceptional air quality events that truly fall outside of the control of air quality managers and regulating complex, messy systems is extremely difficult. However, the way the rule is written and many of the cases where it is applied in the Southwest are not such situations. Instead, the decreased burden of proof of the

new rule allows regular, repeated, and foreseeable events to be ignored, and most importantly, exposes populations to health risk.

This analysis can provide new insights and a starting place to evaluate the rule and spark discussion about its contents and consequences. Rules are revisable; the EER was just revised in 2016 and has the potential to be revised again. Another option is that the EPA could offer new guidance to accompany the rule that would not require a total overhaul. Regardless, the first step needs to be a larger discussion about the rule's impact and if it is in accordance with CAA goals. A discussion needs to weigh the benefits against the problematic elements of this rule; a win-win option might not exist, but tradeoffs need to be more explicit for a sound evaluation. This analysis concludes with policy recommendations to improve the rule.

Recommendations

- *Provide better information about the use of rule:* Currently, requests for exceptional event designation are made on an event level and remain largely disaggregated, which obscures trends of use and impact. More research needs to look at how the EER has been used at state and regional levels and create a national database of exceptional events would make analysis much easier and cumulative impacts legible. Research should examine how the rule has been used to alter nonattainment designations and examine multiple types of events, particularly how wildfire might be similar or different to dust. Additionally, research should examine the policy implications for how the EER interacts with other important air quality policies such as the Regional Haze Rule and the Cross State Air Pollution Rule.
- *Prioritize public health:* If we consider dust natural—despite many complexities—and we recognize some places and regions have high natural levels of a pollutant, it is imperative to decrease *anthropogenic emissions*. Any type of particulate matter (dust or not) carries significant health risk for morbidity or mortality (Dockery et al. 1993) and studies have shown dust can lead to cardiovascular mortality (Crooks et al. 2016), and infectious disease (Tong et al. 2017). In areas with high baselines of dust, we should require decreased anthropogenic emissions so that total levels remain at safe levels below standards.
- *Make the EER adaptive to environmental change:* Environmental change is expected to increase the frequency of extreme events that will affect air quality, particularly dust and wildfire smoke pollution. Greater attention needs to be given to how the EER might be excluding events that are becoming increasingly more common. Adaptive management requires timely and accurate information and excluding extreme events may make it harder to anticipate or see what a "new normal" begins to look like. As environmental systems shift so that averages or normal shift, it might mean that regulators need to reexamine what is exception or abnormal in respect to a new normal.
- *Resolve the frequency problem with exceptionality:* There is no limit on frequency of exceptional events that can occur in a place if they are considered natural. Allowing frequent exclusions works against the intended purpose of the rule—to

exclude *exceptional* events—and the mission of the EPA. A recurrence limit on natural events would prevent uneven impacts for communities with different physical environments.

- *Focus on effect rather than effort:* The rule allows for anthropogenic sources to be treated as "natural" if mitigation is put in place, even if ineffective. Instead, efforts should be evaluated based on effectiveness.
- *Unpack "natural" event designations:* Many of the events categorized as "natural" and thus exceptional have both environmental and anthropogenic contributions. The narrow understanding of "natural" works to hide anthropogenic sources and disincentivizes land use changes or other types of mitigation.

Notes

1. The EPA defines particulate matter "the term for a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others are so small they can only be detected using an electron microscope" (Environmental Protection Agency 2020).
2. The Federal Register states that the revisions were made "to address certain substantive issues raised by state, local and tribal co-regulators and other stakeholders and to increase the administrative efficiency of the Exceptional Events Rule criteria and process" (Treatment of Data Influenced by Exceptional Events 2016, 68220).
3. For example, in the comments, the Western Governors Association wrote "the term 'reasonable controls' has not been defined by EPA and has been inconsistently applied" (Mead and Bullock 2015, 1).
4. Agency Docket: EPA-HQ-OAR-2015-0229.
5. As indicated in the Federal Register.
6. Specifically, PM_{10}.
7. Even by December 2019, Colorado had no public designations under the new rule due to the long review process.

Acknowledgments

I am grateful for the helpful feedback from William Travis, Lisa Dilling, Laura Nash, and Justin Latici and wish to thank the three anonymous reviewers whose thoughtful commentary improved the manuscript. This analysis was made possible with support from the Babbitt Dissertation Fellowship from the Lincoln Institute of Land Policy and the Western Water Assessment.

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