

Research Article

COVID-19 and the Environmental Regulatory Response: Compendium of Regulatory, Ad Hoc Changes and Implications

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Abstract: Using open source and official documents, we documented and analyzed changes in environmental regulations in response to the COVID-19 pandemic. We accumulated 71 such regulatory changes across 29 countries, spanning several environmental sectors, between March and July 2020. The objective of our analysis is to characterize trends, impacts and implications of regulatory changes adopted in response to COVID-19. Our analysis contributes to understanding the types and nature of changes that the pandemic may induce in environmental policy through behavioral changes and resource use. Examination of the data shows that countries around the globe largely pursued rollbacks and enforcement relief in response to COVID-19. However, developing countries in our data were more likely to tighten environmental regulations compared to developed economies, where steps towards deregulation dominated regulatory changes. The data also shows that actions in the energy sector were geared toward deregulation. Air quality and biodiversity regulations were rolled back in response to the COVID-19 pandemic, despite rising concerns about the links between the coronavirus and pollution, wildlife, and habitat destruction. It can be concluded that the nature and type of changes in environmental regulations across countries in response to COVID-19 depended on a country's economic development status and that the degree of regulatory changes across different sectors was driven by the differences in the social and economic impacts of the pandemic.

Keywords: environmental regulations, COVID-19 pandemic, biodiversity, environmental management, deregulation, environmental enforcement

1. Introduction

The onset of the COVID-19 pandemic early in 2020 elicited various responses in public policy, all intended to cushion the negative impacts of the virus. These responses include fiscal and monetary measures of different types, shutdowns of public and private sector operations, quarantines, and travel restrictions. Various policy responses to the pandemic continue to be documented and analyzed; for example, see Gentilini et al. [1] for an analysis of jobs and social protection measures. However, public policy responses focusing specifically on environmental regulations remain underappreciated. This paper seeks to contribute to filling this gap in the literature. The objective is to characterize trends and the impacts and implications of regulatory changes adopted in response to COVID-19. We examine real-time changes in environmental regulations induced by COVID-19. We emphasize the features and trends associated with such changes as well as their implications for environmental quality. In particular, we evaluate regulatory responses to

the COVID-19 pandemic along three key issues: (i) direction of changes (the balance of weakening versus strengthening of regulations), (ii) areas of emphasis in regulatory changes, and (iii) the implications for environmental outcomes.

The importance of addressing these issues is that, first, there is some evidence that environmental quality plays a role in the fatality and transmission of COVID-19 [2-5]. Second, habitat destruction and illegal wildlife trade reduce the buffer between humans and fauna, increasing the likelihood of zoonotic diseases of the COVID-19 type [6]. Thus, there is value in protecting biodiversity in the midst of the COVID-19 pandemic, and the data on regulatory changes allows us to examine the relative significance of biodiversity protection during the pandemic. Third, both the COVID-19 pandemic and the regulatory response in environmental policies ultimately have an effect on the subsequent evolution of environmental policy. Rowell [7] argues that COVID-19 triggers at least four types of changes in environmental law: (i) behavioral changes that have environmental impacts; (ii) changes in resources and their uses; (iii) demographic changes that alter the environmental risks against which policy is designed; and (iv) changes in value systems. Each one of these can induce environmental policy change. Thus, understanding real-time policy changes in response to the COVID-19 pandemic in these contexts will be crucial for anticipating future changes and designing efficient environmental policies.

To address the key issues of this paper, we construct a compendium of changes in environmental regulations that are directly tied to COVID-19. A close examination of our compendium reveals several critical observations and features of changes in environmental regulations during the COVID-19 pandemic. First, developing countries in our data were more likely to tighten environmental regulations compared to developed economies. High-income countries, on the other hand, largely pursued rollbacks and/or enforcement relief. Though this is undesirable, the reason is intuitive: high-income countries tend to have more stringent laws and regulations, along with credible enforcement. These stringent regulations also tend to be costly, making them easy targets during an economic crisis of the type precipitated by the pandemic. Second, deregulation in developed countries, led by Canada and the United States, was highly concentrated in the primary sector or natural resource extraction. This was particularly pronounced in the energy sector, which dominates both regulatory rollbacks and enforcement relief. Third, changes in environmental laws and regulations in response to COVID-19 ranged from expectations of conditional compliance to financial assistance and full rollbacks or suspensions. Regulatory rollbacks were largely justified by the need to provide compliance cost relief to regulated entities. Thus, it was expected that industries and sectors with high compliance costs would experience more rollbacks. The rest of the article is organized as follows: we elaborate on the nature of data, data collection and sources in Section 2. A summary of the data, results, analyses and discussions is presented in Section 3, and a conclusion is provided in Section 4.

2. Data and data sources

To identify the changes in environmental regulations undertaken by various countries around the world in response to the COVID-19 pandemic, we relied on open sources, official government documents, and press releases. Using these open sources, we accumulated 71 real-time changes to existing environmental laws and regulations as well as new environmental regulations specifically attributed to the COVID-19 crisis between March and July 2020. The regulatory timing here is important. The period from March until July 2020 was when policy responses to COVID-19 were most intense. Also, unlike socio-economic changes that were often contingent on the evolving status of the pandemic, environmental regulations required only changes to existing rules or the creation of new ones. Limiting our analysis to this period ensures that the policy changes implemented were specifically in response to COVID-19. In particular, they exclude policies that may have been ready to be implemented prior to the beginning of the pandemic. To maintain a causal link between the pandemic and the policy changes, we consider only those changes that identify “pandemic” or “COVID-19” as the reason for a regulatory change or new regulation. This also guided the search terms we used to identify official government documents and press releases. These search terms consisted of affixes such as “pandemic”, “COVID-19”, “corona-virus” and terms such as “environment”, “environmental regulations”, “environmental policy”, “environmental law” etc. The data on changes to environmental regulations in response to COVID-19 was compiled into an Excel file and is available upon request.

3. Results and discussion

The countries for which we collected data on regulatory changes and their corresponding count of changes are illustrated in Figure 1. According to Figure 1, Canada, the United States and Australia accounted for a significant share of COVID-19-related environmental regulatory changes. These three countries accounted for about 45% of the total number of environmental regulatory changes in the data. In order to derive some insights on the types and nature of regulatory changes, we summarize the data around key issues, focusing on (1) the direction of changes, (2) areas of policy emphasis in regulatory changes, and (3) the impacts of regulatory changes. Note that in analyzing the list of changes to environmental laws and policies in response to COVID-19, we do not distinguish between state, provincial, or regional changes within the same country or jurisdiction.

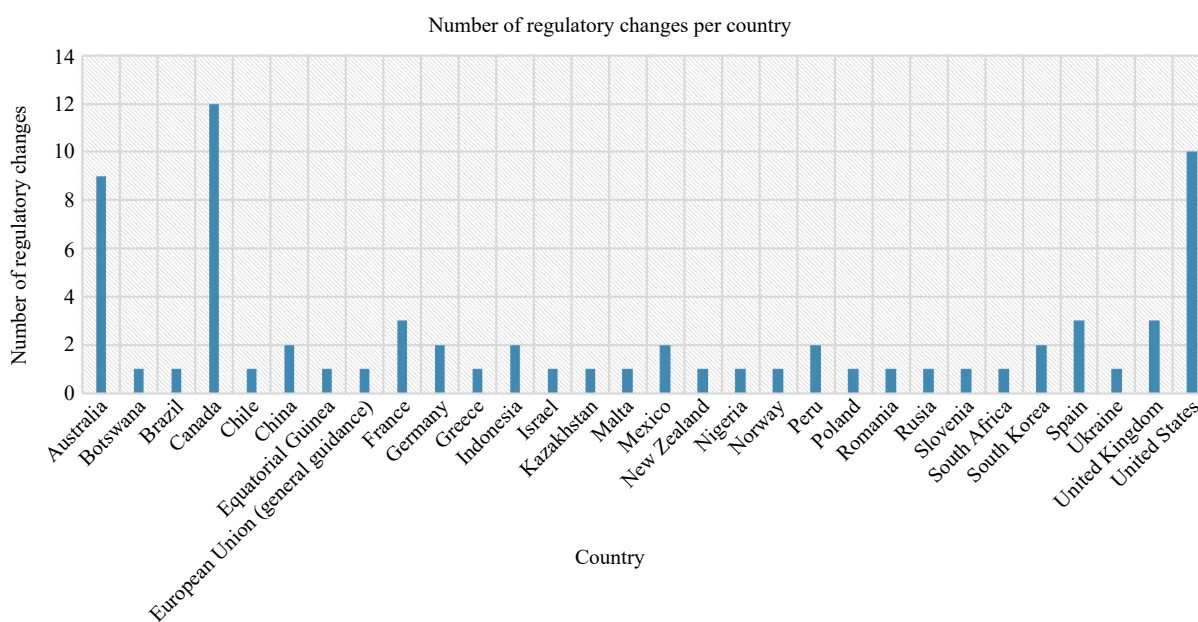


Figure 1. Number of regulatory changes by country

In summarizing the data, we focus on important aspects of the changes in environmental regulations. Table 1 provides a summary that allows us to address the key issues of our paper. It identifies countries and their corresponding numbers of regulatory changes induced by COVID-19. The count of these changes per country is further broken down into two topics of interest: specific environmental subsectors affected by regulatory changes and the type, nature, and direction of the regulatory changes. For the former, we identify regulatory changes in the energy sector, biodiversity, air pollution, waste management, fisheries and aquaculture, transportation, and agriculture. For the latter, we classify regulatory changes as either rollbacks, tightening, enforcement relief or financial assistance. Note that enforcement relief itself is a regulatory rollback, but we use this distinction in order to identify countries that limited their deregulation to enforcement relief (reduction or elimination of inspections, monitoring, and fines or penalties for noncompliance) versus those that pursued full deregulation. In addition, some countries pursued both rollbacks and enforcement relief in the same directive, and thus the count of types of regulatory changes may exceed the count of the total number of regulatory changes recorded for a particular country. In many cases, a directive on a regulatory change did not emphasize any sector, instead referring generally to changes being pursued in environmental regulations in response to COVID-19. That is, if the language in the directive implied that regulatory rollbacks and/or enforcement relief were broadly applied in scope, then we simply labeled them in the general category in Table 1. In some cases, specific sectors were emphasized as part of general changes to policy. In such cases, we note both the sector and the general emphasis. Thus, the count of policy changes across various sectors in a particular country may exceed the total count of policy changes recorded in that country.

Table 1. Types and nature of changes in environmental regulations across countries and sectors

Financial assistance	Types of regulatory changes			Country	Number of changes	Areas affected by regulatory changes											
	Regulatory tightening	Enforcement relief	Regulatory rollbacks			Energy	Biodiversity (includes land use)	Water	Air quality	Waste	Fisheries	Infrastructure	Transportation	Agriculture	General		
		1	8	Australia	9	2	1	1	1	1							5
				Botswana	1	1											
	1		1	Brazil	1		1									1	
		8	6	Canada	12	6	3	2	3				1				3
		1	1	Chile	1												1
		1	1	China	2		1										1
	1			Equatorial Guinea	1	1											
				European Union	1												1
2	1		1	France	3	1			1								
		2		Germany	2	1					1						
			1	Greece	1	1											
			1	Indonesia	2		1		1								1
				Israel	1												1
				Kazakhstan	1	1											
				Malta	1												
			1	Mexico	2	2											1
1				New Zealand	1		1										
				Nigeria	1	1											1
				Norway	1	1								1			
		1	1	Peru	2								1				1
			1	Poland	1							1					
				Romania	1				1								
				Russia	1	1											
				Slovenia	1												
				South Africa	1				1								1
		2	1	South Korea	2					1			1				1
1		2		Spain	3	1	1					1					1
		1		Ukraine	1	1											
			2	United Kingdom	3					1	1	2					1
1			3	United States	11	4	1		2	1							3
8	17	19	40	Total	71	25	12	7	7	6	3	5	1	1		22	

3.1 Trends and implications

Some countries kept compliance expectations during COVID-19 but expressed a willingness to work with regulated entities to adjust expectations if violations or inability to fully comply are directly related to COVID-19. This was the case with a number of directives issued by the Australian authorities. On the other end of the spectrum of changes, many countries pursued changes that fully rolled back regulations or enforcement, including both monitoring and penalties for violations.

3.1.1 Type and nature of regulatory changes

Here we examine the types of changes in environmental regulations adopted in response to COVID-19. We categorize these changes as rollbacks or “policy easing”, enforcement relief, policy tightening, and compliance incentives in the form of financial assistance. Rollbacks involved deregulation, relaxation of compliance requirements, suspension of existing regulations, and delays in the implementation of pending regulations. We qualify “enforcement relief” as reductions in inspections or monitoring in order to maintain social distancing or the total elimination of expected fines or penalties for noncompliance. Policy tightening mostly took the form of imposing stricter compliance standards or expectations and, to a lesser extent, requiring changes for better environmental performance. These rollbacks, enforcement relief and policy tightening were spelled out in various formats across different countries as modifications to either existing laws and regulations, new legislation, or executive orders.

Regulatory rollbacks: Almost 55% (see Table 1) of the changes in environmental laws and regulations across the 29 countries for which we accumulated data were rollbacks. Regulatory changes in general and rollbacks in particular were concentrated in three major economies: Canada, Australia, and the United States. These three countries accounted for about 45% of total regulatory changes, and we qualify approximately 59% of these changes as regulatory rollbacks. These regulatory rollbacks were observed across various environmental subsectors, including air quality, biodiversity, energy production, waste management, etc. Examples of these changes include the suspension of the implementation of soil management regulations [8] and the suspension of part of the Ontario Environmental Bill of Rights in Ontario, Canada [9]. In the United States, regulatory rollbacks included fuel waivers on standards for vendors [10]; an executive order (specifically Executive Order No. 13924, 85 F. R. 31353-31356 [May 22, 2020]) that requested agencies to rescind, modify and provide waivers or exemptions from regulations [11]; and the opening of the Alaskan wilderness for oil exploration and production. In China, rollbacks were limited to extensions of time for facilities to come into compliance [12]. In Poland, regulatory rollbacks were in the form of suspension of permit requirements, administrative and court proceedings, and stays of reporting deadlines [13]. In Australia, policy statements on regulatory changes largely outlined that compliance remained the expected outcome but expressed the willingness to work with regulated entities to provide temporary relief where needed. Such relief included extensions to timeframes, time-bound amendments to license and approval conditions, and granting exemptions where available [14-19]. Rollbacks in Peru were mainly in the form of extensions of deadlines on certifications and relaxation of permit requirements [20, 21].

Enforcement relief: We qualify about 27% of the regulatory changes in our data as enforcement relief. As in the case of rollbacks, Canada dominated in this category, accounting for about 42% of total changes in the enforcement of environmental laws and regulations. In fact, more than two-thirds of the changes in environmental regulations in Canada involved enforcement relief (see Table 1). Just a little less than half of the regulatory changes in Canada involved a reduction or full suspension of either inspections, monitoring, or penalties, or both [22-25]. The second highest number of changes in environmental regulations that involved enforcement relief were observed in the United States, where a little more than a quarter of all changes involved enforcement relief. However, the Environmental Protection Agency (EPA) has specifically stated that enforcement relief did not include the relaxing of the pursuit of felony charges, though civil complaint restrictions were to be eased [26]. Reduced inspections and monitoring were also observed in the Chinese regulatory response to COVID-19 [12]. In Israel, enforcement relief in the Novel Coronavirus Emergency Regulations included temporary suspension of fines for noncompliance with environmental regulations and postponement of due dates for fees, waivers on additional fees, and postponement of trial dates [27].

Policy tightening: In our data, about a quarter of all actions in environmental regulations induced by COVID-19 involved some form of policy tightening. On balance, developing countries in our data were more likely to tighten environmental regulations compared to developed economies. This can be seen in Table 1, where eight of 15 developing

countries took policy measures to tighten regulations amidst the COVID-19 pandemic, while only six of 14 developed economies took similar steps. Spain, South Korea and Germany accounted for more than two-thirds of these policy-tightening measures in developed economies. Notably, Canada implemented the largest number of changes, and none of them involved tightening policy. High-income countries largely pursued rollbacks and/or enforcement relief, though this is undesirable. The reason is intuitive: they tend to have more stringent laws and regulations. South Korea was the exception among high-income countries that did not pursue regulatory rollbacks or enforcement relief. Rather, it established mechanisms and capacity to address COVID-19-related environmental problems, with special emphasis on waste management. In Romania, the effort was focused on creating a committee devoted to the prevention of illegal logging [28].

Financial assistance: Our data indicates that about 11% of all changes in environmental regulations in response to COVID-19 involved some form of financial assistance or innovation contests, and nearly all of them were in developed countries. Canada established a Large Employer Emergency Financing Facility that provided aid to large employers conditioned on environmental improvements [29]. Similarly, in France, the automobile industry received financial assistance from the French government in exchange for commitments to move toward greener solutions in manufacturing [30], and the Department of Energy in the United States announced \$122 million for “coal product innovation” to promote “clean coal” [31].

3.1.2 *Emphasis on regulatory changes*

Environmental regulations are often designed to target specific sectors and areas of human life with negative impacts on the environment. Here, we analyze regulatory changes with respect to the environmental subsectors where these changes were most concentrated. Environmental subsectors in which regulatory changes were easily identified in our data include energy, biodiversity and land management, water resources and management, air quality, waste management, infrastructure and construction, fisheries and aquaculture, agriculture, and transportation.

Energy sector: As expected, the general trend in the changes to environmental laws and regulations in response to COVID-19 was to deregulate activities in the energy sector. This tendency to deregulate is pronounced in countries where resource extraction makes up a large portion of the economy. This is the case for the United States, Canada, and, to a lesser extent, Australia and Mexico. The energy sector dominated the sources of environmental regulatory changes. It accounted for about half of all regulatory changes across all countries, and most of the changes were rollbacks. In countries (like France) without much energy exploration and production activity, on the other hand, there were fewer regulatory rollbacks in environmental regulations in the energy sector, and there was a forward-looking climate policy. Close to half of the regulatory changes in Canada that involved the suspension of either inspections, monitoring, or penalties or both were in the energy sector [22-24]. In the United States, all regulatory changes were geared towards increasing energy production and/or access. For example, easing regulations on fuel vendors [10], innovation initiatives in clean coal [31], and even opening up protected lands for oil and gas exploration. Similar actions were taken in Queensland, Australia [32], and in Greece [33]. Regulatory changes in the energy sector in other countries occurred in a variety of contexts, often aimed at increasing access or ensuring energy security. These included grid security in Mexico [34], renewable energy expansion in Kazakhstan [35], Spain [36], and Ukraine [37], and enabling energy providers to invoke force majeure on contracts in France [38]. Other actions involved the development of a hydrogen plan in Norway [39], the expansion of coal production in Russia [40], the expansion of energy infrastructure in Botswana [41], and a Coronavirus Tax Assistance Act with multiple provisions to encourage the development of hydrogen fuel in Germany [42].

Biodiversity: Roughly 17% of the total number of changes in environmental regulations in our data were in the areas of biodiversity and land management. Canada only contributed a quarter of these changes. COVID-19-related changes in environmental regulations in Canada that directly affected biodiversity included the delayed implementation of soil management regulations, the elimination of groundwater monitoring by oil and gas companies, and the modification of the Public Lands Act to reduce the regulatory burden and stimulate economic activity [8, 9, 24, 25]. Changes elsewhere ranged from new Chinese regulations on certain chemicals with the potential for significant environmental damage [43]; the elimination of existing protections of indigenous lands in Brazil [44, 45]; and legislation in Greece allowing oil drilling in protected areas [33]. Other changes involved amending the Environmental Protection and Biodiversity Conservation Act in Australia to fast-track projects as part of COVID-19 recovery efforts

[46]; a COVID-19 recovery package focusing on nature jobs (pest and weed control, conservation, etc.) in New Zealand [47]; and instituting severe penalties on illegal logging in Romania [28]. Regulatory changes that provide biodiversity protection and improvement included a decree in Spain to improve soil management [48].

Water: Water management and quality were the focus of approximately 10% (see Table 1) of the changes in environmental laws and regulations in our data. This ranks third after energy and biodiversity. Regulatory changes affecting water management and quality included modifications to the Water Act in Canada to provide regulatory relief and stimulate economic activity in response to the coronavirus crisis [25] and delays in administrative deadlines for licensing for water management projects in South Africa [49]. There were changes to the Navigable Waters Protection Act in the United States to limit the scope of waters in the United States under federal protection [50, 51]. Other regulatory changes were either benign - as in the redefinition of some bureaucratic terminology in the Clean Water Act Section 401 Certification Rule in the United States [52, 53] - or simply a stated willingness to provide regulatory relief to regulated facilities to help them deal with COVID-19-related operational challenges, such as in Australia [14, 19] and the United Kingdom [54, 55].

Air quality: The majority of changes in air quality regulations, comprising about one out of every 10 regulatory changes in our data, were largely regulatory rollbacks and enforcement relief, and nearly all of these were concentrated in Canada and the United States. In Canada, a temporal amendment to select air monitoring requirements allowed industrial operations to deviate from air monitoring directives and industrial sites to monitor their ambient air quality less frequently. In addition, the Alberta Energy Regulator relaxed the monitoring of volatile organic compounds (VOCs) emissions in the oil sands region [22-24]. Meanwhile, in the United States, Mercury and Air Toxic Standards (MATS) restrictions and standards were rolled back for coal-fired power plants [56, 57]. In France, the automobile industry was provided financial assistance while securing commitments from automobile manufacturers to move toward greener solutions in manufacturing [30]. Air quality-related regulatory changes in Australia [58] and the United Kingdom [59] were part of well-established and comprehensive mechanisms for addressing climate change. The impact of regulatory rollbacks in the area of air quality was partly compensated by a fall in pollution resulting from a drop in economic activity due to shutdowns, for example, the closure of factories or reduced activity in them as well as a decrease in energy consumption. This explains the evidence of short-term air quality improvements in places like Milan, Italy [60], China [61-63], Brazil [64], and India [65]. Air quality in major cities across the globe improved thanks to a sharp fall in road and air traffic [66] and factory emissions of carbon dioxide (CO₂), nitrogen oxides (NO_x), and trioxigen (O₃).

Waste: A few countries in our data, namely Germany, South Africa, Poland, and the United Kingdom, made regulatory changes to address issues specific to waste and waste management. There had been rising concerns about the appropriate management of COVID-19-related medical waste, particularly the use and disposal of facemasks. Only Poland specifically referenced and emphasized medical waste through “Anti-Crisis Shield” legislation that suspended all administrative procedures and court proceedings for environmental permitting, stayed on deadlines, and modified waste treatment legislation to allow thermal processing of waste related to efforts to counter the coronavirus-related medical waste [13]. In the United Kingdom, a follow-up to a series of policy statements by the Environmental Agency on priorities in the response to the coronavirus included a temporary lift on plastic bag charges as well as allowing shops to eliminate fees on plastic grocery bags [54, 55, 67]. This is in contrast to the European Union, which resisted calls to lift the ban on single-use plastics [68]. The most comprehensive and positive response to COVID-19 in waste management was observed in South Korea and Germany. In Korea, a joint venture between the Ministry of Environment and Korea Environmental Corporation built up reserves of recycling raw materials as a means to relieve the pressure on recycling facilities [69]. In Germany, an initiative called “appreciate instead of throwing away”, ushered in as part of the circular economy concept, advocated reducing environmental impacts from manufacturing processes all the way through to discarding or recycling waste. The corresponding proposed waste legislation emphasized consumer, retail, and public appropriations [70]. Regulatory rollbacks and the accompanying shutdown of waste treatment plants were highly problematic because of the corresponding rise in waste and endangerment of public health [71]. Shutdowns led to the accumulation of large quantities of organic waste amidst severe cuts in agricultural and fishery exports [66]. This was compounded by COVID-19 inducing a sharp drop in the price of oil, which further negatively distorted incentives in the recycling business [72]. A reduction in waste treatment capacity also had severe implications for COVID-19-related waste such as contaminated gloves and facemasks.

Infrastructure and construction: Out of the 29 countries for which we have data on regulatory changes related

to COVID-19, at least five of them made changes in environmental regulations that directly affected the construction sector and infrastructure development, all of which were rollbacks. In the United States, an executive order was issued focusing on deregulation and speeding up infrastructure projects [11]. In a request for government agencies to submit a list of regulations to be relaxed, the executive order articulated that “agencies should address this economic emergency by rescinding, modifying, waiving, or providing exemptions from regulations and other requirements that may inhibit economic recovery, consistent with applicable law and with protection of the public health and safety, with national and homeland security, and with budgetary priorities and operational feasibility” (Executive Order No. 13924, 85 F. R. 31353-31356 [May 22, 2020]). Other rollbacks directly tied to COVID-19 were implemented in Slovenia, where permits for construction projects were fast-tracked [73]; and Malta, where construction and development permits were extended to 2025 without provisions for appeals on grounds of environmental impacts [74]. Regulatory changes in Mexico [34] and Botswana [41] were aimed at improving the energy infrastructure.

Fisheries and agriculture: The sustainable management of fisheries was a concern during the COVID-19 pandemic. A few countries implemented regulatory changes that had a direct impact on the fisheries sector. In Canada, the Department of Fisheries Management suspended the at-sea observer program to comply with social distancing restrictions. At-sea observers are third-party service providers who specialize in data collection to prevent overfishing, illegal fishing, and other irregularities aboard fishing vessels. Their removal was a profound change in environmental monitoring during the pandemic [75]. In Peru, legislation rolled back regulations on artisanal fishing [76]. and in the United States, an executive order (Executive Order No. 13921, 85 F. R. 28471-28477 [May 12, 2020]) essentially deregulated the fisheries sector. The order stated as its objective to “(remove) outdated and unnecessarily burdensome regulations; strengthen efforts to combat illegal, unreported, and unregulated fishing; improve the transparency and efficiency of environmental reviews; and renew our focus on long-term strategic planning to facilitate aquaculture projects so we can protect our aquatic environments, revitalize our nation’s seafood industry, get more Americans back to work, and put healthy, safe food on our families’ tables”. The executive order potentially affected several acts of Congress, including the Magnuson-Stevens Fishery Conservation and Management Act (16 U. S. C. 1801 et seq.), the Endangered Species Act of 1973, and the Marine Mammal Protection Act [11]. In agriculture, only the United Kingdom specifically referenced regulations in agriculture in response to the COVID-19 pandemic. This regulatory change addressed agricultural waste [54].

4. Conclusions

The severity of the COVID-19 pandemic and its impacts have led to a multipronged public policy response in order to mitigate the virus and minimize the negative economic effects. In this article, we focus on the public policy response to COVID-19 in various environmental protection policies across the globe. We analyze the nature and direction of policy changes, identify the environmental subsectors most affected by regulatory changes in response to COVID-19, and discuss the implications of these regulatory changes for environmental quality and future policy directions. To do this, we use open source and official communications to collect information on changes to environmental regulations in 29 countries between March and July 2020. We then summarize and classify the data in a manner that allows us to provide meaningful answers to our key questions of interest. Our analysis of the data shows a trend largely towards deregulation. This is more so in developed countries than in developing countries. Deregulation is concentrated in the environmental subsectors of air quality, energy production, biodiversity regulations, and waste management. This deregulation was pursued via rollbacks and enforcement relief. In our data, developing countries were more likely to tighten environmental regulations compared to developed economies during the COVID-19 pandemic. While few of these regulatory changes were positive, the vast majority of them will negatively affect environmental quality. In addition, some of the regulatory changes were permanent while others were temporary, and this has implications for both the environment and environmental policy given the links between viruses of the COVID-19 type, diseases, pollution, wildlife and habitat destruction. There remain important areas for further exploration of this topic. For example, we do not consider that there are several degrees of policies. For instance, extensions of deadlines and permit requirements may have different implications compared to the elimination of emissions restrictions.

Conflict of interest

The author has no competing interests.

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