

# Environmental Services: U.S. Market and Trade Trends

May 2023

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## Abstract

The U.S. environmental services industry—which includes activities intended to prevent, mitigate, or clean up degradation of the natural environment—has grown since 2010. Population growth, economic activity, and income levels, as well as recent shocks such as environmental disasters and new government regulations, have contributed to the slow but steady growth in most segments of this industry. U.S. trade in environmental services is small and is impacted by measures that are specifically directed at environmental services providers, and measures that affect related services. In recent years, there has been increasing recognition of the role of trade in providing access to the goods and services needed to address climate impacts and boost resilience; however, prospects for future liberalization of trade in environmental services remain uncertain.

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May 2023

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The author would like to thank Martha Lawless, Tamar Khachaturian, Sarah Oliver, and Dylan Carlson for their helpful comments and suggestions and Gwenetta Duvall for her production support.

## Introduction

In recent years, the environmental and climate impacts of production processes and services activities have been the subject of increased attention in both the United States and abroad. While some activities are a focus of attention due to their negative environmental effects, other goods and services are notable for their role in protecting and restoring the environment.

There is no single, authoritative definition of environmental services, and definitions of environmental services used for data collection and negotiating purposes vary in scope. In general terms, environmental services include activities intended to prevent, mitigate, or clean up degradation of the natural environment. In practical terms, this may include core activities that have a specific environmental purpose (such as wastewater treatment and soil remediation) as well as related activities that can have both environmental and nonenvironmental purposes (such as architecture, engineering, and research and development services).<sup>1</sup>

This paper provides an overview of the U.S. market for environmental services, focusing primarily on core activities. It presents data on the size and recent growth of the market, identifies top participants, and discusses trends affecting the supply of these services. The paper also presents data on U.S. trade in these services and reviews measures that may impact the provision of these services in overseas markets. Details regarding the specific environmental services activities covered by the various data sources cited throughout this paper are provided in footnotes to each data discussion.

## Market Size

Data on the size of the U.S. environmental services industry are available from a variety of government and industry sources and for a range of different time periods. The U.S. Department of Commerce (USDOC), Bureau of Economic Analysis (BEA) reports that value added in the U.S. waste management and remediation services industry<sup>2</sup> grew in most years during 2010–21, increasing from \$47.8 billion to \$65.5 billion over the period.<sup>3</sup> Likewise, data published by U.S. Department of Labor (DOL), Bureau of

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<sup>1</sup> The scope of the environmental services market and the classification of environmental services are discussed in a number of sources. For example, see WTO, “Background Note on Environmental Services,” August 20, 2010; KPMG, “The International Trade in Environmental Services,” August 2021; Bucher et al, “Trade in Environmental Goods and Services,” International Trade Centre, 2014. Most recently, APEC developed a “Reference List of Environmental and Environmentally Related Services,” to aid environmental services cooperation and liberalization. APEC, “Annex 2,” November 10, 2021.

<sup>2</sup> BEA data on value added are reported on a NAICS (North American Industry Classification System) basis. Waste management and remediation services (NAICS 562) is comprised of 1) waste collection (NAICS 5621), which includes solid, hazardous, and other waste collection; 2) waste treatment and disposal (NAICS 5622), which includes un-hazardous and hazardous waste treatment and disposal, solid waste landfill, and solid waste combustors and incinerators; and 3) remediation and other waste management services (NAICS 5629), which includes remediation services, materials recovery facilities, septic tank and related services, and all other waste management services. U.S. Census Bureau. “North American Industry Classification System,” (accessed April 18, 2023). For a more detailed definition of this industries, see OMB, *North American Industry Classification System*, 2022, 502-508.

<sup>3</sup> With the exception of 2011, value added in this industry category increased in every year during 2010–21. USDOC, BEA, Industry Economic Accounts Data, (accessed March 15, 2023).

Labor Statistics (BLS) shows steady employment growth in the U.S. waste management and remediation services industry,<sup>4</sup> with the number of workers increasing from about 357,300 to about 476,700 during 2010–22.<sup>5</sup> Waste collection accounted for the largest share of employment in this category, with about 204,300 employees in 2022. BLS also reports employment data for the water, sewage, and other systems industry and the environmental consulting industry.<sup>6</sup> The number of workers in the water, sewage, and other systems industry grew from about 46,900 to 56,500 during 2010–22, while employment in the environmental consulting industry increased from about 77,100 to 94,800.<sup>7</sup>

IBISWorld reports discrete data for industries classified in the waste management and remediation services industry, as well as for sewage treatment facilities and environmental consulting (table 1).<sup>8</sup> According to these data, the waste collection segment registered the highest revenue and employment levels in 2021 (with \$72.7 billion and 229,736, respectively).<sup>9</sup> Further, most segments recorded positive revenue and employment growth during 2010–21 (figure 1). The portable toilet and septic tank industry posted the fastest revenue and employment growth (4.6 percent and 3.6 percent, respectively) during the period. In contrast, revenues and employment declined at compound average growth rates (CAGRs) of 0.2 percent and 0.3 percent, respectively, in the sewage treatment facilities segment.<sup>10</sup>

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<sup>4</sup> Like BEA data on value added, BLS employment data are reported on a NAICS basis. See footnote 2 for additional details.

<sup>5</sup> DOL, BLS, Employment, Hours, and Earnings, (accessed March 15, 2023).

<sup>6</sup> The water, sewage, and other systems industry (NAICS 2213) includes water supply and irrigation systems, sewage treatment facilities, and steam and air conditioning supply. The environmental consulting industry (NAICS 54162) includes “...establishments primarily engaged in providing advice and assistance to businesses and other organizations on environmental issues...” For a more detailed definition of these industries, see OMB, *North American Industry Classification System, 2022*, 116-117, 469.

<sup>7</sup> DOL, BLS, Employment, Hours, and Earnings, (accessed March 15, 2023).

<sup>8</sup> IBISWorld data are reported on a NAICS basis, with IBISWorld industry categories corresponding to the following codes: sewage treatment facilities (NAICS 22132), environmental consulting (NAICS 54162), waste collection (NAICS 56211), waste treatment and disposal (NAICS 56221), remediation (NAICS 56291), recycling facilities (NAICS 56292), and portable toilet and septic tank (NAICS 56299). For a more detailed definition of each of these industries, see OMB, *North American Industry Classification System, 2022*, 116-117, 469, 502-508.

<sup>9</sup> IBISWorld data reflect the total revenues and employment of firms that are active in multiple NAICS industries. As such, revenue and employment data cannot be added together to calculate an industry total as this would likely result in the double counting of data for some firms.

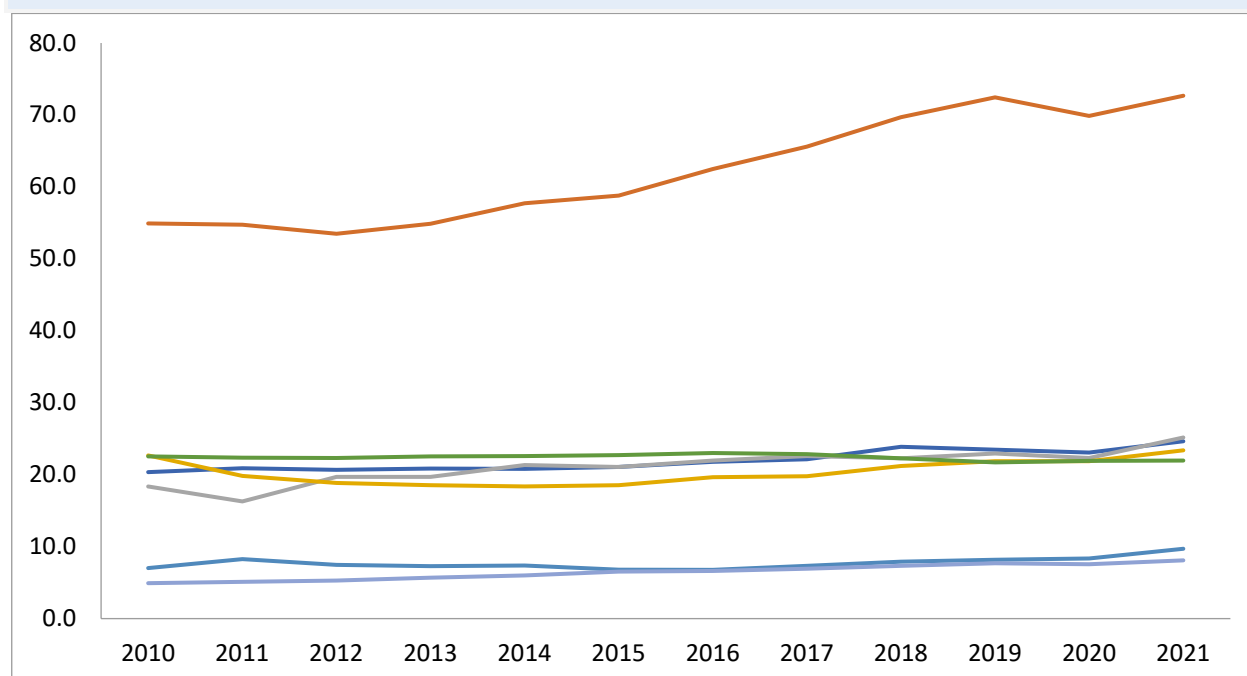
<sup>10</sup> Clark, “Sewage Treatment,” IBISWorld, June 2022, 35; Pigott, “Waste Treatment & Disposal,” IBISWorld, January 2023, 41; Seiler, “Portable Toilet Rental,” IBISWorld, September 2022, 45; O’Malley, “Remediation & Environmental Cleanup,” IBISWorld, January 2023, 44; Rose, “Recycling Facilities,” IBISWorld, January 2023, 37; Perdomo, “Waste Collection,” IBISWorld, January 2023, 40; Ristoff, “Environmental Consulting,” IBISWorld, January 2023, 36.

**Table. 1:** Revenues and Employment in U.S. Environmental Services Industries, 2021

	Revenue (\$ billion)	CAGR, 2010-21	Employment (units)	CAGR, 2010-21
Sewage Treatment Facilities	22.0	-0.2	60,020	-0.3
Environmental Consulting	24.6	1.8	153,491	2.8
Waste Collection	72.7	2.6	229,736	1.9
Waste Treatment and Disposal	25.2	2.9	66,837	3.1
Remediation	23.4	0.3	90,509	2.4
Recycling Facilities	9.7	3.0	23,577	3.3
Portable Toilet and Septic Tank	8.1	4.6	49,881	3.6

Source: Clark, “Sewage Treatment,” IBISWorld, June 2022, 35; Pigott, “Waste Treatment & Disposal,” IBISWorld, January 2023, 41; Seiler, “Portable Toilet Rental,” IBISWorld, September 2022, 45; O’Malley, “Remediation & Environmental Cleanup,” IBISWorld, January 2023, 44; Rose, “Recycling Facilities,” IBISWorld, January 2023, 37; Perdomo, “Waste Collection,” IBISWorld, January 2023, 40; Ristoff, “Environmental Consulting,” IBISWorld, January 2023, 36.

**Figure. 1:** Revenues in U.S. Environmental Services Industries, 2010-2021



Source: Clark, “Sewage Treatment,” IBISWorld, June 2022, 35; Pigott, “Waste Treatment & Disposal,” IBISWorld, January 2023, 41; Seiler, “Portable Toilet Rental,” IBISWorld, September 2022, 45; O’Malley, “Remediation & Environmental Cleanup,” IBISWorld, January 2023, 44; Rose, “Recycling Facilities,” IBISWorld, January 2023, 37; Perdomo, “Waste Collection,” IBISWorld, January 2023, 40; Ristoff, “Environmental Consulting,” IBISWorld, January 2023, 36.

Environmental Business International (EBI) data on environmental services<sup>11</sup>—as reported by the U.S. Department of Commerce (USDOC) International Trade Administration (ITA)— indicate that U.S. environmental services revenues totaled \$268.9 billion in 2017, with solid waste management (\$63.4 billion), water treatment works (\$61.5 billion), and water utilities (\$59.2 billion) accounting for the

<sup>11</sup> EBI data capture revenues in the water supply and treatment, solid and hazardous waste management, remediation, resource recovery, and environment-related consulting, engineering, and analytical services industries.

largest shares.<sup>12</sup> EBI reports that, together, environmental services industries employed almost 1.2 million workers in the United States.<sup>13</sup>

## Top Firms

According to an annual survey of design, engineering, construction, and similar firms conducted by *Engineering News-Record* (ENR), several U.S. firms rank among the world's top providers of environmental services (table 2).<sup>14</sup> Specifically, while French firm Veolia Environment was the world's top environmental services firm in 2021 by a wide margin (reporting revenues of \$33.7 billion), six of the world's top ten environmental services providers—including AECOM, Jacobs, Clean Harbors, Tetra Tech, Bechtel, and Fluor—were based in the United States. Each of these six U.S. firms derived some share of its environmental services revenues from non-U.S. markets, ranging from Fluor (which earned 2 percent of its environmental revenues in foreign markets) to Tetra Tech (with 33 percent of its environmental services revenues earned in overseas markets). While Clean Harbors and Tetra Tech respectively focused on the hazardous waste and nuclear waste segments of the markets,<sup>15</sup> other top U.S. firms were more diversified, drawing revenues from four or more market segments and not relying on any single segment for more than 50 percent of total environmental services revenues.<sup>16</sup> Overall, the top 200 companies that responded to the ENR survey generated environmental revenues totaling \$112.7 billion in 2021.<sup>17</sup>

**Table 2:** Top Suppliers of Environmental Services, by 2021 Revenue

Firm	Headquarters	Environmental Revenue, 2021 (in \$ billions)
Veolia Environmental	France	\$33.7
AECOM	United States	\$6.8
Larsen & Toubro Ltd.	India	\$4.8
Jacobs	United States	\$4.8
Clean Harbors, Inc.	United States	\$3.8
Tetra Tech	United States	\$3.3
WSP Global	Canada	\$2.8
Bechtel	United States	\$2.0
Fluor	United States	\$2.0
Webuild SpA	Italy	\$1.8

Source: Rubin and Grinapol, "The Top 200 Environmental Firms," *ENR*, July 25/August 1, 2022.

<sup>12</sup> USDOC, ITA, "2019 Top Markets Report," April 2020, 4.

<sup>13</sup> Many definitions of the environmental services market exclude water supply. When this activity is removed from the USDOC's EBI-based estimates, revenues in the U.S. environmental services industry are almost \$210 million while employment is just under 970,000. USDOC, ITA, "2019 Top Markets Report," April 2020, 4, 12.

<sup>14</sup> Rubin and Grinapol, "The Top 200 Environmental Firms," *ENR*, July 25/August 1, 2022. More specifically, firms on this list include entities engaged in environment-related design, engineering, construction, remediation, contracting, consulting, research and development, and equipment manufacturing, among other activities.

<sup>15</sup> Hazardous waste accounted for 95 percent of Clean Harbors' environmental services revenues, while nuclear waste accounted for 98 percent of Fluor's revenues.

<sup>16</sup> ENR reports firms' environmental services revenues in eight market segments: air quality and clean energy, environmental management, environmental science, hazardous waste, nuclear waste, wastewater treatment, water treatment and supply, and other.

<sup>17</sup> Rubin and Grinapol, "The Top 200 Environmental Firms," *ENR*, July 25/August 1, 2022, 34.

IBISWorld reports that among firms in environment-related categories,<sup>18</sup> key U.S. market participants include Waste Management (the top supplier of waste collection, waste treatment and disposal, and recycling services in the United States), Republic (which also accounts for significant shares of the waste collection and waste treatment and disposal segments), Jacobs (the top supplier of remediation services), and Chemed (the top supplier of portable toilet services), among others.<sup>19</sup> However, IBISWorld data suggest that the U.S. market for environmental services is generally fragmented, with no single firm dominating any one market segment and with top firms accounting for less than half of revenues in each segment (table 3). The waste treatment and disposal and waste collection industries are the least fragmented, with top firms respectively accounting for 48.5 percent and 47.9 percent of revenues in these segments, while sewage treatment is the most fragmented, with its top provider—American Water Works Company—accounting for less than one percent of total industry revenues. Further, there seems to be minimal cross-over in environment-related NAICS industries as most top firms specialize in a single market segment, or in a group of related segments (such as waste collection, waste treatment and disposal, and recycling).

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<sup>18</sup> For the purposes of this discussion, these categories include sewage treatment facilities (NAICS 22132), environmental consulting (NAICS 54162), waste collection (NAICS 56211), waste treatment and disposal (NAICS 56221), remediation (NAICS 56291), recycling facilities (NAICS 56292), and portable toilet and septic tank (NAICS 56299).

<sup>19</sup> Clark, “Sewage Treatment,” IBISWorld, June 2022, 7; Pigott, “Waste Treatment & Disposal,” IBISWorld, January 2023, 7; Seiler, “Portable Toilet Rental,” IBISWorld, September 2022, 7; O’Malley, “Remediation & Environmental Cleanup,” IBISWorld, January 2023, 7; Rose, “Recycling Facilities,” IBISWorld, January 2023, 7; Perdomo, “Waste Collection,” IBISWorld, January 2023, 7; Ristoff, “Environmental Consulting,” IBISWorld, January 2023, 7.



**Table 3:** Top Providers of Environmental Services in the U.S. Market, by NAICS Category, 2022–23

	Sewage Treatment	Environmental Consulting	Waste Collection	Waste Treatment and Disposal	Remediation	Recycling	Portable Toilet
<i>Share of U.S. Market (percent)</i>							
AECOM	--	1.7	--	--	--	--	--
American Water Works Company	0.9	--	--	--	--	--	--
Brown & Caldwell	--	--	--	--	1.9	--	--
Chemed	--	--	--	--	--	--	10.7
Covanta	--	--	--	8.5	--	--	--
Jacobs	--	8.1	--	--	17.9	--	--
Liquid Environmental Solutions	--	--	--	--	--	--	1.4
McDermott	--	--	--	--	5.4	--	--
Republic	--	--	16.4	10.3	--	3.6	--
Stericycle	--	--	2.2	6.2	--	--	--
Tetra Tech	--	6.8	--	--	2.9	--	--
Thompson Industrial Services	--	--	--	--	--	--	0.9
United States Environmental Services	--	--	--	--	--	--	0.4
Veolia	--	--	1.0	--	4.7	--	4.4
Waste Connections	--	--	6.3	7.6	--	1.0	--
Waste Management	--	--	22.1	16.0	--	12.9	--
Other	99.1	83.5	52.1	51.5	67.2	82.5	82.1

Notes: This table presents the leading services providers in each U.S. industry segment as identified in IBISWorld industry reports published during June 2022–January 2023.

Source: Clark, “Sewage Treatment,” IBISWorld, June 2022, 7; Pigott, “Waste Treatment & Disposal,” IBISWorld, January 2023, 7; Seiler, “Portable Toilet Rental,” IBISWorld, September 2022, 7; O’Malley, “Remediation & Environmental Cleanup,” IBISWorld, January 2023, 7; Rose, “Recycling Facilities,” IBISWorld, January 2023, 7; Perdomo, “Waste Collection,” IBISWorld, January 2023, 7; Ristoff, “Environmental Consulting,” IBISWorld, January 2023, 7.

## Factors Impacting Demand and Supply in the U.S. Environmental Services Market

Due to the essential nature of many environmental services and the connection between waste generation and economic prosperity, both demand and supply in this sector are tied to population growth, economic activity, and income levels.<sup>20</sup> Consumer spending and industrial activity generate waste which, in turn, creates demand for environmental services.<sup>21</sup> This explains, for example, the relatively high demand for environmental services among developed countries and rising demand in the rapidly growing ASEAN region.<sup>22</sup> In recent years, these factors and other economic and environmental shocks have contributed to slow but steady growth in most segments of the U.S. environmental services industry.

The COVID-19 pandemic had a mixed effect on both supply and demand for environmental services. Efforts to mitigate the spread of COVID-19 complicated the provision of environmental services and shifted focus and government money away from environmental services.<sup>23</sup> The slowdown in industry activity in 2020 led to decreased demand for waste collection, treatment, and disposal services, while a drop in the number of large-scale events—such as concerts—had a negative impact on demand for portable toilet rental.<sup>24</sup> At the same time, stay-at-home mandates and the shift to remote work boosted demand for sewage and waste services in the household segment, while increased use of disposable sanitation products—such as tissues, wipes, and hand sanitizer—led to higher demand for recycling services.<sup>25</sup> In the remediation industry, low interest rates spurred growth in the housing market and a follow-on need for building remediation.<sup>26</sup> Further, providers of environmental consulting services derived some benefit from growing healthcare infrastructure needs.<sup>27</sup> Overall, however, COVID-19 impacts in the environmental services industry were reportedly short-lived and relatively less severe than those in other industries.<sup>28</sup>

While natural and manmade disasters can hinder cleanup activities,<sup>29</sup> these events generally have a positive impact on demand for environmental services. Observers indicate that increasingly intense and numerous natural disasters have and will continue to boost demand for services such as environmental

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<sup>20</sup> ASEAN, “Trade in Environmental Services,” March 2021, 4–5; Clark, “Sewage Treatment,” IBISWorld, June 2022, 33; Pigott, “Waste Treatment & Disposal,” IBISWorld, January 2023, 8; Perdomo, “Waste Collection,” IBISWorld, January 2023, 8.

<sup>21</sup> Pigott, “Waste Treatment & Disposal,” IBISWorld, January 2023, 8.

<sup>22</sup> ASEAN, “Trade in Environmental Services,” March 2021, 4–5.

<sup>23</sup> Ristoff, “Environmental Consulting,” IBISWorld, January 2023, 10; The Business Research Company, “How Global Environmental Consulting Services,” February 3, 2022.

<sup>24</sup> Pigott, “Waste Treatment & Disposal,” IBISWorld, January 2023, 10; Seiler, “Portable Toilet Rental,” IBISWorld, September 2022, 10; Perdomo, “Waste Collection,” IBISWorld, January 2023, 9.

<sup>25</sup> Clark, “Sewage Treatment,” IBISWorld, June 2022, 17; Pigott, “Waste Treatment & Disposal,” IBISWorld, January 2023, 26; Rose, “Recycling Facilities,” IBISWorld, January 2023, 10; Perdomo, “Waste Collection,” IBISWorld, January 2023, 8.

<sup>26</sup> O’Malley, “Remediation & Environmental Cleanup Services in the US,” IBISWorld, January 2023, 8.

<sup>27</sup> Ristoff, “Environmental Consulting in the US,” IBISWorld, January 2023, 10.

<sup>28</sup> Walter et al, “Eight Trends,” L.E.K. Consulting, July 26, 2022.

<sup>29</sup> For example, during Texas’ 2021 cold snap, site remediation activities were temporarily suspended due to power grid shutdowns. O’Malley, “Remediation & Environmental Cleanup,” IBISWorld, January 2023, 10.

consulting, remediation, and waste collection.<sup>30</sup> Increased public concern regarding climate change has also increased demand. For example, demand for environmental consulting services has grown as companies respond to greater scrutiny of their environmental impact, and due to consumer and investor preferences for firms that incorporate sustainability into their operations.<sup>31</sup> While it has been suggested that recent inflation and cost concerns may temper consumer willingness to pursue sustainability, observers suggest that sentiment in favor of sustainability is strong and will likely continue.<sup>32</sup>

Government efforts to address climate change and sustainability issues have also had a positive effect on environmental services demand in both the United States and abroad. In the United States, both the Infrastructure Investment and Jobs Act (IIJA) (2021) and the Inflation Reduction Act (IRA) (2022) are expected to increase demand in several environmental services segments. More specifically, the IIJA is expected to have a particularly large effect on the remediation and consulting segments—with \$21 billion of IIJA funding devoted to remediation projects—and a moderate effect on the waste management and recycling segments.<sup>33</sup> Already, demand for environmental services has increased due to environmental review requirements and Superfund tax reinstatement under the IIJA.<sup>34</sup> Further, the IRA's green energy provisions may benefit waste management providers—particularly waste-to-energy facilities.<sup>35</sup> Opportunities for environmental services providers are also boosted by state and local regulation, as well as foreign government policies. For example, India's sanitation and emissions reduction goals have grown demand for wastewater services and carbon capture projects.<sup>36</sup>

On the supply side, factors such as market opening, growth in the trade of high-tech environmental goods (which has led to higher demand for associated services), and more stringent environmental rules and benchmarks has led to an expansion in the number of environmental services suppliers in recent years.<sup>37</sup> At the same time, firms' ability to provide environmental services has reportedly been challenged by supply chain issues, rising costs, and the availability of workers and subcontractors.<sup>38</sup> Several sources identify labor shortages and increasing wages as key obstacles, with some suggesting that these shortages hamper firms' ability to pursue projects and respond to market demand.<sup>39</sup> One source indicates that it is particularly difficult to find and retain workers with transferrable or non-sector specific skills (such as truck drivers and engineers).<sup>40</sup> Firms have addressed these challenges by

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<sup>30</sup> Perdomo, "Waste Collection," IBISWorld, January 2023, 8; O'Malley, "Remediation & Environmental Cleanup," IBISWorld, January 2023, 9, 10; Ristoff, "Environmental Consulting," IBISWorld, January 2023, 8.

<sup>31</sup> Ristoff, "Environmental Consulting," IBISWorld, January 2023, 10,12.

<sup>32</sup> Rubin and Grinapol, "The Top 200 Environmental Firms," ENR, July 25/August 1, 2022, 35, 37, 39; Harris Williams, "Environmental Services Update," Q2 2022,, 1.

<sup>33</sup> McMillian, "2022 Environmental Services and Waste Management Trends," Real Economy, February 16, 2022; Walter et al, "Eight Trends," L.E.K. Consulting, July 26, 2022.

<sup>34</sup> Rubin and Grinapol, "The Top 200 Environmental Firms," ENR, July 25/August 1, 2022, 39.

<sup>35</sup> Pigott, "Waste Treatment & Disposal," IBISWorld, January 2023, 14.

<sup>36</sup> Rubin and Grinapol, "The Top 200 Environmental Firms," ENR, July 25/August 1, 2022, 39.

<sup>37</sup> ASEAN, "Trade in Environmental Services," March 2021, 5.

<sup>38</sup> Rubin and Grinapol, "The Top 200 Environmental Firms," ENR, July 25/August 1, 2022, 41.

<sup>39</sup> Rubin and Grinapol, "The Top 200 Environmental Firms," ENR, July 25/August 1, 2022, 41; McMillian, "2022 Environmental Services and Waste Management Trends," Real Economy, February 16, 2022.

<sup>40</sup> Walter et al, "Eight Trends," L.E.K. Consulting, July 26, 2022.

offshoring and automating certain tasks, and by adopting technology that boosts productivity.<sup>41</sup> Firms are also prioritizing employee retention, and the industry is helped by workers' growing preference for jobs with a larger purpose.<sup>42</sup>

## Cross-Border Trade and Affiliate Transactions in Environmental Services

BEA data indicate that U.S. trade in waste treatment and de-pollution services<sup>43</sup> are extremely small, with exports and imports totaling only \$17 million and \$11 million, respectively, in 2021. U.S. trade in such services fluctuated unevenly between 2010–21, with imports exceeding exports in most years (figure 2). There is not a clear explanation for these trends. However, considering the low level of trade and the high value of certain projects in this sector, these fluctuations may simply reflect a small number of one-time projects or transactions.

The data do not clearly identify top U.S. export markets for waste treatment and de-pollution services in 2021, as trade with many individual countries is very small and recent data for some markets were suppressed to avoid the disclosure of information on individual firms. However, it is notable that Australia and Canada respectively accounted for \$6 million and \$4 million of U.S. waste treatment and de-pollution services exports in 2017, representing over three-quarters of total U.S. exports of such services in that year.<sup>44</sup> Canada accounted for the largest share (\$5 million) of U.S imports of waste treatment and de-pollution services in 2021, followed by Malaysia (\$2 million).<sup>45</sup>

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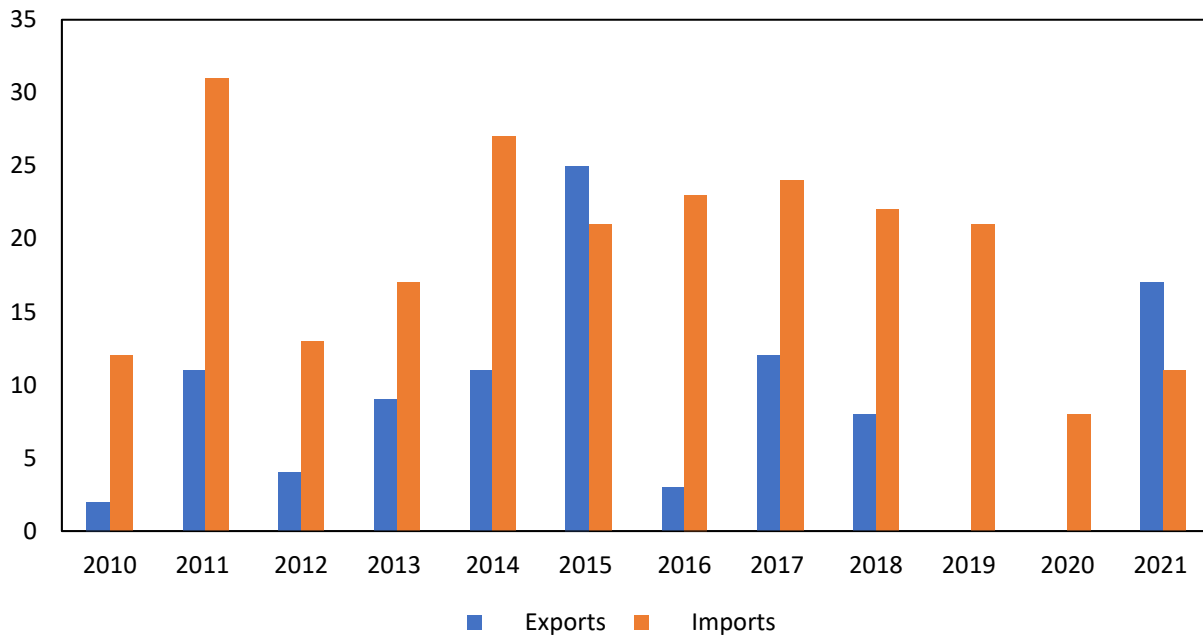
<sup>41</sup> Walter et al, "Eight Trends," L.E.K. Consulting, July 26, 2022; McMillian, "2022 Environmental Services and Waste Management Trends," Real Economy, February 16, 2022.

<sup>42</sup> Walter et al, "Eight Trends," L.E.K. Consulting, July 26, 2022; Harris Williams, "Environmental Services Update," Q2 2022, 1.

<sup>43</sup> The BEA waste treatment and de-pollution services category includes, "Treatment of radioactive and other waste, stripping of contaminated soil, cleaning up of pollution including spills, restoration of mining sites, and decontamination and sanitation services. Includes all other services that relate to the cleaning or restoring of the environment." USDOC, BEA, "Quarterly Survey of Transactions," (accessed June 16, 2021).

<sup>44</sup> Due to the suppression of data for Canada, Australia, and other countries, it is not possible to identify top U.S. export markets for waste treatment and de-pollution services after 2017. For example, U.S. exports of waste treatment and de-pollution services to Canada dropped to \$1 billion in 2018, but data on 2019, 2020, and 2021 exports were suppressed to avoid the disclosure of information on individual firms. Data on exports of these services to Australia were suppressed for the years 2018–21.

<sup>45</sup> Certain country-specific data on U.S. imports of waste treatment and de-pollution services in 2021 were suppressed to avoid the disclosure of information on individual firms. However, available data suggest that Canada and Malaysia were the top U.S. import markets for such services in that year.

**Figure. 2:** U.S Trade in Waste Treatment and De-Pollution Services, 2010-21

Note: Data on total U.S. exports of waste treatment and de-pollution services in 2019 and 2020 were suppressed to avoid the disclosure of information on individual firms.

Source: BEA, "Table 2.3. U.S. Trade in Services, by Country or Affiliation and by Type of Service," July 7, 2022.

The low level of U.S. cross-border trade in environmental services is not surprising. As the provision of many environmental services requires heavy machinery and/or infrastructure networks that may require a local presence to access or operate, they are largely supplied to overseas clients through foreign affiliates. BEA publishes data on the sales and purchases of affiliates in the waste management and remediation services industry.<sup>46</sup> Much of the BEA data on affiliate transactions by these affiliates is suppressed to avoid the disclosure of individual company statistics, but some important information can be drawn from these data. First, U.S. affiliate transactions by waste management and remediation firms are far higher than U.S. cross-border trade in the similar waste treatment and de-pollution category. Further, U.S. purchases from foreign-owned waste management and remediation affiliates exceed sales by a substantial margin. For example, sales by U.S. waste treatment and remediation affiliates totaled \$3.5 billion in 2020, while purchases from U.S.-based foreign affiliates in this industry totaled \$9.0 billion.<sup>47</sup> Europe and Canada account for substantial shares of U.S. affiliate sales in this industry

<sup>46</sup> BEA data on affiliate transactions are reported on a NAICS basis, with waste management and remediation services corresponding to NAICS 562 (see footnote 2). As such, BEA data on cross-border trade and affiliate transactions are not completely analogous.

<sup>47</sup> For the sake of comparison, sales by U.S. waste management and remediation services affiliates in foreign markets totaled \$3.3 billion in 2016.

category, with \$1.6 billion and \$1.4 billion, respectively.<sup>48</sup> Country and region-specific data on U.S. affiliate purchases of waste treatment and remediation services are largely unavailable.<sup>49</sup>

## Trade Barriers

Both cross-border trade and affiliate transactions in environmental services are impacted by measures that are specifically directed at the provision of water, waste, and other environmental clean-up and protection services, as well as measures that affect related services such as engineering, construction, and testing, among many others. Observers note that the liberalization of these barriers may have both economic and environmental benefits—opening markets to exports, fostering knowledge transfer and workforce development, and increasing the availability and affordability of the technologies, solutions, and expertise needed to address climate change and other environmental issues.<sup>50</sup> Analysts have also found that the liberalization of trade in environmental and related services facilitates trade in environmental goods.<sup>51</sup> Currently, there is no single source that catalogs barriers to trade in environmental services across countries. However, WTO GATS schedules and the OECD's STRI index provide some information on measures that providers may face when supplying environmental services across borders.

Fifty-nine of the GATS' 139 members (including the EU) have scheduled commitments on at least one of the four segments of the environmental services industry as defined in the WTO's Services Sectoral Classification List (W/120) (table 4).<sup>52</sup> These commitments specify some of the limitations that foreign environmental services providers may face in certain markets, which include joint venture requirements, economic needs tests, licensing requirements, and the monopoly provision of certain services, among

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<sup>48</sup> Data on U.S. affiliate sales of waste management and remediation services in several key European countries are available only for certain years to avoid the disclosure of firm-specific information. For the years in which data are available, the United Kingdom consistently accounted for the majority of such sales to Europe. In 2017, the most recent year for which such data are available, U.S. affiliate sales of waste management and remediation services to the United Kingdom were \$954 million.

<sup>49</sup> Individual countries and regions for which these data are available account for \$1 million or less in purchases in any given year.

<sup>50</sup> ASEAN, "Trade in Environmental Services," March 2021, 43-45; OECD, "Trade in Services Related to the Environment," March 27, 2017, 8, 9; EC, Directorate-General for Trade, "Trade Sustainability Impact Assessment," March 2016, 54; WTO, "World Trade Report 2022," 2022, 123.

<sup>51</sup> National Board of Trade, "Making Green Trade Happen," December 2014; EC, Directorate-General for Trade, "Trade Sustainability Impact Assessment," March 2016, 54; Reinsch et al, "Environmental Goods Agreement" October 2021, CSIS, 7-8; Nordås and Steenblik, "Trade in Environmental Services," Council on Economic Policies, March 29, 2021.

<sup>52</sup> WTO members and parties to regional and bilateral trade agreements commonly use the WTO's Services Sectoral Classification List (W/120) as the foundation for commitments on environmental services, which defines environmental services to include sewage services, refuse disposal services, sanitation and similar services, and "other." The W/120 provides references to the United Nation's Provisional Central Product Classification (UN CPCprov) to more precisely identify the type of activities included in the sewage services (CPCprov 9401), refuse disposal services (CPCprov 9402), and sanitation and similar services (CPCprov 9403) categories. The W/120 provides no CPCprov code for "other" environmental services, but members' commitments on this category frequently include references to cleaning services of exhaust gases (CPCprov 9404), noise abatement services (CPCprov 9405), nature and landscape protection services (CPCprov 9406), and other environmental protection services n.e.c. (CPCprov 9409).

others. The extent of the barriers that are specifically identified in these commitments is generally low, and many members' commitments grant full market access to foreigners that supply environmental services through their foreign affiliates, or to clients that travel abroad to consume these services. At the same time, the overall level of commitment in this category is not high, as less than half of GATS members have scheduled commitments on environmental services. Further, many of these commitments do not cover services provided remotely, often with a member indicating that it is infeasible to provide a particular service in this manner.<sup>53</sup>

**Table 4:** Environmental services commitments under the General Agreement on Trade in Services (GATS)

W/120 Code	Industry segment	Number of commitments
Sewage Services	6.A	52
Refuse Disposal Services	6.B	50
Sanitation and Similar Services	6.C	51
Other Environmental Services	6.C	51

Source: WTO, Services Sectoral Classification List, MTN.GNS/W/120, July 10, 1991. 5; WTO and World Bank, I-TIP Services database, (accessed April 14, 2022).

It should be kept in mind that GATS commitments on environmental services only reflect members' bindings on core activities. Other measures that may limit the foreign supply of environmental services are found in GATS members' cross-industry commitments—such as limitations on land ownership and restrictions on business travel and work permits—as well as commitments affecting related industries—such as measures on the recognition of foreign architecture and engineering credentials and foreign equity caps on technical testing and analysis services. Additionally, GATS commitments do not necessarily reflect the limitations that are applied in practice (which may be less, but not more, restrictive than those listed in a member's commitments).<sup>54</sup>

The OECD Services Trade Restrictiveness Index (STRI) provides industry-specific information on barriers facing foreign services providers in 38 OECD and 10 non-OECD countries. The index assigns a scores ranging between 0 and 1 to 22 specific industries in each of the covered countries, with 0 denoting the absence of barriers to the foreign provision of services and 1 signifying a completely closed market. While environmental services are not currently among the industries covered by the index,<sup>55</sup> several sectors that are critical to the provision of environmental services—namely architecture, engineering, and construction—are included. Barriers facing services suppliers in these industries could have a large impact on environmental services provision in foreign markets.

Overall, STRI scores are not particularly high in industries that are critical to environmental services provision, with average scores in these industries ranging from 0.206 (architecture) to 0.230

<sup>53</sup> KPMG suggests that the relatively minimal number of commitments on the remote provision of environmental services has become more significant as technology has increased the feasibility of such activities. KPMG, "The International Trade in Environmental Services," August 2021, 28.

<sup>54</sup> See KPMG, "The International Trade in Environmental Services," August 2021, 25–29.

<sup>55</sup> The OECD is reportedly in the process of adding industry-specific information on environmental services to the STRI, in addition to developing a separate green STRI. Remarks provided by John Drummond, Head of Trade in Services Division, OECD, at Council on Economic Policies (CEP), "Trade in Environmental Services," webinar, December 8, 2021.

(construction).<sup>56</sup> Some common barriers facing foreign services providers in these industries include licensing requirements, labor market tests, restrictions on the use and purchase of real estate, residency requirements for board members, preferences for local firms in public procurements, and restrictions on the movement of persons, among others.<sup>57</sup> Taking a closer look at STRI scores for architecture, engineering, and construction, restrictions on the cross-border movement of workers are the largest obstacle to trade in all three industries. Foreign entry restrictions are the second-largest source of obstacles for providers of construction and engineering services, while regulatory transparency ranks second for architecture services.<sup>58</sup>

Only a small number of papers and reports have examined the extent and impact of trade barriers that affect the foreign provision of environmental and related services. Among these publications, several indicate that many barriers impacting the foreign provision of these services are measures that apply to the economy as a whole. These include limitations on the establishment and operation of a commercial presence (such as foreign equity limitations, economic needs tests, nationality or residency requirements, and joint venture mandates), measures affecting the movement of workers across borders (such as visa provisions and licensing requirements), subsidies and government procurement preferences for domestic firms, and limitations on the transfer of data, among others.<sup>59</sup> In a 2017 paper, the OECD identifies a handful of measures that limit foreign participation in utility industries, including sewage. For example, foreign participation in public utilities in the Philippines is capped at 40 percent. The OECD also indicates that market conditions—specifically, the supply of certain environmental services by public utilities or municipalities—effectively exclude private firms from some markets.<sup>60</sup>

Regarding the impact of multilateral and bilateral trade agreements on the openness of environmental services markets, de Melo and Vijil (2014) find that high-income countries' GATS commitments on environmental services are more liberal than those scheduled by developing countries. They also find that high-income countries' environmental services commitments are more open than their commitments on other services, while developing countries' environmental services commitments were generally more restrictive than their commitments on other services.<sup>61</sup> The authors conclude that north-

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<sup>56</sup> OECD.Stat, Services Trade Restrictiveness Index, (accessed March 31, 2023).

<sup>57</sup> OECD, Services Trade Restrictiveness Index Regulatory Database, (accessed March 31, 2023).

<sup>58</sup> Based on calculated averages of the scores posted at OECD.Stat, Services Trade Restrictiveness Index, (accessed March 31, 2023). A 2021 KPMG report, which analyzed OECD STRI scores extracted in 2021, also finds that restrictions on the cross-border movement of workers are the largest obstacle to trade in such services, and that U.S. restrictions on the foreign provision of these services are relatively low. KPMG, "The International Trade in Environmental Service," August 2021, 31.

<sup>59</sup> Reinsch et al, "Environmental Goods Agreement" October 2021, CSIS, 8; OECD, "Trade in Services Related to the Environment," March 27, 2017, 11-12; Bucher et al, "Trade in Environmental Goods and Services," International Trade Centre, 2014, 15; EC, Directorate-General for Trade, "Trade Sustainability Impact Assessment," March 2016, 53; National Board of Trade, "Making Green Trade Happen," December 2014, 17-18; WEF, Accelerating Decarbonization," September 2022, 18-19; Nordås and Steenblik, "Trade in Environmental Services," Council on Economic Policies, March 29, 2021.

<sup>60</sup> In some of these markets, private firms may supply services through contracts or the delegation of exclusive rights. OECD, "Trade in Services Related to the Environment," March 27, 2017, 12, 13.

<sup>61</sup> The authors calculated two scores for each country's environmental services commitments under the GATS: one based on the W/120 and another based on a wider definition which included several related sectors. Using the scores based on the W/120, they found that both lower and upper middle-income countries' environmental services commitments were more restrictive than their commitments on other services. Using the wider definition,



south regional trade agreements have resulted in substantial environmental services liberalization by developing country partners, particularly under U.S. agreements in which services commitments are scheduled on a negative-list basis.<sup>62</sup>

The OECD states that environmental services liberalization has typically been a byproduct of broad negotiations, rather than negotiations aimed at expanding access to clean technologies.<sup>63</sup> The Doha Declaration (2001) specifically called on WTO members to liberalize environmental goods and services trade, but both the Doha negotiations and subsequent efforts to establish an environmental goods agreement ultimately collapsed.<sup>64</sup> In very recent years, there has been some renewed interest. In 2019, a group of WTO members advocated for the liberalization of environmental services barriers.<sup>65</sup> Further, APEC developed a “Reference List of Environmental and Environmentally Related Services,” in 2021 and a model environmental services schedule in 2022 to facilitate environmental services liberalization and the development of new bindings in this sector.<sup>66</sup> However, no multilateral or plurilateral negotiations focusing on environmental services have been undertaken to date.

## Looking Ahead

In the short-term, IBISWorld projects slow but steady growth in the U.S. environmental services market, with revenues in individual industry segments expected to increase at CAGRs ranging between 0.6 percent and 1.5 percent during 2022–28.<sup>67</sup> Several factors are expected to drive growth in the market. For example, infrastructure segments (including sewage and solid waste services) are expected to benefit from overall economic and population growth and increased infrastructure and consumer spending, while new legislation (such as the IIJA) and increased focus on—and efforts to address—environmental and climate issues are among the factors expected to boost growth in the remediation and environmental consulting segments.<sup>68</sup> U.S. firms may benefit from increased opportunities to provide environmental services in overseas markets. For example, infrastructure investment, increasing construction, and efforts to meet sustainability and environmental goals may lead to rapid growth in the

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this result held true for lower middle-income countries, but upper middle-income countries’ commitments on environmental services were found to be slightly more open than commitments on other services.

<sup>62</sup> Additionally, the authors conclude that South-South agreements include more liberal commitments on environmental services than the GATS. de Melo and Vijil, “Barriers to Trade in Environmental Goods and Services,” *Fondazione Eni Enrico Mattei*, April 2014, 21-22. Commitments in “negative list” agreements apply to all services sectors unless they are specifically excluded. In contrast, “positive list” agreements such as the GATS do not apply certain obligations to services sectors unless they are specifically included.

<sup>63</sup> OECD, “Trade in Services Related to the Environment,” March 27, 2017, 14.

<sup>64</sup> Negotiations on an Environmental Goods Agreement (EGA) did not cover environmental services and ultimately stalled in 2016. WTO, *Eliminating Trade Barriers*, n.d; Reinsch et al., “Environmental Goods Agreement” October 2021, CSIS, 1-2, 3, 7.

<sup>65</sup> Reinsch et al., “Environmental Goods Agreement” October 2021, CSIS, 7. Relatedly, a 2021 International Chamber of Commerce (ICC) report on the circular economy suggests that including this issue in multilateral or plurilateral efforts to liberalize trade in environmental goods and services may be one way to boost shifts towards circularity. Bellmann, “The Circular Economy,” November 2021, 26, 28–29.

<sup>66</sup> APEC, “Annex 2,” November 10, 2021; APEC, “Model Schedule of Commitments,” December 2022.

<sup>67</sup> USITC staff calculations based in IBISWorld estimates.

<sup>68</sup> Clark, “Sewage Treatment,” IBISWorld, June 2022, 13; Pigott, “Waste Treatment & Disposal,” IBISWorld, January 2023, 8; Perdomo, “Waste Collection,” IBISWorld, January 2023, 8. O’Malley, “Remediation & Environmental Cleanup,” IBISWorld, January 2023, 8, 9; Ristoff, “Environmental Consulting,” IBISWorld, January 2023, 8, 10.

global market.<sup>69</sup> The increasing prevalence of the Internet of Things (IoT) may also create cross-border trade opportunities, enabling the remote provision of services such as water and air quality monitoring.<sup>70</sup>

In recent years, there has been increasing recognition of the role of trade in providing access to the goods and services needed to address climate impacts and boost resilience,<sup>71</sup> and some have advocated revisiting talks on environmental goods.<sup>72</sup> However, prospects for future liberalization of trade in both environmental goods and services remain uncertain.

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<sup>69</sup> Globe Newswire, “Global Environmental Consulting,” August 22, 2022.

<sup>70</sup> Nordås and Steenblik, “Trade in Environmental Services,” Council on Economic Policies, March 29, 2021.

<sup>71</sup> See, for example, WTO, “World Trade Report 2022,” 2022; Reinsch et al, “Environmental Goods Agreement” October 2021; Benson, “Beyond Bicycles,” CSIS, January 26, 2023.

<sup>72</sup> Reinsch et al, “Environmental Goods Agreement” October 2021, 22; Benson, “Beyond Bicycles,” CSIS, January 26, 2023.

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