



AMERICAN PETROLEUM INSTITUTE

---

# Environmental Expenditures

by the U.S. Oil and Natural Gas Industry



1990–2016

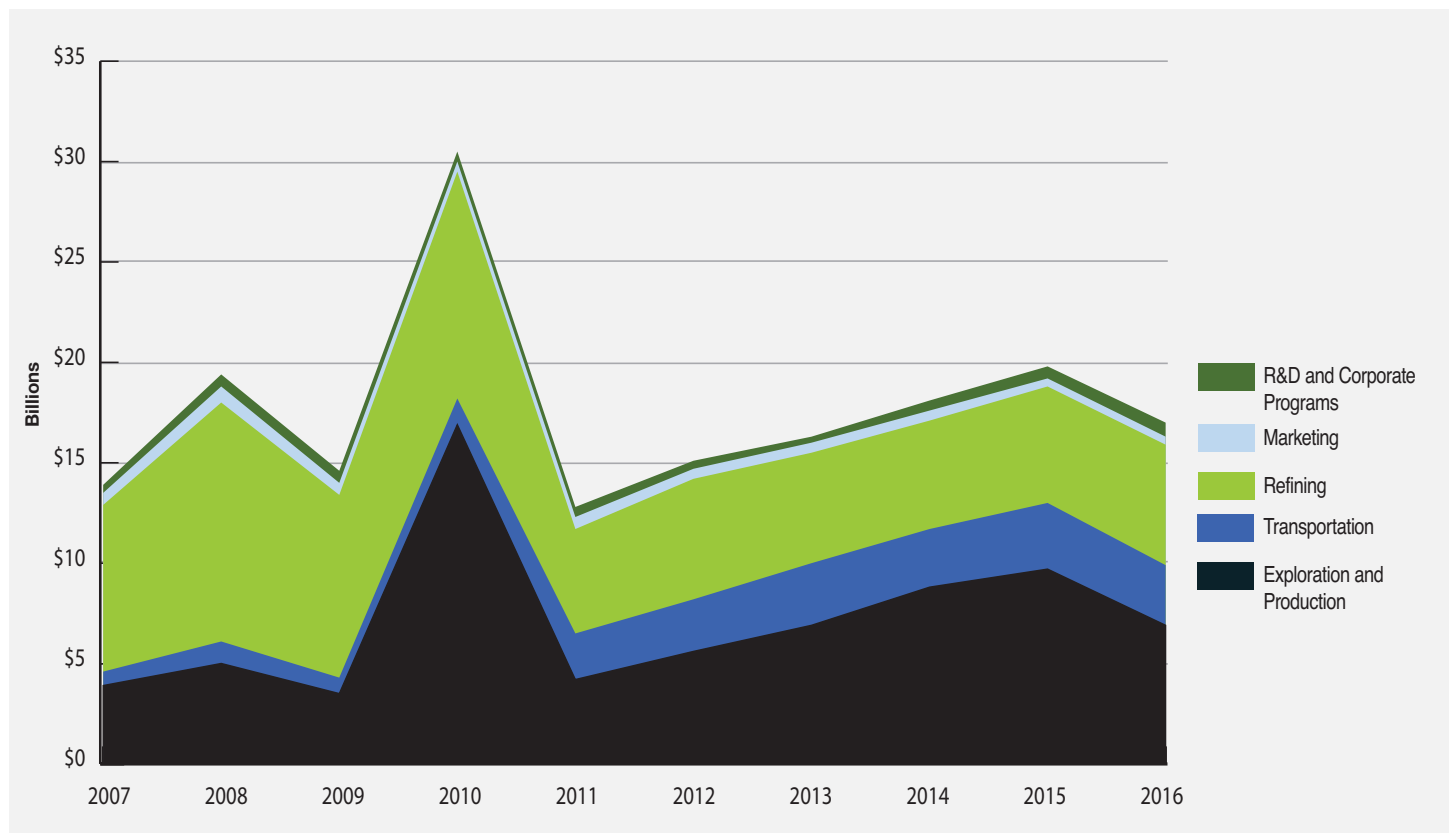
The industry has spent **\$1,045** on the environment for every man, woman and child in the United States.

## About This Report

Expenditures covered in this report are those related to the prevention, control, abatement, or elimination of environmental pollution by the U.S. oil and natural gas industry in the United States and its territories. API sends questionnaires to a sample of companies that are representative of the industry. To ensure accurate and comparable responses, API includes detailed guidelines and definitions for completing the survey. After checking for consistency, API uses this sample to estimate the industry's overall environmental expenditures.

Figure 1

### U.S. Environmental Expenditures 2007-2016 by (by sector\*)



\* Remediation & Spills expenditures are included in the sector numbers and are reported data only. 2010 data is unusually high due to an outlier event. The remaining sector expenditures are estimated for the entire industry.

<sup>1</sup> Based on 2016 U.S. population estimate of 324 million by U.S. Census Bureau.

## Environmental Expenditures

The U.S. oil and natural gas industry has invested an estimated \$339 billion since 1990 toward improving the environmental performance of its products, facilities and operations — \$1,045 for every man, woman and child in the United States.<sup>1</sup> In 2016 alone, API estimates that approximately \$17.1 billion was spent on the environment; \$15.3 billion was spent implementing new technologies, creating cleaner fuels and funding ongoing environmental initiatives. An additional \$1.7 billion went toward research and development, corporate environmental programs and spill remediation efforts.

- 30% of the industry's environmental expenditures in 2016 targeted air pollution abatement; meeting or surpassing the requirements of the 1990 Clean Air Act.
- Refineries across the nation implemented new processes designed to dramatically reduce the presence of sulfur in gasoline and diesel — years ahead of federal requirement to do so.

## Investment Priorities by Industry Sector

The U.S. oil and natural gas industry's business operations are divided into four major sectors: exploration and production, refining, transportation, and marketing. Following is a brief overview of how environmental expenditures have been allocated across these sectors:

**Exploration and Production:** The U.S. is the number one producer of oil and natural gas in the world, with approximately 888,752<sup>2</sup> producing oil and natural gas wells operating onshore and approximately 3,671<sup>3</sup> oil and natural gas platforms operating offshore in U.S. state and federal waters. These wells produce approximately 12.4 billion<sup>4</sup> barrels of oil and almost 32.6 trillion<sup>5</sup> cubic feet of natural gas annually.

**Refining:** The nation's 141 refineries, which process more than 18 million<sup>6</sup> barrels of crude oil every day, are constantly upgrading their operations to produce ever-cleaner fuels and meet the growing variety of state and local mandates for fuel formulation.

**Transportation:** Petroleum products move from well to refinery to market through a network of tanker ships, pipelines, barges, and tanker trucks. Among the industry's key environmental investments in this segment: By 2016, all tankers and barges operating in U.S. waters will feature double hulls, which help to contain cargo and prevent spills in the event of a collision or grounding.

**Marketing:** According to the National Association of Convenience Stores (NACS), there are more than 120 thousand convenience stores selling motor fuels across the United States. In recent years, the petroleum industry has made a major investment to upgrade underground storage tanks and install leak detection devices, helping to protect communities and groundwater supplies.

**Other:** Non-sector specific corporate programs such as planting trees or junking old cars. Also includes Research & Development expenditures to reduce pollution and emissions.

---

<sup>2</sup> Website link: <http://info.drillinginfo.com>

---

<sup>3</sup> Bureau of Ocean Management - <https://www.data.boem.gov/Leasing/OffshoreStatsbyWD/Default.aspx>

---

<sup>4</sup> U.S. EIA, Monthly Energy Review October 2017, Table 3.1

---

<sup>5</sup> U.S. EIA, Monthly Energy Review October 2017, Table 4.1

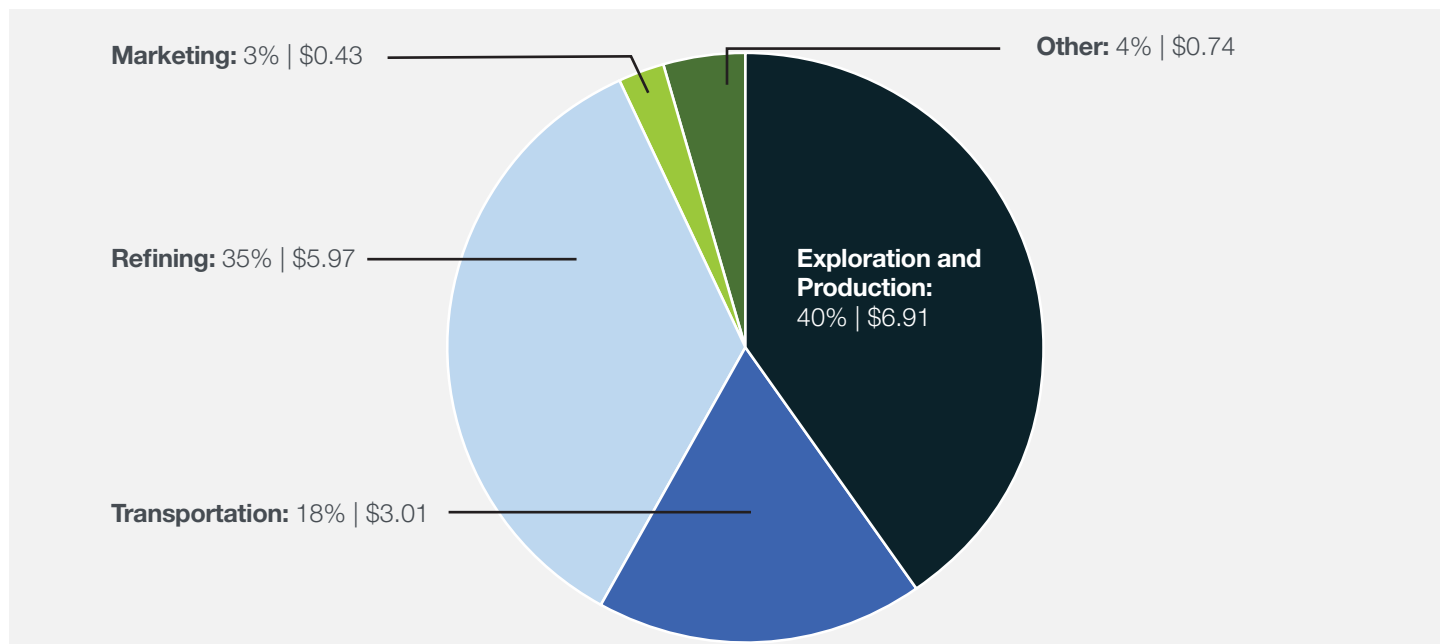
---

<sup>6</sup> U.S. EIA, Number and Capacity of Petroleum Refineries - [https://www.eia.gov/dnav/pet/pet\\_pnp\\_cap1\\_a\\_\(na\)\\_8D0\\_BpCD\\_a.htm](https://www.eia.gov/dnav/pet/pet_pnp_cap1_a_(na)_8D0_BpCD_a.htm)

Figure 2

## 2016 Environmental Expenditures by Sector<sup>7</sup>

(in billions of dollars) Total Expenditures = \$17.1 billion

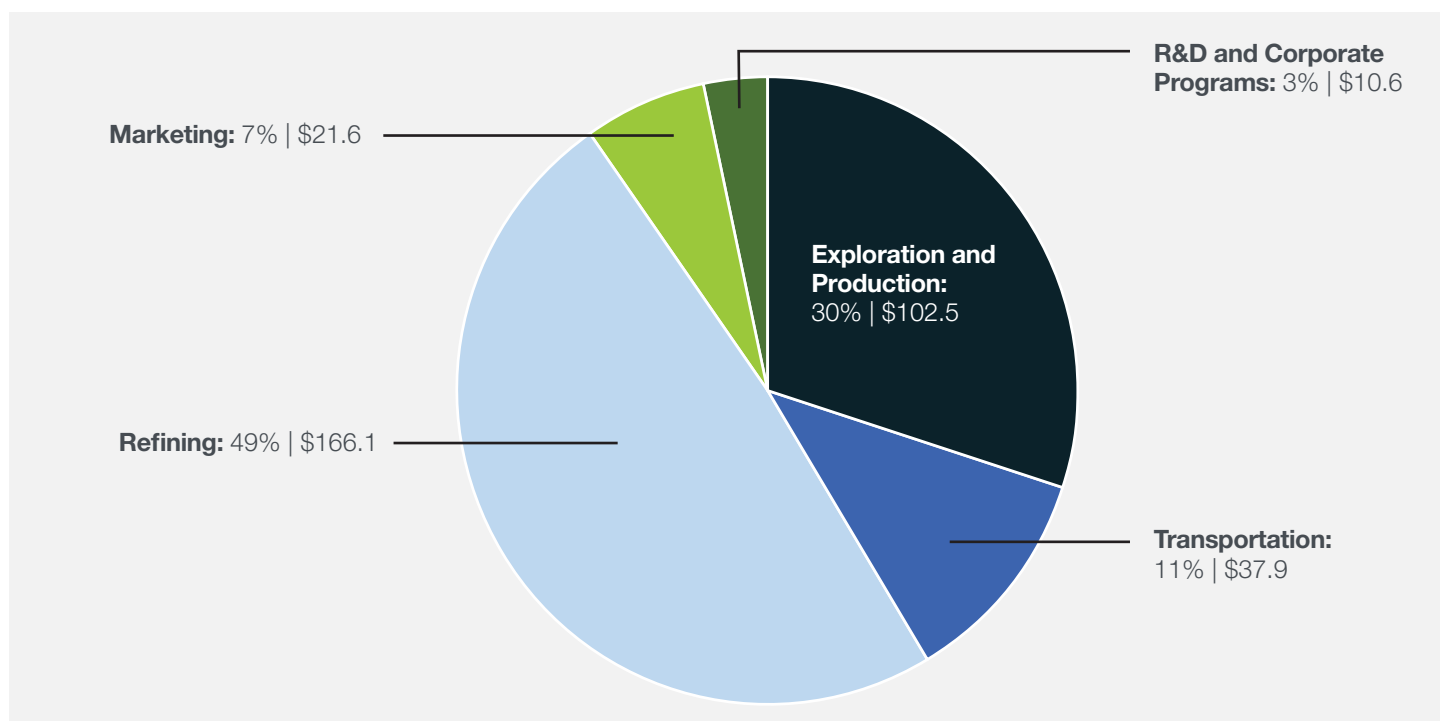


<sup>7</sup> Remediation & Spills expenditures are included in the sector numbers and are reported data only.  
The remaining sector expenditures are estimated for the entire industry.

Figure 3

## Spending on the Environment per Business Sector since 1990<sup>8</sup> (in billions of dollars)

1990-2016: Total Expenditures = \$338.8 billion



<sup>8</sup> Remediation & Spills expenditures are included in the sector numbers and are reported data only.  
The remaining sector expenditures are estimated for the entire industry.

Historically, a **majority of the investments** have focused on achieving reductions in airborne emissions.

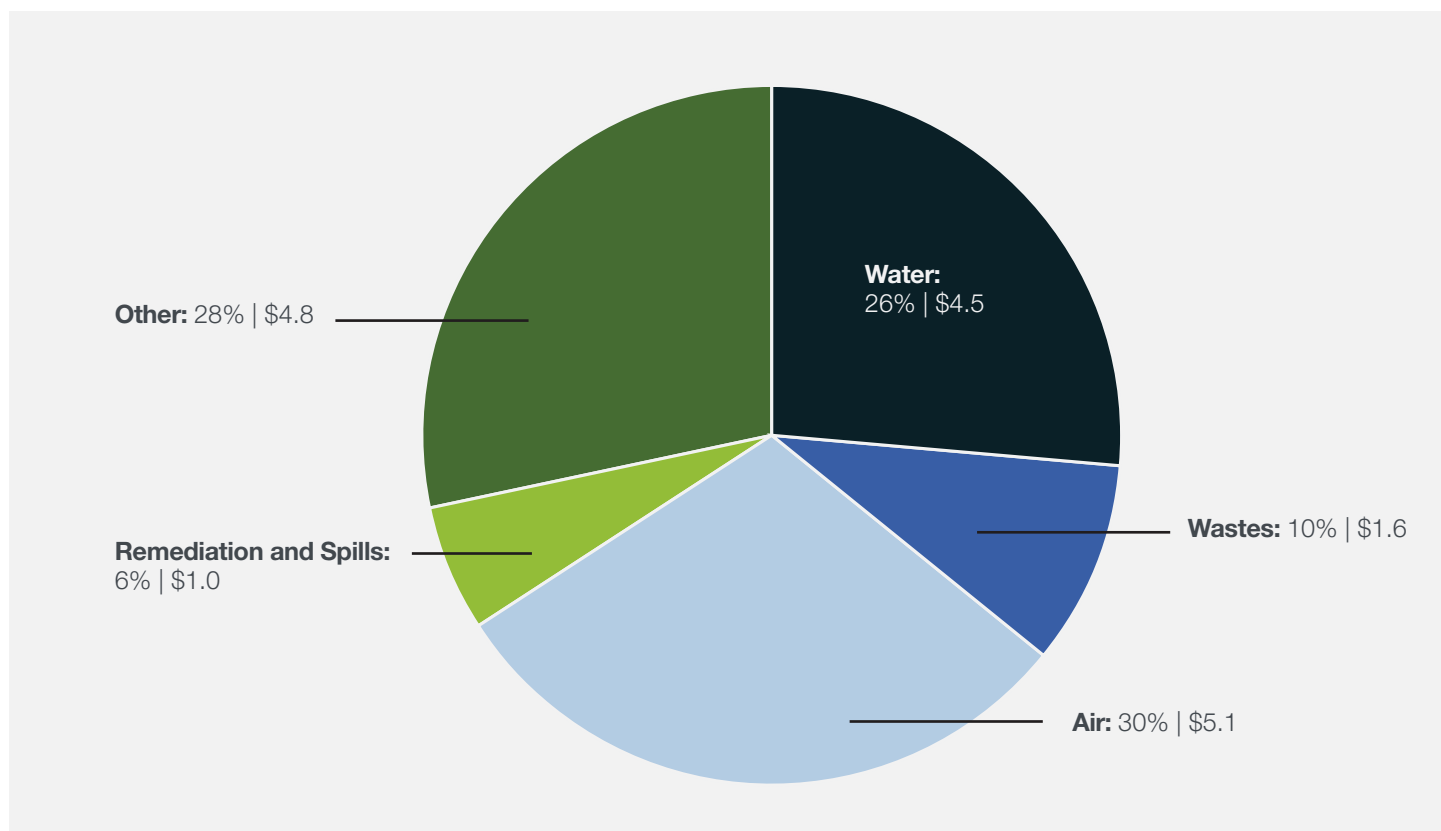
## Investment Priorities by Emissions Medium

The following charts illustrate how the U.S. oil and natural gas industry's environmental expenditures have been targeted toward reducing emissions by air, water, and land.

**Historically, a majority of the investments have focused on achieving reductions in airborne emissions.**

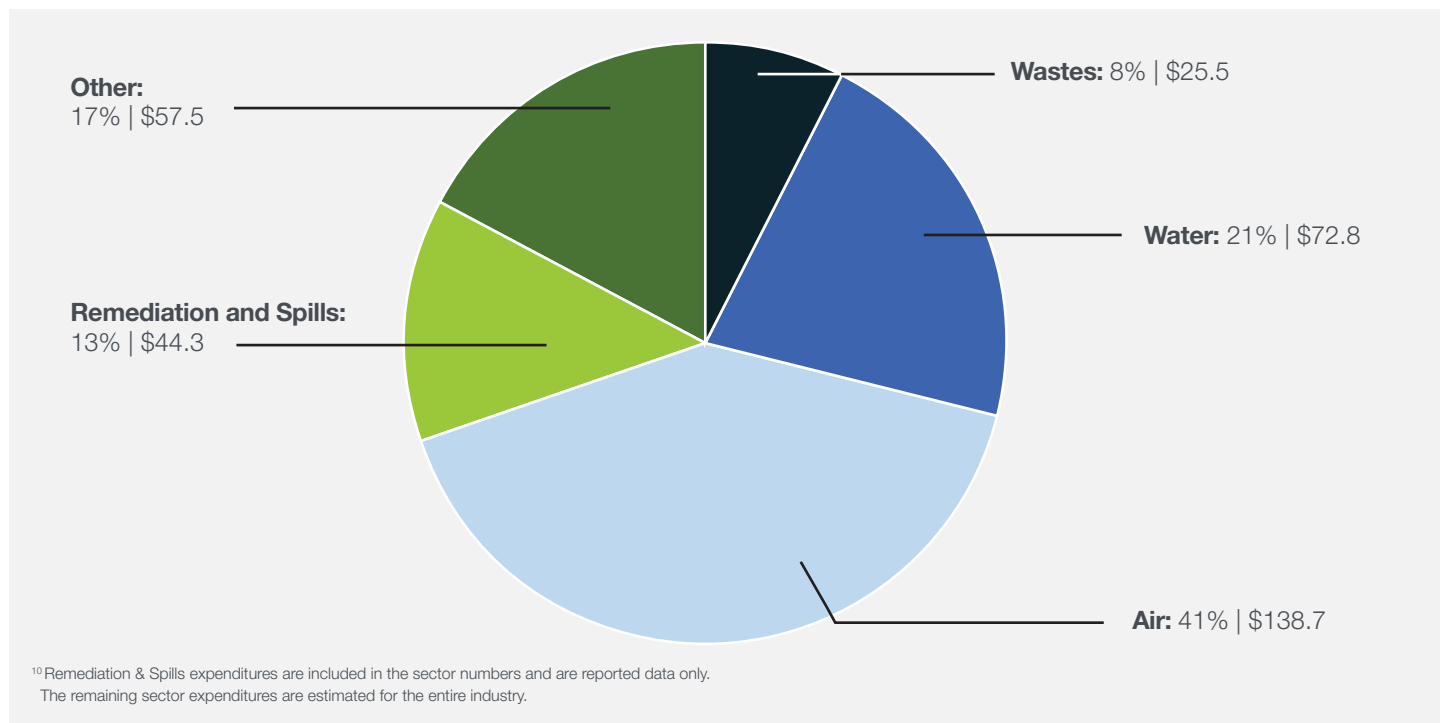
- The emphasis on air pollution control is driven by the requirements of the 1990 Clean Air Act Amendments and subsequent regulations to reduce emissions from so-called "stationary sources" (industrial facilities such as refineries) and "mobile sources" (cars, trucks, etc.).
- Federal and state environmental programs aimed at reducing carbon monoxide, smog, and air toxics require the sale of oxygenated, reformulated, and low-volatility (evaporates more slowly) gasolines in certain parts of the country. The exact formulations required vary from one jurisdiction to the next, so the petroleum industry must modify its processes accordingly. These reformulated fuels often cost more to produce than conventional gasoline.

**Figure 4**  
**2016 Environmental Expenditures by Medium<sup>9</sup>**  
(in billions of dollars) Total Expenditures = \$17.1 billion

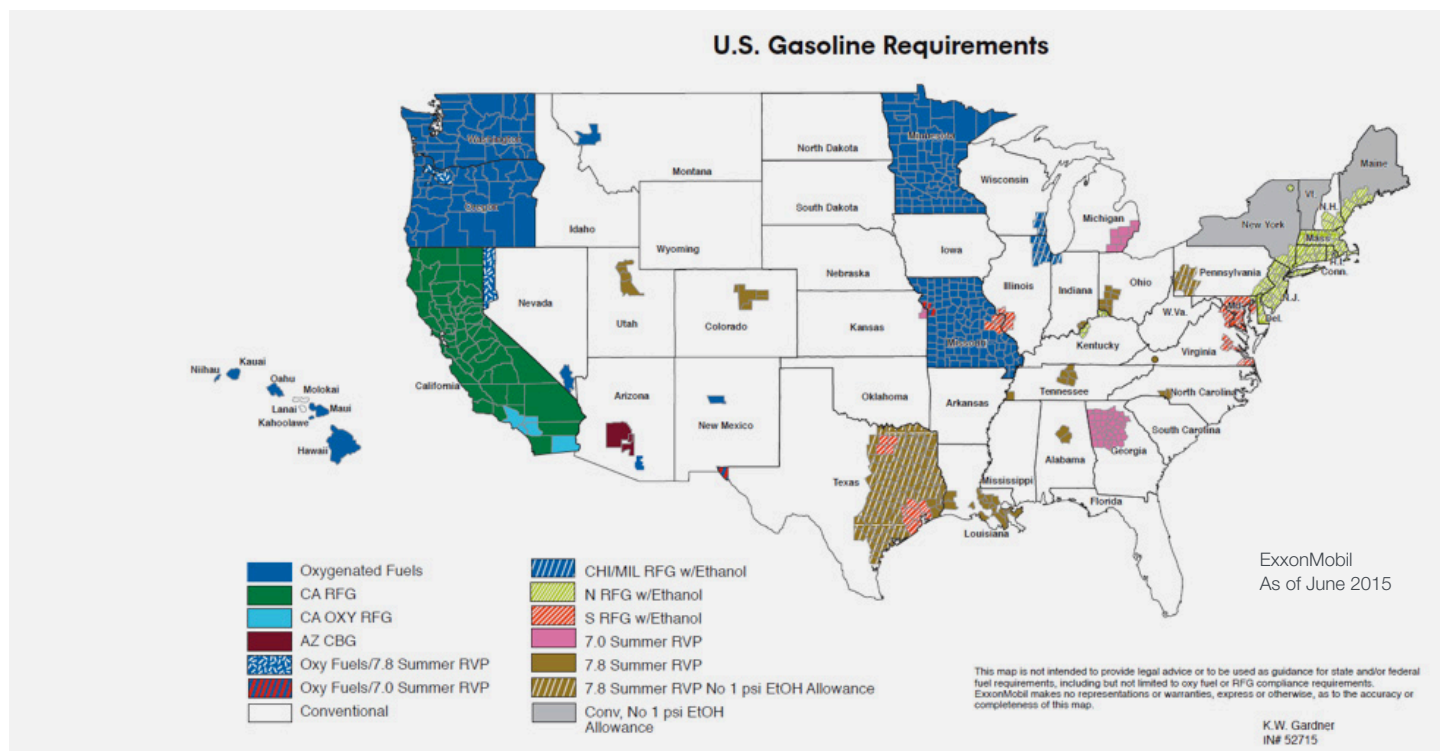


<sup>9</sup> Remediation & Spills expenditures are included in the sector numbers and are reported data only. The remaining sector expenditures are estimated for the entire industry.

**Figure 5**  
**1990-2016 Environmental Expenditures by Medium<sup>10</sup>**  
 (in billions of dollars) Total Expenditures = \$338.8 billion



**Figure 6**  
**U.S. Gasoline Requirements**



**Note:** This map is not intended to provide legal advice or to be used as guidance for state and/or federal fuel requirements, including but not limited to oxy fuel or RFG compliance requirements. API makes no representations or warranties, express or otherwise, as to the accuracy or completeness of this map.

**Table 1****Total U.S. Environmental Expenditures: 2007-2016\***

(in millions of dollars)

Year	Ongoing Activities	Research and Development	Corporate Programs	Subtotal	Remediation and Spills	Total
2007	11,988	78	267	12,333	1,623	13,956
2008	17,383	115	385	17,882	1,490	19,372
2009	12,412	145	365	12,922	1,670	14,592
2010	15,454	135	302	15,891	14,634	30,525
2011	11,037	114	337	11,487	1,427	12,914
2012	13,152	94	218	13,464	1,483	14,947
2013**	14,622	61	242	14,926	1,372	16,298
2014	16,106	204	243	16,553	1,379	17,931
2015	17,879	326	204	18,408	1,288	19,696
2016	15,320	509	206	16,034	1,025	17,060
10-Year Total	145,353	1,780	2,768	149,900	27,392	177,292

\* All expenditures are estimated except for remediation and spills. In 2010, Remediation and spills are unusually high because of an outlier event.

\*\* Pre 2013 Exploration and Production expenditures were partly estimated using the annual NGL wellhead price. Effective January 2013 the wellhead price was discontinued. Post 2012 Exploration and Production expenditures were partly estimated using the Henry Hub spot price.

Table 2

**Summary of U.S. Environmental Expenditures by Medium: 2007-2016** (in millions of dollars)

Year	Air	Water	Wastes	Other	Subtotal <sup>1</sup>	Remediation <sup>2</sup>	Spills <sup>2</sup>	Total
2007	7,019	2,177	947	2,189	12,333	1,481	142	13,956
2008	10,711	3,033	1,288	2,849	17,882	1,321	170	19,372
2009	7,526	2,380	905	2,111	12,922	1,342	328	14,592
2010	9,699	2,672	948	2,573	15,891	1,906	12,728	30,525
2011	4,522	2,611	1,018	3,336	11,487	1,118	309	12,914
2012	4,766	3,763	1,194	3,740	13,464	1,197	286	14,947
2013*	4,623	4,054	1,547	4,702	14,926	1,079	294	16,298
2014	5,136	4,655	1,717	5,044	16,553	999	379	17,931
2015	4,929	5,098	2,044	6,337	18,408	961	326	19,696
2016	5,094	4,513	1,642	4,786	16,034	852	173	17,060
10-Year Total	64,026	34,957	13,250	37,666	149,900	12,257	15,135	177,292

<sup>1</sup> Includes expenditures for ongoing activities, research & development, and corporate programs

<sup>2</sup> Aggregate of amounts reported by participants in API's survey. In 2010, remediation & spills are unusually high because of an outlier event

\* Pre 2013 Exploration and Production expenditures were partly estimated using the annual NGL wellhead price. Effective January 2013 the wellhead price was discontinued. Post 2012 Exploration and Production expenditures were partly estimated using the Henry Hub spot price.

Table 3

**Summary of Estimated U.S. Environmental Expenditures: 2007-2016** (in millions of dollars)

Sector	2007	2008	2009	2010	2011	2012	2013*	2014	2015	2016	10-Year
<b>Exploration and production:</b>											
Capital	1,252	1,904	1,222	1,068	1,276	2,820	3,063	4,583	3,195	2,642	23,025
O & M <sup>1</sup>	1,962	2,511	1,642	2,086	2,597	2,269	3,401	3,641	6,087	3,989	30,186
Subtotal	3,214	4,415	2,864	3,154	3,873	5,089	6,464	8,224	9,282	6,631	53,210
<b>Transportation:</b>											
Capital	327	310	441	450	975	1,046	1,565	1,271	1,259	818	8,462
O & M <sup>1</sup>	348	691	228	698	1,145	1,344	1,273	1,424	1,729	1,977	10,857
Subtotal	675	1,002	669	1,148	2,120	2,390	2,839	2,694	2,988	2,796	19,320
<b>Refining</b>											
Capital	3,529	6,696	4,502	7,385	2,016	2,234	1,546	1,727	1,940	2,295	33,869
O & M <sup>1</sup>	4,373	4,884	4,229	3,634	2,918	3,298	3,535	3,282	3,491	3,409	37,053
Subtotal	7,902	11,580	8,731	11,019	4,934	5,532	5,081	5,009	5,431	5,704	70,922
<b>Marketing</b>											
Capital	116	284	83	35	51	45	115	84	83	78	975
O & M <sup>1</sup>	81	102	65	98	58	96	124	95	96	111	926
Subtotal	197	386	149	133	109	141	239	179	179	190	1,901
<b>Other</b>											
Research and development	78	115	145	135	114	94	61	204	326	509	1,780
Corporate Programs	267	385	365	302	337	218	242	243	204	206	2,768
<b>Grand Total</b>	<b>12,333</b>	<b>17,882</b>	<b>12,922</b>	<b>15,891</b>	<b>11,487</b>	<b>13,464</b>	<b>14,926</b>	<b>16,553</b>	<b>18,408</b>	<b>16,034</b>	<b>149,900</b>

<sup>1</sup> Operations, maintenance, and administration. \* In 2010, Remediation and Spills are unusually high because of an outlier event.



Table 4

# **‘Summary of Reported U.S. Environmental Expenditures on Remediation and Spills by Sector: 2007-2016** (in millions of dollars)

Sector	2007	2008	2009	2010*	2011	2012	2013*	2014	2015	2016	10-Year
<b>Exploration and Production:</b>											
Remediation	646	481	566	1,096	223	273	276	246	212	169	<b>4,188</b>
Spills	63	75	87	12,641	111	199	150	299	181	107	<b>13,914</b>
Subtotal	710	556	653	13,737	334	472	425	545	393	277	<b>18,101</b>
<b>Transportation</b>											
Remediation	50	67	68	101	66	141	153	128	162	170	<b>1,106</b>
Spills	22	42	56	51	164	53	111	54	123	47	<b>721</b>
Subtotal	72	109	124	153	229	194	264	182	284	217	<b>1,827</b>
<b>Refining</b>											
Remediation	314	283	213	279	278	416	359	326	304	253	<b>3,025</b>
Spills	49	43	177	32	23	29	28	22	18	14	<b>436</b>
Subtotal	363	326	390	311	301	446	387	348	322	267	<b>3,462</b>
<b>Marketing</b>											
Remediation	422	430	413	363	472	333	278	282	258	240	<b>3,491</b>
Spills	6	8	2	2	1	1	3	4	4	3	<b>33</b>
Subtotal	428	437	415	365	473	333	281	287	262	243	<b>3,524</b>
<b>Research and Development</b>											
Remediation	50	60	82	67	79	34	13	17	25	20	<b>447</b>
Spills	2	2	6	2	10	4	3	1	1	1	<b>31</b>
Subtotal	52	62	88	68	89	38	16	18	26	21	<b>477</b>
<b>Grand Total</b>	<b>1,623</b>	<b>1,490</b>	<b>1,670</b>	<b>14,634</b>	<b>1,427</b>	<b>1,483</b>	<b>1,372</b>	<b>1,379</b>	<b>1,288</b>	<b>1,025</b>	<b>27,392</b>

\* In 2010, Remediation and Spills are unusually high because of an outlier event

\* Pre 2013 Exploration and Production expenditures were partly estimated using the annual NGL wellhead price. Effective January 2013 the wellhead price was discontinued. Post 2012 Exploration and Production expenditures were partly estimated using the Henry Hub spot price.

Table 4(i)

## Summary of Reported U.S. Environmental Expenditures on Remediation by Sector: 2007-2016 (in millions of dollars)

Sector	2007	2008	2009	2010*	2011	2012	2013	2014	2015	2016	10-Year
<b>Exploration and Production:</b>											
Capital	15	11	9	4	19	10	13	11	9	5	105
O&M <sup>1</sup>	631	470	556	1,092	204	263	262	235	203	164	4,082
Subtotal	646	481	566	1,096	223	273	276	246	212	169	4,188
<b>Transportation</b>											
Capital	5	2	1	15	2	5	2	3	4	5	43
O&M <sup>1</sup>	45	65	67	87	64	136	151	126	158	164	1,062
Subtotal	50	67	68	101	66	141	153	128	162	170	1,106
<b>Refining</b>											
Capital	1	7	1	5	4	2	2	2	6	2	32
O&M <sup>1</sup>	313	276	212	274	274	414	357	324	298	251	2,993
Subtotal	314	283	213	279	278	416	359	326	304	253	3,025
<b>Marketing</b>											
Capital	0	-	0	0	0	0	0	0	1	1	4
O&M <sup>1</sup>	421	430	413	363	472	333	278	282	258	239	3,488
Subtotal	422	430	413	363	472	333	278	282	258	240	3,491
<b>Research and Development</b>											
Capital	50	60	82	67	79	34	13	17	25	20	447
O&M <sup>1</sup>	-	-	-	-	-	-	-	-	-	-	-
Subtotal	50	60	82	67	79	34	13	17	25	20	447
<b>Grand Total</b>	<b>1,481</b>	<b>1,321</b>	<b>1,342</b>	<b>1,906</b>	<b>1,118</b>	<b>1,197</b>	<b>1,079</b>	<b>999</b>	<b>961</b>	<b>852</b>	<b>12,257</b>

<sup>1</sup> Operations, maintenance, and administration.

\* In 2010, Remediation and Spills are unusually high because of an outlier event.

Pre 2013 Exploration and Production expenditures were partly estimated using the annual NGL wellhead price. Effective January 2013 the wellhead price was discontinued.

Post 2012 Exploration and Production expenditures were partly estimated using the Henry Hub spot price.

Table 4(ii)

## Summary of Reported U.S. Environmental Expenditures on Spills by Sector: 2007-2016

(in millions of dollars)

Sector	2007	2008	2009	2010*	2011	2012	2013	2014	2015	2016	10-Year
<b>Exploration and Production:</b>											
Capital	6	19	39	13	54	142	99	221	92	62	747
O&M <sup>1</sup>	57	56	49	12,628	58	57	51	78	89	45	13,167
Subtotal	63	75	87	12,641	111	199	150	299	181	107	13,914
<b>Transportation</b>											
Capital	2	13	1	7	11	7	6	5	5	3	62
O&M <sup>1</sup>	20	29	55	44	152	45	105	49	117	44	660
Subtotal	22	42	56	51	164	53	111	54	123	47	721
<b>Refining</b>											
Capital	6	11	25	12	7	12	15	10	10	5	113
O&M <sup>1</sup>	44	33	152	21	17	17	12	12	9	9	324
Subtotal	49	43	177	32	23	29	28	22	18	14	436
<b>Marketing</b>											
Capital	0	0	0	0	0	0	2	2	1	1	6
O&M <sup>1</sup>	6	7	2	1	1	1	1	3	2	3	26
Subtotal	6	8	2	2	1	1	3	4	4	3	33
<b>Research and Development</b>											
Capital	2	2	6	2	10	4	3	1	1	1	31
O&M <sup>1</sup>	-	-	-	-	-	-	-	-	-	-	-
Subtotal	2	2	6	2	10	4	3	1	1	1	31
<b>Grand Total</b>	<b>142</b>	<b>170</b>	<b>328</b>	<b>12,728</b>	<b>309</b>	<b>286</b>	<b>294</b>	<b>379</b>	<b>326</b>	<b>173</b>	<b>15,135</b>

<sup>1</sup> Operations, maintenance, and administration.

\* In 2010, Remediation and Spills are unusually high because of an outlier event.

\* Pre 2013 Exploration and Production expenditures were partly estimated using the annual NGL wellhead price. Effective January 2013 the wellhead price was discontinued.

Post 2012 Exploration and Production expenditures were partly estimated using the Henry Hub spot price.

**Table 5**  
**U.S. Market Share of Survey Participants: 2007-2016**

Year	Sector			
	<b>Exploration and Production<sup>1</sup></b> Upstream Revenues (dollars)	<b>Transportation<sup>2</sup></b> Trunkline Miles (barrel miles)	<b>Refining<sup>3</sup></b> Refinery Capacity (b/cd)	<b>Marketing<sup>4</sup></b> Gasoline Sales Volumes (gallons)
2007	46%	31%	56%	51%
2008	37%	23%	58%	51%
2009	52%	44%	57%	45%
2010	37%	55%	61%	60%
2011	36%	50%	66%	55%
2012	29%	49%	54%	51%
2013	35%	44%	56%	57%
2014	27%	48%	57%	59%
2015	34%	44%	53%	61%
2016	35%	67%	53%	63%

<sup>1</sup>Estimate based on API surveys and U.S. Department of Energy, Energy Information Administration, "Petroleum Supply Annual."

<sup>2</sup>Oil and Gas Journal, "Pipeline Economics."

<sup>3</sup>U.S. Department of Energy, Energy Information Administration, "Petroleum Supply Annual."

<sup>4</sup>U.S. Department of Transportation, Federal Highway Administration, "Monthly Motor Fuel Reported by States."

**Table 6 Margins of Error in API Estimates: 2007-2016** (estimates in millions of dollars)

Year	Exploration and Production	Transportation	Refining	Marketing	R&D and Corporate Programs	Total
<b>2007:</b>						
Estimate	3,214	675	7,902	197	345	12,333
Margin of error	± 39.2%	± 13.1%	± 4.2%	± 12.9%	± 53.3%	± 10.7%
<b>2008:</b>						
Estimate	4,415	1,002	11,580	386	499	17,882
Margin of error	± 21.9%	± 32.6%	± 9.1%	± 7.3%	± .0%	± 8.2%
<b>2009:</b>						
Estimate	2,864	669	8,731	149	510	12,922
Margin of error	± 4.9%	± 21.6%	± 3.0%	± 11.7%	± .0%	± 2.6%
<b>2010:</b>						
Estimate	3,154	1,148	11,019	133	437	15,891
Margin of error	± 4.1%	± 10.0%	± 3.8%	± 13.5%	± .0%	± 2.9%
<b>2011:</b>						
Estimate	3,873	2,120	4,934	109	450	11,487
Margin of error	± 13.4%	± 14.8%	± 13.3%	± 7.3%	± .0%	± 7.8%
<b>2012:</b>						
Estimate	5,089	2,390	5,532	141	312	13,464
Margin of error	± 7.3%	± 14.1%	± 6.6%	± 15.6%	± .0%	± 4.6%
<b>2013:</b>						
Estimate	6,464	2,839	5,081	239	304	14,926
Margin of error	± 5.6%	± 23.0%	± 10.4%	± 12.4%	± .0%	± 6.1%
<b>2014:</b>						
Estimate	8,224	2,694	5,009	179	447	16,553
Margin of error	± 7.8%	± 23.3%	± 11.1%	± 17.7%	± .0%	± 6.4%
<b>2015:</b>						
Estimate	9,282	2,988	5,431	179	529	18,408
Margin of error	± 13.0%	± 23.7%	± 9.5%	± 18.8%	± .0%	± 8.1%
<b>2016:</b>						
Estimate	6,631	2,796	5,704	190	715	16,034
Margin of error	± 18.2%	± 23.9%	± 9.6%	± 16.9%	± .0%	± 9.2%

Table 7

**Estimated U.S. Environmental Expenditures by Medium: 1990** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	109	424	74	46	653
O&M <sup>1</sup>	101	540	92	139	872
Subtotal	210	964	166	185	1,525
<b>Transportation</b>					
Capital	46	149	8	74	277
O&M <sup>1</sup>	43	181	15	150	389
Subtotal	89	330	23	224	666
<b>Refining</b>					
Capital	601	569	100	16	1,286
O&M <sup>1</sup>	1,217	620	279	308	2,424
Subtotal	1,818	1,189	379	324	3,710
<b>Marketing</b>					
Capital	27	163	17	22	229
O&M <sup>1</sup>	26	76	80	29	211
Subtotal	53	239	97	51	440
<b>Other</b>					
R&D	102	39	26	8	175
Corporate Programs	2	3	1	141	147
<b>Grand Total</b>	<b>2,274</b>	<b>2,764</b>	<b>692</b>	<b>933</b>	<b>6,663</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 8

**Estimated U.S. Environmental Expenditures by Medium: 1991** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	176	425	76	52	729
O&M <sup>1</sup>	106	380	121	217	824
Subtotal	282	805	197	269	1,553
<b>Transportation</b>					
Capital	59	179	4	49	291
O&M <sup>1</sup>	79	215	32	120	446
Subtotal	138	394	36	169	737
<b>Refining</b>					
Capital	1,240	467	65	37	1,809
O&M <sup>1</sup>	1,002	601	335	371	2,309
Subtotal	2,242	1,068	400	408	4,118
<b>Marketing</b>					
Capital	66	189	28	46	329
O&M <sup>1</sup>	28	101	92	96	317
Subtotal	94	290	120	142	646
<b>Other</b>					
R&D	157	37	27	6	227
Corporate Programs	49	18	5	49	121
<b>Grand Total</b>	<b>2,962</b>	<b>2,612</b>	<b>785</b>	<b>1,043</b>	<b>7,402</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 9

**Estimated U.S. Environmental Expenditures by Medium: 1992** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	173	430	99	41	743
O&M <sup>1</sup>	70	393	175	185	823
Subtotal	243	823	274	226	1,566
<b>Transportation</b>					
Capital	81	232	5	47	365
O&M <sup>1</sup>	84	294	25	198	601
Subtotal	165	526	30	245	966
<b>Refining</b>					
Capital	2,533	573	153	23	3,282
O&M <sup>1</sup>	1,087	528	333	578	2,526
Subtotal	3,620	1,101	486	601	5,808
<b>Marketing</b>					
Capital	77	232	45	12	366
O&M <sup>1</sup>	35	92	85	63	275
Subtotal	112	324	130	75	641
<b>Other</b>					
R&D	137	26	24	27	214
Corporate Programs	8	13	8	49	78
<b>Grand Total</b>	<b>4,285</b>	<b>2,813</b>	<b>952</b>	<b>1,223</b>	<b>9,273</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 10

**Estimated U.S. Environmental Expenditures by Medium: 1993** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	174	496	114	75	859
O&M <sup>1</sup>	86	288	118	212	704
Subtotal	259	785	232	287	1,563
<b>Transportation</b>					
Capital	106	228	10	30	374
O&M <sup>1</sup>	71	267	28	232	598
Subtotal	177	496	38	261	972
<b>Refining</b>					
Capital	2,500	567	130	19	3,215
O&M <sup>1</sup>	1,212	457	279	536	2,483
Subtotal	3,712	1,023	409	554	5,698
<b>Marketing</b>					
Capital	167	161	46	21	395
O&M <sup>1</sup>	65	79	100	104	347
Subtotal	232	239	146	125	742
<b>Other</b>					
R&D	127	30	25	46	227
Corporate Programs	31	49	53	113	246
<b>Grand Total</b>	<b>4,539</b>	<b>2,622</b>	<b>902</b>	<b>1,385</b>	<b>9,448</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 11

**Estimated U.S. Environmental Expenditures by Medium: 1994** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	166	474	129	58	828
O&M <sup>1</sup>	102	289	128	212	731
Subtotal	268	763	257	270	1,559
<b>Transportation</b>					
Capital	98	121	6	62	288
O&M <sup>1</sup>	65	197	28	294	584
Subtotal	163	318	35	356	872
<b>Refining</b>					
Capital	2,481	481	143	12	3,118
O&M <sup>1</sup>	1,564	586	264	402	2,815
Subtotal	4,045	1,068	407	414	5,933
<b>Marketing</b>					
Capital	187	160	34	13	393
O&M <sup>1</sup>	96	75	90	77	339
Subtotal	283	235	124	90	732
<b>Other</b>					
R&D	95	26	20	35	175
Corporate Programs	13	15	12	154	194
<b>Grand Total</b>	<b>4,868</b>	<b>2,423</b>	<b>854</b>	<b>1,320</b>	<b>9,465</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 12

**Estimated U.S. Environmental Expenditures by Medium: 1995** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	73	379	90	54	596
O&M <sup>1</sup>	103	262	128	233	726
Subtotal	176	641	218	287	1,322
<b>Transportation</b>					
Capital	123	80	3	40	246
O&M <sup>1</sup>	58	195	36	275	563
Subtotal	181	275	38	315	809
<b>Refining</b>					
Capital	1,795	271	74	19	2,158
O&M <sup>1</sup>	2,173	543	273	362	3,351
Subtotal	3,968	814	346	381	5,509
<b>Marketing</b>					
Capital	61	108	24	17	211
O&M <sup>1</sup>	73	40	62	122	297
Subtotal	134	148	86	140	508
<b>Other</b>					
R&D	81	21	16	38	156
Corporate Programs	24	16	17	84	141
<b>Grand Total</b>	<b>4,564</b>	<b>1,915</b>	<b>720</b>	<b>1,245</b>	<b>8,445</b>

<sup>1</sup> Operations, Maintenance and Administration.



Table 13

**Estimated U.S. Environmental Expenditures by Medium: 1996** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	118	474	95	74	762
O&M <sup>1</sup>	104	323	113	280	820
Subtotal	222	797	209	354	1,582
<b>Transportation</b>					
Capital	98	129	12	18	257
O&M <sup>1</sup>	97	231	36	393	757
Subtotal	195	360	48	410	1,013
<b>Refining</b>					
Capital	614	159	34	21	826
O&M <sup>1</sup>	2,398	431	207	95	3,132
Subtotal	3,012	590	241	116	3,958
<b>Marketing</b>					
Capital	36	101	12	15	165
O&M <sup>1</sup>	96	48	70	53	267
Subtotal	133	149	83	68	432
<b>Other</b>					
R&D	41	17	11	33	103
Corporate Programs	25	40	17	104	187
<b>Grand Total</b>	<b>3,628</b>	<b>1,953</b>	<b>608</b>	<b>1,086</b>	<b>7,276</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 14

**Estimated U.S. Environmental Expenditures by Medium: 1997** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	161	557	131	79	928
O&M <sup>1</sup>	107	319	131	219	776
Subtotal	268	876	263	298	1,705
<b>Transportation</b>					
Capital	62	181	4	11	258
O&M <sup>1</sup>	37	110	31	210	388
Subtotal	99	291	35	221	645
<b>Refining</b>					
Capital	342	144	25	8	519
O&M <sup>1</sup>	2,748	530	262	97	3,637
Subtotal	3,090	674	287	105	4,156
<b>Marketing</b>					
Capital	21	174	33	21	249
O&M <sup>1</sup>	100	70	51	76	297
Subtotal	121	244	84	97	545
<b>Other</b>					
R&D	27	14	11	38	90
Corporate Programs	23	24	20	116	183
<b>Grand Total</b>	<b>3,628</b>	<b>2,122</b>	<b>700</b>	<b>875</b>	<b>7,324</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 15

**Estimated U.S. Environmental Expenditures by Medium: 1998** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	164	382	154	72	772
O&M <sup>1</sup>	123	315	126	240	805
Subtotal	287	697	280	313	1,577
<b>Transportation</b>					
Capital	12	410	5	41	468
O&M <sup>1</sup>	25	122	25	176	347
Subtotal	37	531	30	217	815
<b>Refining</b>					
Capital	915	112	41	10	1,078
O&M <sup>1</sup>	2,152	549	297	364	3,361
Subtotal	3,067	661	337	374	4,439
<b>Marketing</b>					
Capital	61	271	6	47	384
O&M <sup>1</sup>	60	96	70	31	256
Subtotal	120	366	76	78	640
<b>Other</b>					
R&D	45	16	7	34	102
Corporate Programs	17	5	4	144	170
<b>Grand Total</b>	<b>3,573</b>	<b>2,277</b>	<b>734</b>	<b>1,159</b>	<b>7,743</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 16

**Estimated U.S. Environmental Expenditures by Medium: 1999** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	117	339	145	58	658
O&M <sup>1</sup>	123	385	284	343	1,135
Subtotal	239	724	430	400	1,793
<b>Transportation</b>					
Capital	11	464	8	1	484
O&M <sup>1</sup>	29	144	19	179	371
Subtotal	40	607	27	181	855
<b>Refining</b>					
Capital	467	91	32	7	597
O&M <sup>1</sup>	2,130	459	178	202	2,970
Subtotal	2,597	550	210	209	3,567
<b>Marketing</b>					
Capital	19	95	2	13	130
O&M <sup>1</sup>	143	65	23	74	305
Subtotal	162	161	25	87	435
<b>Other</b>					
R&D	35	12	3	29	79
Corporate Programs	12	8	4	94	118
<b>Grand Total</b>	<b>3,085</b>	<b>2,062</b>	<b>699</b>	<b>1,001</b>	<b>6,846</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 17

**Estimated U.S. Environmental Expenditures by Medium: 2000** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	148	598	131	108	984
O&M <sup>1</sup>	123	295	94	232	744
Subtotal	270	893	225	339	1,728
<b>Transportation</b>					
Capital	35	254	19	15	324
O&M <sup>1</sup>	73	336	82	307	798
Subtotal	108	591	101	322	1,122
<b>Refining</b>					
Capital	572	182	28	82	864
O&M <sup>1</sup>	2,384	408	202	82	3,077
Subtotal	2,957	590	230	164	3,941
<b>Marketing</b>					
Capital	18	67	0	7	91
O&M <sup>1</sup>	22	56	27	44	148
Subtotal	40	123	27	50	239
<b>Other</b>					
R&D <sup>2</sup>	91	13	7	9	120
Corporate Programs	9	7	2	36	54
<b>Grand Total</b>	<b>3,474</b>	<b>2,216</b>	<b>593</b>	<b>921</b>	<b>7,205</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 18

**Estimated U.S. Environmental Expenditures by Medium: 2001** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	93	508	125	129	855
O&M <sup>1</sup>	157	393	145	225	920
Subtotal	250	901	270	355	1,776
<b>Transportation</b>					
Capital	31	255	23	2	311
O&M <sup>1</sup>	54	385	56	143	638
Subtotal	85	639	79	145	948
<b>Refining</b>					
Capital	977	106	24	48	1,156
O&M <sup>1</sup>	2,576	443	272	139	3,430
Subtotal	3,553	549	296	187	4,586
<b>Marketing</b>					
Capital	25	161	0	14	200
O&M <sup>1</sup>	23	53	37	47	160
Subtotal	48	214	37	62	360
<b>Other</b>					
R&D	111	29	7	15	162
Corporate Programs	7	5	1	30	43
<b>Grand Total</b>	<b>4,054</b>	<b>2,337</b>	<b>690</b>	<b>794</b>	<b>7,875</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 19

**Estimated U.S. Environmental Expenditures by Medium: 2002** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	110	369	95	96	670
O&M <sup>1</sup>	74	209	77	257	617
Subtotal	184	578	172	353	1,287
<b>Transportation</b>					
Capital	83	173	4	33	293
O&M <sup>1</sup>	58	187	60	403	708
Subtotal	141	360	64	436	1,001
<b>Refining</b>					
Capital	2,092	157	12	114	2,376
O&M <sup>1</sup>	1,881	579	279	99	2,838
Subtotal	3,973	736	291	214	5,214
<b>Marketing</b>					
Capital	47	116	—	61	224
O&M <sup>1</sup>	46	61	28	20	154
Subtotal	93	177	28	81	378
<b>Other</b>					
R&D	172	33	6	14	225
Corporate Programs	7	3	1	193	203
<b>Grand Total</b>	<b>4,570</b>	<b>1,886</b>	<b>561</b>	<b>1,290</b>	<b>8,308</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 20

**Estimated U.S. Environmental Expenditures by Medium: 2003** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	96	593	188	89	967
O&M <sup>1</sup>	49	223	69	273	614
Subtotal	145	816	257	362	1,580
<b>Transportation</b>					
Capital	91	206	27	21	345
O&M <sup>1</sup>	109	203	64	261	637
Subtotal	200	409	91	282	982
<b>Refining</b>					
Capital	3,100	103	16	24	3,243
O&M <sup>1</sup>	1,978	458	273	115	2,824
Subtotal	5,078	561	289	140	6,068
<b>Marketing</b>					
Capital	11	41	—	58	110
O&M <sup>1</sup>	34	50	24	45	153
Subtotal	45	91	24	103	263
<b>Other</b>					
R&D	121	38	6	18	184
Corporate Programs	6	1	0	115	122
<b>Grand Total</b>	<b>5,595</b>	<b>1,917</b>	<b>667</b>	<b>1,020</b>	<b>9,199</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 21

**Estimated U.S. Environmental Expenditures by Medium: 2004** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	74	407	140	76	696
O&M <sup>1</sup>	83	297	98	431	909
Subtotal	157	704	238	507	1,605
<b>Transportation</b>					
Capital	71	150	2	30	253
O&M <sup>1</sup>	52	231	55	302	640
Subtotal	123	381	57	332	893
<b>Refining</b>					
Capital	3,170	111	12	70	3,363
O&M <sup>1</sup>	1,985	499	279	106	2,869
Subtotal	5,155	610	291	176	6,232
<b>Marketing</b>					
Capital	37	50	0	48	135
O&M <sup>1</sup>	26	44	22	46	138
Subtotal	63	94	22	94	273
<b>Other</b>					
R&D	60	24	4	24	111
Corporate Programs	3	1	0	224	228
<b>Grand Total</b>	<b>5,560</b>	<b>1,814</b>	<b>612</b>	<b>1,357</b>	<b>9,343</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 22

**Estimated U.S. Environmental Expenditures by Medium: 2005** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	329	443	194	54	1,020
O&M <sup>1</sup>	116	243	126	403	889
Subtotal	445	686	320	457	1,909
<b>Transportation</b>					
Capital	90	138	3	20	251
O&M <sup>1</sup>	71	204	75	238	587
Subtotal	161	341	78	258	838
<b>Refining</b>					
Capital	4,013	283	15	87	4,398
O&M <sup>1</sup>	2,354	539	289	194	3,376
Subtotal	6,368	822	304	281	7,774
<b>Marketing</b>					
Capital	33	14	55	32	133
O&M <sup>1</sup>	19	28	12	31	90
Subtotal	51	42	67	63	223
<b>Other</b>					
R&D	69	15	5	43	131
Corporate Programs	24	6	3	192	225
<b>Grand Total</b>	<b>7,118</b>	<b>1,913</b>	<b>776</b>	<b>1,293</b>	<b>11,101</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 23

**Estimated U.S. Environmental Expenditures by Medium: 2006** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	411	580	164	143	1,298
O&M <sup>1</sup>	111	275	155	736	1,276
Subtotal	522	854	319	880	2,574
<b>Transportation</b>					
Capital	208	176	2	42	429
O&M <sup>1</sup>	59	226	37	305	626
Subtotal	267	402	39	347	1,055
<b>Refining</b>					
Capital	3,142	310	28	31	3,511
O&M <sup>1</sup>	2,891	519	278	324	4,012
Subtotal	6,033	829	306	356	7,524
<b>Marketing</b>					
Capital	13	44	2	43	102
O&M <sup>1</sup>	10	24	12	30	76
Subtotal	23	68	14	73	178
<b>Other</b>					
R&D	67	12	6	18	103
Corporate Programs	10	2	1	224	237
<b>Grand Total</b>	<b>6,921</b>	<b>2,168</b>	<b>685</b>	<b>1,897</b>	<b>11,671</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 24

**Estimated U.S. Environmental Expenditures by Medium: 2007** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	336	520	295	101	1,252
O&M <sup>1</sup>	181	248	182	1,350	1,962
Subtotal	518	768	477	1,451	3,214
<b>Transportation</b>					
Capital	146	145	3	33	327
O&M <sup>1</sup>	35	104	27	182	348
Subtotal	181	249	30	214	675
<b>Refining</b>					
Capital	3,138	306	33	53	3,529
O&M <sup>1</sup>	3,083	734	390	166	4,373
Subtotal	6,221	1,040	422	219	7,902
<b>Marketing</b>					
Capital	30	73	0	13	116
O&M <sup>1</sup>	14	32	12	23	81
Subtotal	44	105	12	36	197
<b>Other</b>					
R&D	49	13	4	11	78
Corporate Programs	7	2	1	257	267
<b>Grand Total</b>	<b>7,019</b>	<b>2,177</b>	<b>947</b>	<b>2,189</b>	<b>12,333</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 25

**Estimated U.S. Environmental Expenditures by Medium: 2008** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	400	865	475	165	1,904
O&M <sup>1</sup>	256	313	290	1,651	2,511
Subtotal	656	1,178	765	1,816	4,415
<b>Transportation</b>					
Capital	95	184	4	27	310
O&M <sup>1</sup>	62	261	59	309	691
Subtotal	157	445	64	336	1,002
<b>Refining</b>					
Capital	6,038	551	38	70	6,696
O&M <sup>1</sup>	3,581	732	395	176	4,884
Subtotal	9,619	1,283	432	246	11,580
<b>Marketing</b>					
Capital	167	88	0	30	284
O&M <sup>1</sup>	20	28	23	31	102
Subtotal	187	116	23	60	386
<b>Other</b>					
R&D	85	11	4	15	115
Corporate Programs	8	1	0	375	385
<b>Grand Total</b>	<b>10,711</b>	<b>3,033</b>	<b>1,288</b>	<b>2,849</b>	<b>17,882</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 26

**Estimated U.S. Environmental Expenditures by Medium: 2009** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	271	561	254	136	1,222
O&M <sup>1</sup>	113	210	187	1,132	1,642
Subtotal	384	771	441	1,268	2,864
<b>Transportation</b>					
Capital	172	229	3	37	441
O&M <sup>1</sup>	25	87	18	99	228
Subtotal	197	316	21	136	669
<b>Refining</b>					
Capital	3,913	467	43	79	4,502
O&M <sup>1</sup>	2,883	747	383	216	4,229
Subtotal	6,796	1,214	426	296	8,731
<b>Marketing</b>					
Capital	26	41	0	15	83
O&M <sup>1</sup>	12	18	11	24	65
Subtotal	39	59	11	39	149
<b>Other</b>					
R&D	105	19	5	16	145
Corporate Programs	6	1	1	356	365
<b>Grand Total</b>	<b>7,526</b>	<b>2,380</b>	<b>905</b>	<b>2,111</b>	<b>12,922</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 27

**Estimated U.S. Environmental Expenditures by Medium: 2010** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	235	512	215	105	1,068
O&M <sup>1</sup>	187	293	252	1,354	2,086
Subtotal	423	805	467	1,460	3,154
<b>Transportation</b>					
Capital	95	159	9	187	450
O&M <sup>1</sup>	36	348	52	262	698
Subtotal	131	507	61	449	1,148
<b>Refining</b>					
Capital	6,537	665	56	127	7,385
O&M <sup>1</sup>	2,504	624	337	169	3,634
Subtotal	9,041	1,289	393	296	11,019
<b>Marketing</b>					
Capital	10	24	0	1	35
O&M <sup>1</sup>	13	19	18	47	98
Subtotal	23	43	18	49	133
<b>Other</b>					
R&D	76	28	7	24	135
Corporate Programs	5	1	1	296	302
<b>Grand Total</b>	<b>9,699</b>	<b>2,672</b>	<b>948</b>	<b>2,573</b>	<b>15,891</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 28

**Estimated U.S. Environmental Expenditures by Medium: 2011** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	286	580	206	204	1,276
O&M <sup>1</sup>	236	336	396	1,629	2,597
Subtotal	521	916	603	1,833	3,873
<b>Transportation</b>					
Capital	178	332	18	447	975
O&M <sup>1</sup>	59	547	82	458	1,145
Subtotal	236	879	100	905	2,120
<b>Refining</b>					
Capital	1,666	266	19	65	2,016
O&M <sup>1</sup>	2,025	474	283	137	2,918
Subtotal	3,691	739	302	202	4,934
<b>Marketing</b>					
Capital	8	35	-	8	51
O&M <sup>1</sup>	6	11	7	33	58
Subtotal	14	47	7	41	109
<b>Other</b>					
R&D	54	26	5	28	114
Corporate Programs	5	3	1	327	337
<b>Grand Total</b>	<b>4,522</b>	<b>2,611</b>	<b>1,018</b>	<b>3,336</b>	<b>11,487</b>

<sup>1</sup> Operations, Maintenance and Administration.



Table 29

**Estimated U.S. Environmental Expenditures by Medium: 2012** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	516	1,547	328	429	2,820
O&M <sup>1</sup>	153	317	417	1,383	2,269
Subtotal	669	1,864	745	1,811	5,089
<b>Transportation</b>					
Capital	138	278	9	622	1,046
O&M <sup>1</sup>	85	666	89	504	1,344
Subtotal	222	944	98	1,125	2,390
<b>Refining</b>					
Capital	1,667	332	21	215	2,234
O&M <sup>1</sup>	2,163	550	319	266	3,298
Subtotal	3,829	882	340	481	5,532
<b>Marketing</b>					
Capital	7	31	-	6	45
O&M <sup>1</sup>	1	8	4	83	96
Subtotal	9	39	4	89	141
<b>Other</b>					
R&D	27	28	6	33	94
Corporate Programs	10	6	1	201	218
<b>Grand Total</b>	<b>4,766</b>	<b>3,763</b>	<b>1,194</b>	<b>3,740</b>	<b>13,464</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 30

**Estimated U.S. Environmental Expenditures by Medium: 2013** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	521	1,587	372	583	3,063
O&M <sup>1</sup>	348	422	692	1,939	3,401
Subtotal	869	2,009	1,064	2,522	6,464
<b>Transportation</b>					
Capital	204	441	6	915	1,565
O&M <sup>1</sup>	71	606	102	494	1,273
Subtotal	276	1,046	108	1,409	2,839
<b>Refining</b>					
Capital	1,072	266	37	170	1,546
O&M <sup>1</sup>	2,351	616	328	241	3,535
Subtotal	3,422	882	365	412	5,081
<b>Marketing</b>					
Capital	10	87	-	19	115
O&M <sup>1</sup>	5	9	5	106	124
Subtotal	14	95	5	124	239
<b>Other</b>					
R&D	23	14	3	21	61
Corporate Programs	18	9	2	214	242
<b>Grand Total</b>	<b>4,623</b>	<b>4,054</b>	<b>1,547</b>	<b>4,702</b>	<b>14,926</b>

<sup>1</sup> Operations, Maintenance and Administration.

\* Pre 2013 Exploration and Production expenditures were partly estimated using the annual NGL wellhead price. Effective January 2013 the wellhead price was discontinued. 2013 Exploration and Production expenditures were partly estimated using the Henry Hub spot price.

Table 31

**Estimated U.S. Environmental Expenditures by Medium: 2014** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	930	2,230	512	911	4,583
O&M <sup>1</sup>	280	593	741	2,028	3,641
Subtotal	1,209	2,823	1,254	2,938	8,224
<b>Transportation</b>					
Capital	159	287	6	819	1,271
O&M <sup>1</sup>	80	714	108	522	1,424
Subtotal	239	1,001	113	1,341	2,694
<b>Refining</b>					
Capital	1,337	158	28	204	1,727
O&M <sup>1</sup>	2,287	553	307	135	3,282
Subtotal	3,624	711	335	339	5,009
<b>Marketing</b>					
Capital	3	70	0	11	84
O&M <sup>1</sup>	4	8	5	78	95
Subtotal	6	78	5	89	179
<b>Other</b>					
R&D	31	30	7	136	204
Corporate Programs	27	12	3	200	243
<b>Grand Total</b>	<b>5,136</b>	<b>4,655</b>	<b>1,717</b>	<b>5,044</b>	<b>16,553</b>

<sup>1</sup> Operations, Maintenance and Administration.

Table 32

**Estimated U.S. Environmental Expenditures by Medium: 2015** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	572	1,519	498	606	3,195
O&M <sup>1</sup>	337	1,491	996	3,263	6,087
Subtotal	909	3,009	1,494	3,869	9,282
<b>Transportation</b>					
Capital	72	226	3	958	1,259
O&M <sup>1</sup>	122	879	139	589	1,729
Subtotal	194	1,105	141	1,547	2,988
<b>Refining</b>					
Capital	1,449	227	17	247	1,940
O&M <sup>1</sup>	2,318	646	378	150	3,491
Subtotal	3,767	872	395	397	5,431
<b>Marketing</b>					
Capital	4	63	0	16	83
O&M <sup>1</sup>	4	6	4	82	96
Subtotal	8	69	4	98	179
<b>Other</b>					
R&D	31	31	7	257	326
Corporate Programs	21	10	3	169	204
<b>Grand Total</b>	<b>4,929</b>	<b>5,098</b>	<b>2,044</b>	<b>6,337</b>	<b>18,408</b>

<sup>1</sup> Operations, Maintenance and Administration.

\* Pre 2013 Exploration and Production expenditures were partly estimated using the annual NGL wellhead price. Effective January 2013 the wellhead price was discontinued. 2013 Exploration and Production expenditures were partly estimated using the Henry Hub spot price.

Table 33

**Estimated U.S. Environmental Expenditures by Medium: 2016** (in millions of dollars)

Sector	Air	Water	Wastes	Other	Total
<b>Exploration &amp; Production</b>					
Capital	473	1,256	411	501	2,642
O&M <sup>1</sup>	221	977	653	2,139	3,989
Subtotal	694	2,233	1,064	2,640	6,631
<b>Transportation</b>					
Capital	157	299	3	359	818
O&M <sup>1</sup>	183	945	133	716	1,977
Subtotal	340	1,244	136	1,076	2,796
<b>Refining</b>					
Capital	1,722	319	20	234	2,295
O&M <sup>1</sup>	2,260	611	408	130	3,409
Subtotal	3,982	930	428	364	5,704
<b>Marketing</b>					
Capital	7	57	0	15	78
O&M <sup>1</sup>	6	6	4	95	111
Subtotal	13	63	4	109	190
<b>Other</b>					
R&D	42	34	6	427	509
Corporate Programs	22	10	3	170	206
<b>Grand Total</b>	<b>5,094</b>	<b>4,513</b>	<b>1,642</b>	<b>4,786</b>	<b>16,034</b>

<sup>1</sup> Operations, Maintenance and Administration.

## Technical Notes

API's environmental expenditures survey is sent to a stratified sample of the industry: all large and mid-size companies, plus a randomly selected group of smaller companies. Each year since 1990, the survey has been mailed to about 800 companies. In 2016, the data used to complete the survey represent a large share – from 35 percent to 67 percent – of the variables used to estimate expenditures for the entire industry ([see Table 5](#)).

To estimate expenditures for the industry as a whole, API used regression and ratio analysis. Different variables were used for different parts of the industry: upstream revenues for exploration and production, trunkline miles for transportation, refinery capacity for refining, and gasoline sales for marketing. To estimate industry-wide expenditures for research and development and corporate programs, API used a combination of these variables.

API's estimates may differ from the results that would have been obtained if the entire industry, or a different group of companies, had participated in the survey. Table 6 gives the margin of error representing the 95-percent confidence interval for API's estimates – the range in which the actual value almost certainly lies. Thus, there is a 95 percent probability that the true amount for the industry is within that range.

API estimated that -- excluding remediation and spills -- the entire industry's environmental expenditures were \$16.0 billion in 2016 (the remaining portion of the \$17.1 billion – remediation and spills expenditures – is not an industry estimate but only the amounts reported by the survey respondents). The margin of error for this estimate is plus or minus 9.2 percent. This means that API estimates with 95-percent certainty that expenditures were between \$14.6 billion and \$17.5 billion.

The model used to estimate these expenditures and margins of error assumes perfect accuracy in company responses. However, as with any survey, practical difficulties can also influence results and introduce errors. Many companies do not track environmental spending separately. Others categorize environmental spending differently from the survey. Consequently, some companies are only able to provide a best estimate of what they spend. As a result, although API's estimates are based on imperfect data, they are the most extensive data available to the public.

## Definitions

**Air pollution:** Substances emitted into open air that are targeted for reduction by the Clean Air Act and other environmental laws—for example, carbon monoxide, hydrocarbons, lead, nitrogen oxides, particulates, and sulfur dioxide.

**Capital expenditures:** Costs incurred by ongoing activities to comply with environmental regulations and to minimize or treat output streams. Examples include wastewater treatment plants, stack scrubbers, modifications or additions to plants due to existing or pending laws or regulations, smoke control, groundwater recovery control, dust suppression systems, or other factors that positively influence the environment.

**Corporate programs:** Activities of company environmental departments. Also, voluntary efforts to improve environmental quality such as supporting environmental education programs; collecting used oil; buying and destroying older, high-polluting cars; and providing free engine tune-ups.

**Environmental expenditures:** Costs incurred that relate to the prevention, control, abatement, or elimination of environmental pollution. Expenditures are the incremental costs reported by a unit in a facility that would not have been incurred if environmental issues had not been considered.

**Low-sulfur gasoline:** A specially formulated gasoline that enables the use of advanced catalytic emissions controls on gasoline-powered vehicles, primarily to reduce hydrocarbon, particulate, and nitrogen oxides emissions.

**Low-sulfur / Ultra-low-sulfur diesel fuel:** A specially formulated diesel fuel that enables the use of advanced catalytic emissions controls, primarily to reduce particulate and nitrogen oxides emissions from diesel-powered engines.

**Ongoing activities:** Capital, operating, maintenance, and administrative expenses associated with routine operating practices in each sector (E&P, Refining, Transportation, and Marketing) of the industry.

**Other media:** Recurring activities that are not reported under air, water, or wastes—for example, removing abandoned production platforms, and supporting oil spill cooperatives.

**Reformulated gasoline (RFG):** A specially blended, cleaner-burning gasoline designed to improve air quality by reducing urban smog. It reduces carbon monoxide and toxic emissions as well as smog-forming emissions. It has less benzene and no heavy metals. RFG is available in all octane grades, and its use is currently required in about one-quarter of the nation (see Figure 8).

**Remediation:** Cleaning up soil and groundwater contamination. Such contamination is caused by leaks from storage tanks, pipelines, pits, settlement ponds, or underground piping. Contamination may also have resulted from practices allowed in the past, but no longer permitted. Remediation costs, because of their unique nature, cannot be extrapolated to the entire industry. Remediation costs shown in this report are only those reported by survey respondents.

**Research and development:** Investigating new technologies to limit or reduce emissions or pollution from products and operations—for example, research leading to the development and continuing improvement in reformulated gasoline and diesel fuel.

**Spills:** Sudden releases of crude oil or petroleum products caused by malfunctions or accidents. Spills costs shown in this report are only those reported by survey respondents, do not include fines and penalties, and are not extrapolated to the entire industry.

**Waste management:** Collecting, treating, recycling, and disposing of solid or contained wastes. It includes efforts to prevent pollution by reducing waste at the source.

**Water pollution:** Substances discharged into bodies of water targeted by the Clean Water Act and other environmental laws—for example, oils, metals, solids, and toxic chemicals.



AMERICAN PETROLEUM INSTITUTE

1220 L Street, NW  
Washington, DC 20005-4070  
Phone: 202-682-8528  
Email: [daiw@api.org](mailto:daiw@api.org)

[www.api.org](http://www.api.org)

Copyright 2018 - American Petroleum Institute,  
all rights reserved. API and the API logo are either  
trademarks or registered trademarks of API in the  
United States and/or other countries.

API Digital Media: 2018-001 | 1.17 | PDF