



AMERICAN PETROLEUM INSTITUTE

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# Environmental Expenditures

by the U.S. Oil and Natural Gas Industry



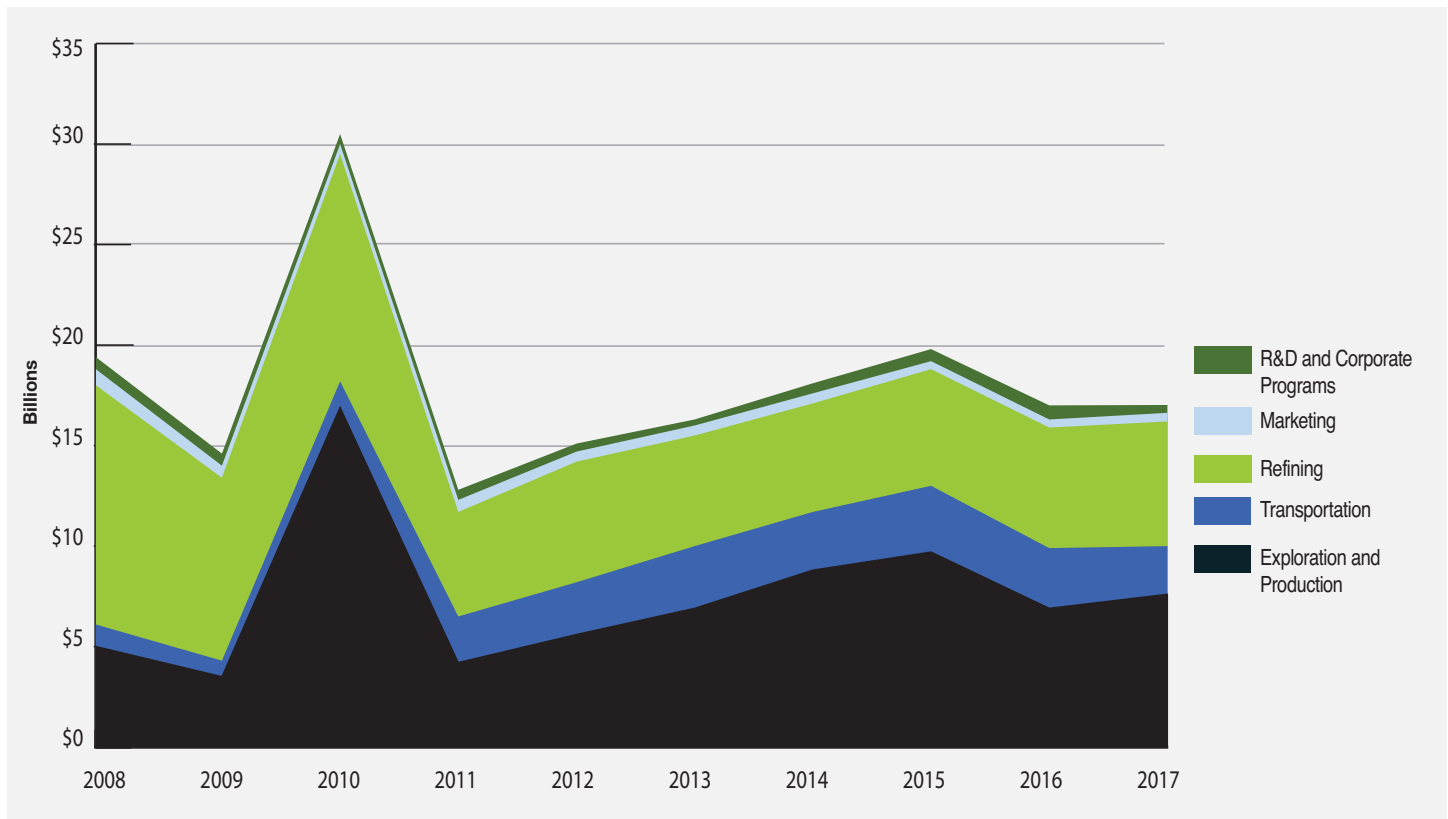
1990–2017

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 2008-2017 by (by sector<sup>1</sup>)**



<sup>1</sup> 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>2</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 \$356 billion since 1990 toward improving the environmental performance of its products, facilities and operations — \$1,088 for every man, woman and child in the United States.<sup>2</sup> In 2017 alone, API estimates that approximately \$17.1 billion was spent on the environment; \$15.9 billion was spent implementing new technologies, creating cleaner fuels and funding ongoing environmental initiatives. An additional \$1.2 billion went toward research and development, corporate environmental programs and spill remediation efforts.

- 32% of the industry's environmental expenditures in 2017 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 847,589<sup>3</sup> producing oil and natural gas wells operating onshore and approximately 3,488<sup>4</sup> oil and natural gas platforms operating offshore in U.S. state and federal waters. These wells produce approximately 3.4 billion<sup>5</sup> barrels of oil and almost 33.4 trillion<sup>6</sup> cubic feet of natural gas annually.

**Refining:** The nation's 135 refineries, which process more than 18 million<sup>7</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: Currently, 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 122<sup>8</sup> 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.

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<sup>3</sup> Website link: <http://info.drillinginfo.com>

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<sup>4</sup> Bureau of Ocean Management - <https://www.data.boem.gov/Leasing/OffshoreStatsbyWD/Default.aspx>

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<sup>5</sup> U.S. EIA, Monthly Energy Review October 2018, Table 3.1

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<sup>6</sup> U.S. EIA, Monthly Energy Review October 2018, Table 4.1

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<sup>7</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)

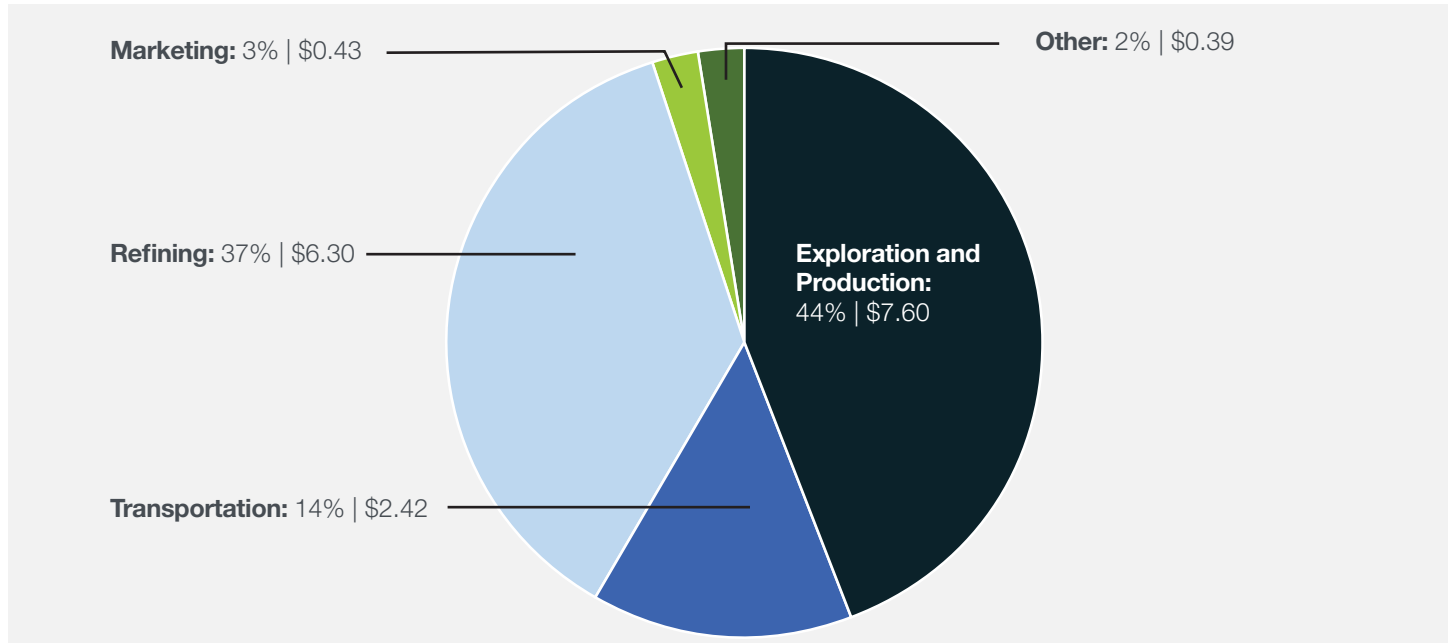
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<sup>8</sup> Website link: <http://www.convenience.org/Media/Press-Releases/2018/PR012518#.XBALuGhKgaY>

Figure 2

### 2017 Environmental Expenditures by Sector<sup>9</sup>

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

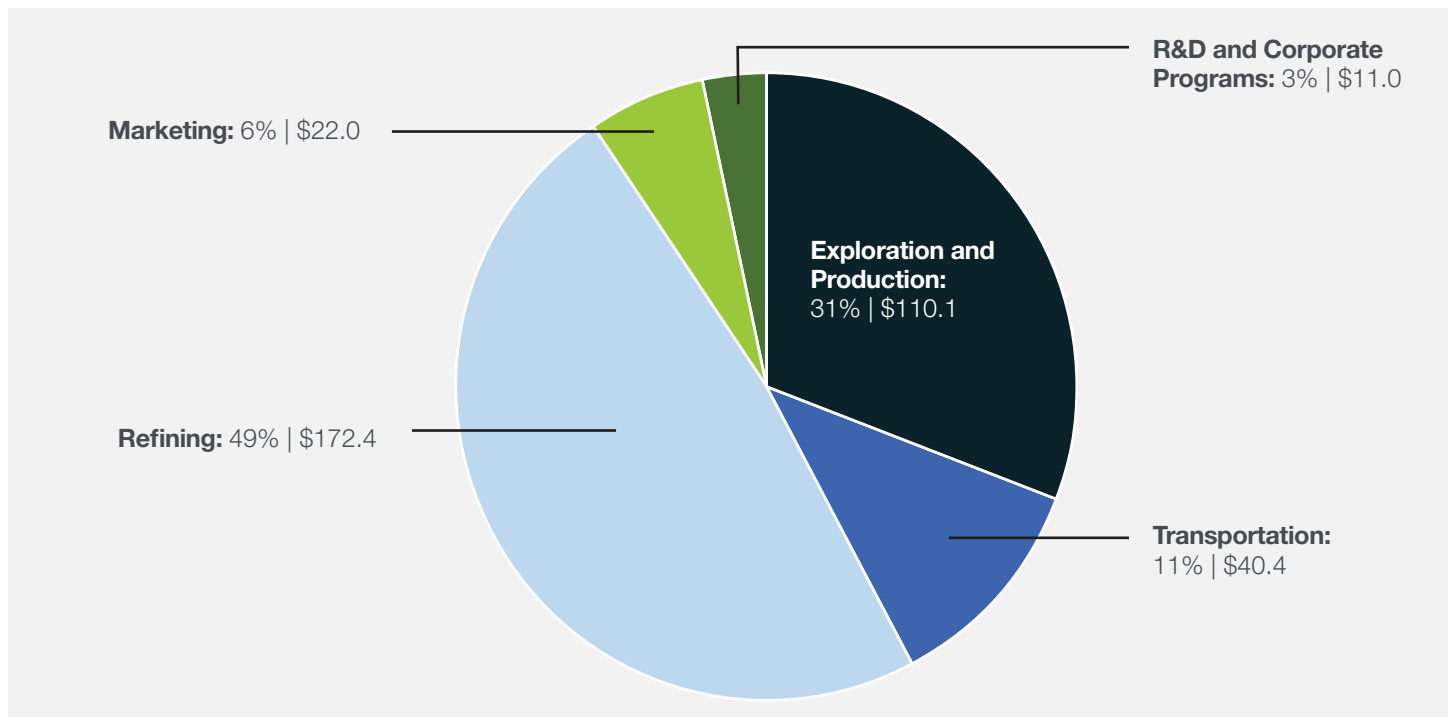


<sup>9</sup> Remediation & Spills expenditures are included in the sector numbers and are reported data only. The remaining sector expenditures are estimated for the entire industry.

Figure 3

### Spending on the Environment per Business Sector since 1990<sup>10</sup> (in billions of dollars)

1990-2017: Total Expenditures = \$355.9 billion



<sup>10</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

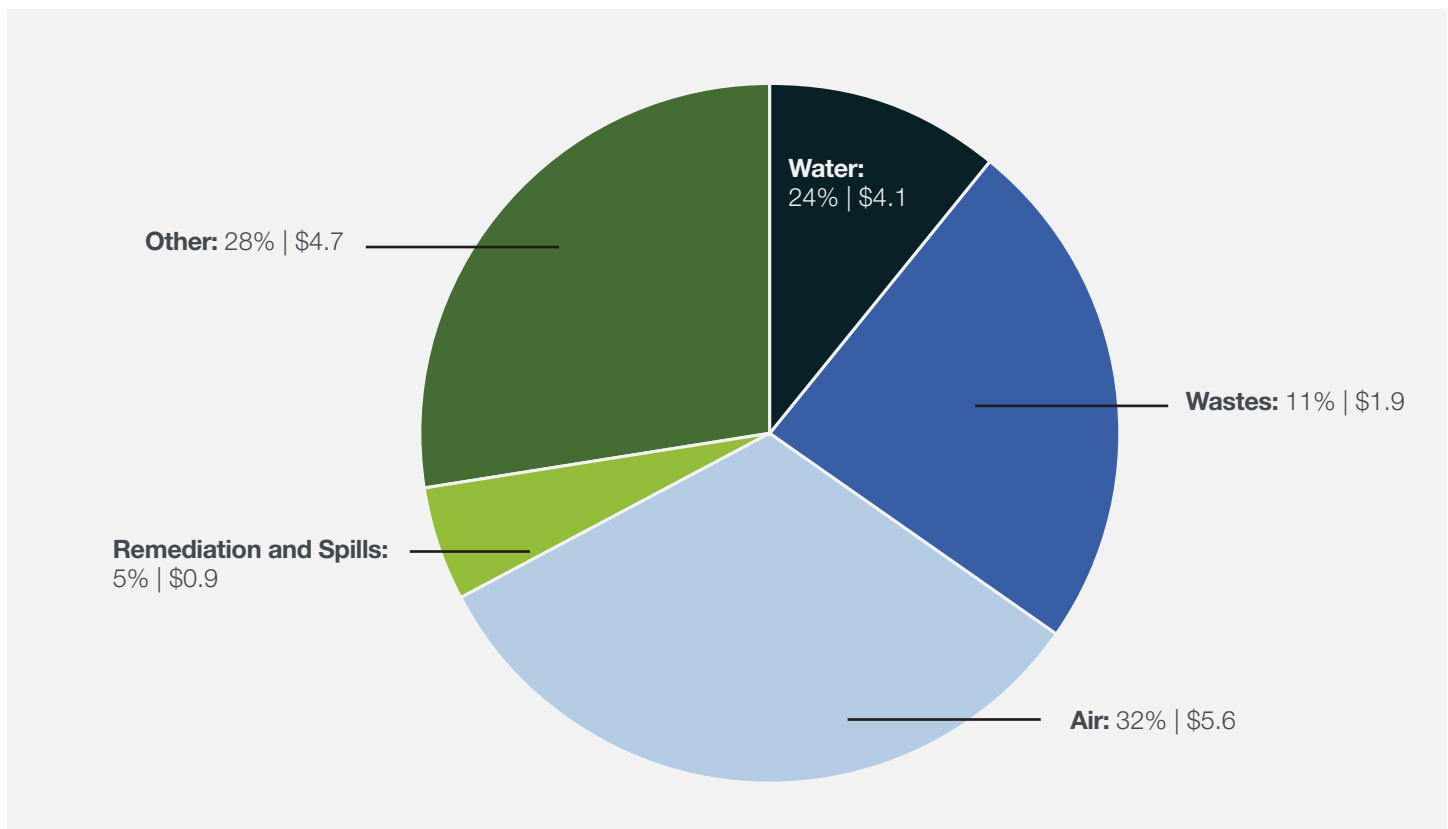
The following charts illustrate how the U.S. oil and natural gas industry's environmental expenditures have been targeted toward reducing emissions by air, water, and land.

**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.

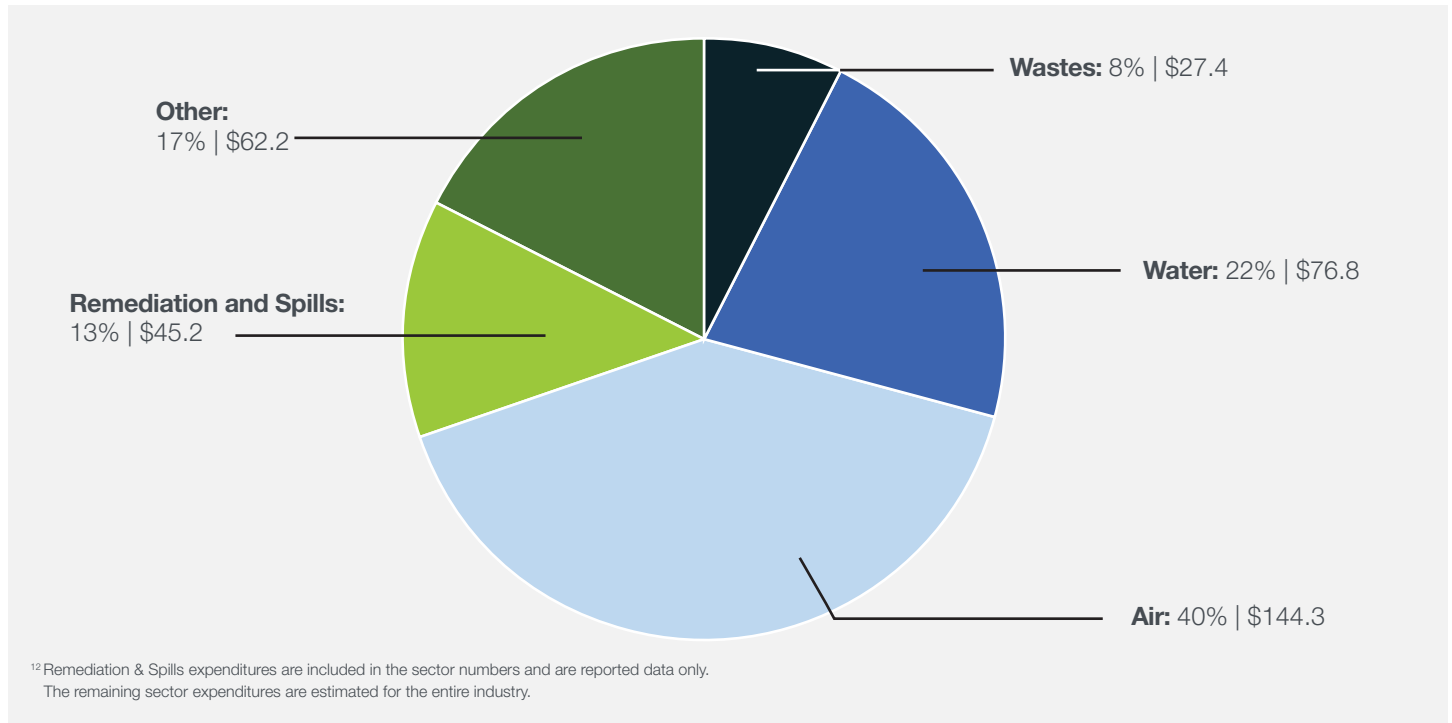
**Figure 4**  
**2017 Environmental Expenditures by Medium<sup>11</sup>**

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

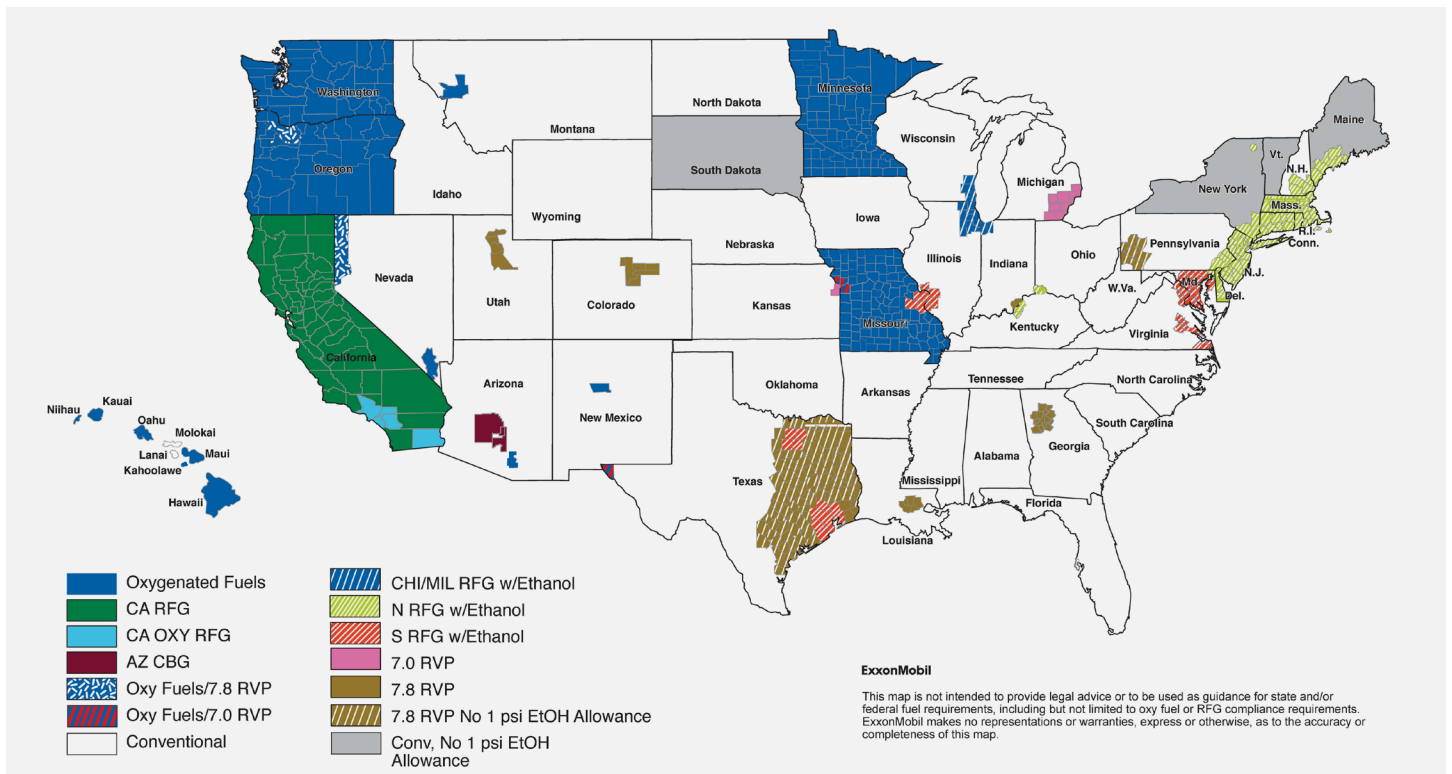


<sup>11</sup> Remediation & Spills expenditures are included in the sector numbers and are reported data only. The remaining sector expenditures are estimated for the entire industry.

**Figure 5**  
**1990-2017 Environmental Expenditures by Medium<sup>12</sup>**  
 (in billions of dollars) Total Expenditures = \$355.9 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: 2008-2017\***

(in millions of dollars)

| Year                 | Ongoing Activities | Research and Development | Corporate Programs | Subtotal       | Remediation and Spills | Total          |
|----------------------|--------------------|--------------------------|--------------------|----------------|------------------------|----------------|
| 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         |
| 2017                 | 15,864             | 130                      | 241                | 16,234         | 897                    | 17,132         |
| <b>10-Year Total</b> | <b>149,228</b>     | <b>1,832</b>             | <b>2,741</b>       | <b>153,801</b> | <b>26,666</b>          | <b>180,467</b> |

\* 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: 2008-2017 (in millions of dollars)

| Year                 | Air           | Water         | Wastes        | Other         | Subtotal <sup>1</sup> | Remediation <sup>2</sup> | Spills <sup>2</sup> | Total          |
|----------------------|---------------|---------------|---------------|---------------|-----------------------|--------------------------|---------------------|----------------|
| 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         |
| 2017                 | 5,554         | 4,070         | 1,883         | 4,728         | 16,234                | 777                      | 120                 | 17,132         |
| <b>10-Year Total</b> | <b>69,580</b> | <b>39,027</b> | <b>15,132</b> | <b>42,394</b> | <b>166,134</b>        | <b>13,034</b>            | <b>15,255</b>       | <b>194,424</b> |

<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: 2008-2017 (in millions of dollars)

| Sector                             | 2008          | 2009          | 2010          | 2011          | 2012          | 2013*         | 2014          | 2015          | 2016          | 2017          | 10-Year        |
|------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|----------------|
| <b>Exploration and production:</b> |               |               |               |               |               |               |               |               |               |               |                |
| Capital                            | 1,904         | 1,222         | 1,068         | 1,276         | 2,820         | 3,063         | 4,583         | 3,195         | 2,642         | 2,787         | <b>24,560</b>  |
| O & M <sup>1</sup>                 | 2,511         | 1,642         | 2,086         | 2,597         | 2,269         | 3,401         | 3,641         | 6,087         | 3,989         | 4,604         | <b>32,828</b>  |
| Subtotal                           | 4,415         | 2,864         | 3,154         | 3,873         | 5,089         | 6,464         | 8,224         | 9,282         | 6,631         | 7,391         | <b>57,388</b>  |
| <b>Transportation:</b>             |               |               |               |               |               |               |               |               |               |               |                |
| Capital                            | 310           | 441           | 450           | 975           | 1,046         | 1,565         | 1,271         | 1,259         | 818           | 884           | <b>9,020</b>   |
| O & M <sup>1</sup>                 | 691           | 228           | 698           | 1,145         | 1,344         | 1,273         | 1,424         | 1,729         | 1,977         | 1,350         | <b>11,859</b>  |
| Subtotal                           | 1,002         | 669           | 1,148         | 2,120         | 2,390         | 2,839         | 2,694         | 2,988         | 2,796         | 2,234         | <b>20,879</b>  |
| <b>Refining</b>                    |               |               |               |               |               |               |               |               |               |               |                |
| Capital                            | 6,696         | 4,502         | 7,385         | 2,016         | 2,234         | 1,546         | 1,727         | 1,940         | 2,295         | 2,061         | <b>32,401</b>  |
| O & M <sup>1</sup>                 | 4,884         | 4,229         | 3,634         | 2,918         | 3,298         | 3,535         | 3,282         | 3,491         | 3,409         | 3,996         | <b>36,676</b>  |
| Subtotal                           | 11,580        | 8,731         | 11,019        | 4,934         | 5,532         | 5,081         | 5,009         | 5,431         | 5,704         | 6,057         | <b>69,077</b>  |
| <b>Marketing</b>                   |               |               |               |               |               |               |               |               |               |               |                |
| Capital                            | 284           | 83            | 35            | 51            | 45            | 115           | 84            | 83            | 78            | 78            | <b>936</b>     |
| O & M <sup>1</sup>                 | 102           | 65            | 98            | 58            | 96            | 124           | 95            | 96            | 111           | 104           | <b>949</b>     |
| Subtotal                           | 386           | 149           | 133           | 109           | 141           | 239           | 179           | 179           | 190           | 181           | <b>1,885</b>   |
| <b>Other</b>                       |               |               |               |               |               |               |               |               |               |               |                |
| Research and development           | 115           | 145           | 135           | 114           | 94            | 61            | 204           | 326           | 509           | 130           | <b>1,832</b>   |
| Corporate Programs                 | 385           | 365           | 302           | 337           | 218           | 242           | 243           | 204           | 206           | 241           | <b>2,741</b>   |
| <b>Grand Total</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>16,234</b> | <b>153,801</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: 2008-2017 (in millions of dollars)

| Sector                             | 2008         | 2009         | 2010*         | 2011         | 2012         | 2013*        | 2014         | 2015         | 2016         | 2017       | 10-Year       |
|------------------------------------|--------------|--------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|------------|---------------|
| <b>Exploration and Production:</b> |              |              |               |              |              |              |              |              |              |            |               |
| Remediation                        | 481          | 566          | 1,096         | 223          | 273          | 276          | 246          | 212          | 169          | 154        | <b>3,695</b>  |
| Spills                             | 75           | 87           | 12,641        | 111          | 199          | 150          | 299          | 181          | 107          | 54         | <b>13,905</b> |
| Subtotal                           | 556          | 653          | 13,737        | 334          | 472          | 425          | 545          | 393          | 277          | 208        | <b>17,600</b> |
| <b>Transportation</b>              |              |              |               |              |              |              |              |              |              |            |               |
| Remediation                        | 67           | 68           | 101           | 66           | 141          | 153          | 128          | 162          | 170          | 132        | <b>1,188</b>  |
| Spills                             | 42           | 56           | 51            | 164          | 53           | 111          | 54           | 123          | 47           | 49         | <b>749</b>    |
| Subtotal                           | 109          | 124          | 153           | 229          | 194          | 264          | 182          | 284          | 217          | 181        | <b>1,937</b>  |
| <b>Refining</b>                    |              |              |               |              |              |              |              |              |              |            |               |
| Remediation                        | 283          | 213          | 279           | 278          | 416          | 359          | 326          | 304          | 253          | 230        | <b>2,942</b>  |
| Spills                             | 43           | 177          | 32            | 23           | 29           | 28           | 22           | 18           | 14           | 12         | <b>399</b>    |
| Subtotal                           | 326          | 390          | 311           | 301          | 446          | 387          | 348          | 322          | 267          | 242        | <b>3,341</b>  |
| <b>Marketing</b>                   |              |              |               |              |              |              |              |              |              |            |               |
| Remediation                        | 430          | 413          | 363           | 472          | 333          | 278          | 282          | 258          | 240          | 247        | <b>3,317</b>  |
| Spills                             | 8            | 2            | 2             | 1            | 1            | 3            | 4            | 4            | 3            | 4          | <b>31</b>     |
| Subtotal                           | 437          | 415          | 365           | 473          | 333          | 281          | 287          | 262          | 243          | 251        | <b>3,347</b>  |
| <b>Research and Development</b>    |              |              |               |              |              |              |              |              |              |            |               |
| Remediation                        | 60           | 82           | 67            | 79           | 34           | 13           | 17           | 25           | 20           | 13         | <b>410</b>    |
| Spills                             | 2            | 6            | 2             | 10           | 4            | 3            | 1            | 1            | 1            | 1          | <b>30</b>     |
| Subtotal                           | 62           | 88           | 68            | 89           | 38           | 16           | 18           | 26           | 21           | 14         | <b>440</b>    |
| <b>Grand Total</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>897</b> | <b>26,666</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: 2008-2017 (in millions of dollars)

| Sector                             | 2008         | 2009         | 2010*        | 2011         | 2012         | 2013         | 2014       | 2015       | 2016       | 2017       | 10-Year       |
|------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|------------|------------|---------------|
| <b>Exploration and Production:</b> |              |              |              |              |              |              |            |            |            |            |               |
| Capital                            | 11           | 9            | 4            | 19           | 10           | 13           | 11         | 9          | 5          | 7          | <b>98</b>     |
| O&M <sup>1</sup>                   | 470          | 556          | 1,092        | 204          | 263          | 262          | 235        | 203        | 164        | 147        | <b>3,598</b>  |
| Subtotal                           | 481          | 566          | 1,096        | 223          | 273          | 276          | 246        | 212        | 169        | 154        | <b>3,695</b>  |
| <b>Transportation</b>              |              |              |              |              |              |              |            |            |            |            |               |
| Capital                            | 2            | 1            | 15           | 2            | 5            | 2            | 3          | 4          | 5          | 1          | <b>40</b>     |
| O&M <sup>1</sup>                   | 65           | 67           | 87           | 64           | 136          | 151          | 126        | 158        | 164        | 131        | <b>1,148</b>  |
| Subtotal                           | 67           | 68           | 101          | 66           | 141          | 153          | 128        | 162        | 170        | 132        | <b>1,188</b>  |
| <b>Refining</b>                    |              |              |              |              |              |              |            |            |            |            |               |
| Capital                            | 7            | 1            | 5            | 4            | 2            | 2            | 2          | 6          | 2          | 1          | <b>33</b>     |
| O&M <sup>1</sup>                   | 276          | 212          | 274          | 274          | 414          | 357          | 324        | 298        | 251        | 229        | <b>2,909</b>  |
| Subtotal                           | 283          | 213          | 279          | 278          | 416          | 359          | 326        | 304        | 253        | 230        | <b>2,942</b>  |
| <b>Marketing</b>                   |              |              |              |              |              |              |            |            |            |            |               |
| Capital                            | -            | 0            | 0            | 0            | 0            | 0            | 0          | 1          | 1          | 0          | <b>4</b>      |
| O&M <sup>1</sup>                   | 430          | 413          | 363          | 472          | 333          | 278          | 282        | 258        | 239        | 247        | <b>3,313</b>  |
| Subtotal                           | 430          | 413          | 363          | 472          | 333          | 278          | 282        | 258        | 240        | 247        | <b>3,317</b>  |
| <b>Research and Development</b>    |              |              |              |              |              |              |            |            |            |            |               |
| Capital                            | 60           | 82           | 67           | 79           | 34           | 13           | 17         | 25         | 20         | 13         | <b>410</b>    |
| O&M <sup>1</sup>                   | -            | -            | -            | -            | -            | -            | -          | -          | -          | -          | <b>-</b>      |
| Subtotal                           | 60           | 82           | 67           | 79           | 34           | 13           | 17         | 25         | 20         | 13         | <b>410</b>    |
| <b>Grand Total</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>777</b> | <b>11,553</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: 2008-2017 (in millions of dollars)

| Sector                             | 2008       | 2009       | 2010*         | 2011       | 2012       | 2013       | 2014       | 2015       | 2016       | 2017       | 10-Year       |
|------------------------------------|------------|------------|---------------|------------|------------|------------|------------|------------|------------|------------|---------------|
| <b>Exploration and Production:</b> |            |            |               |            |            |            |            |            |            |            |               |
| Capital                            | 19         | 39         | 13            | 54         | 142        | 99         | 221        | 92         | 62         | 19         | <b>760</b>    |
| O&M <sup>1</sup>                   | 56         | 49         | 12,628        | 58         | 57         | 51         | 78         | 89         | 45         | 36         | <b>13,145</b> |
| Subtotal                           | 75         | 87         | 12,641        | 111        | 199        | 150        | 299        | 181        | 107        | 54         | <b>13,905</b> |
| <b>Transportation</b>              |            |            |               |            |            |            |            |            |            |            |               |
| Capital                            | 13         | 1          | 7             | 11         | 7          | 6          | 5          | 5          | 3          | 2          | <b>62</b>     |
| O&M <sup>1</sup>                   | 29         | 55         | 44            | 152        | 45         | 105        | 49         | 117        | 44         | 47         | <b>687</b>    |
| Subtotal                           | 42         | 56         | 51            | 164        | 53         | 111        | 54         | 123        | 47         | 49         | <b>749</b>    |
| <b>Refining</b>                    |            |            |               |            |            |            |            |            |            |            |               |
| Capital                            | 11         | 25         | 12            | 7          | 12         | 15         | 10         | 10         | 5          | 4          | <b>111</b>    |
| O&M <sup>1</sup>                   | 33         | 152        | 21            | 17         | 17         | 12         | 12         | 9          | 9          | 8          | <b>288</b>    |
| Subtotal                           | 43         | 177        | 32            | 23         | 29         | 28         | 22         | 18         | 14         | 12         | <b>399</b>    |
| <b>Marketing</b>                   |            |            |               |            |            |            |            |            |            |            |               |
| Capital                            | 0          | 0          | 0             | 0          | 0          | 2          | 2          | 1          | 1          | 1          | <b>8</b>      |
| O&M <sup>1</sup>                   | 7          | 2          | 1             | 1          | 1          | 1          | 3          | 2          | 3          | 2          | <b>23</b>     |
| Subtotal                           | 8          | 2          | 2             | 1          | 1          | 3          | 4          | 4          | 3          | 4          | <b>31</b>     |
| <b>Research and Development</b>    |            |            |               |            |            |            |            |            |            |            |               |
| Capital                            | 2          | 6          | 2             | 10         | 4          | 3          | 1          | 1          | 1          | 1          | <b>30</b>     |
| O&M <sup>1</sup>                   | -          | -          | -             | -          | -          | -          | -          | -          | -          | -          | <b>-</b>      |
| Subtotal                           | 2          | 6          | 2             | 10         | 4          | 3          | 1          | 1          | 1          | 1          | <b>30</b>     |
| <b>Grand Total</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>120</b> | <b>15,113</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: 2008-2017**

| Year | Sector   |   |   |  |
|------|--|---|---|--|
|      | <b>Exploration and Production<sup>1</sup></b><br>Upstream Revenues (dollars) | <b>Transportation<sup>2</sup></b><br>Trunkline Miles (barrel miles) | <b>Refining<sup>3</sup></b><br>Refinery Capacity (b/cd) | <b>Marketing<sup>4</sup></b><br>Gasoline Sales Volumes (gallons) |
| 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%  |
| 2017 | 32%  | 63%   | 58%   | 69%  |

<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: 2008-2017** (estimates in millions of dollars)

| Year            | Exploration and Production | Transportation | Refining | Marketing | R&D and Corporate Programs | Total  |
|-----------------|----------------------------|----------------|----------|-----------|----------------------------|--------|
| <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% |
| <b>2017:</b>    |                            |                |          |           |                            |        |
| Estimate        | 7,391                      | 2,234          | 6,057    | 181       | 371                        | 16,234 |
| Margin of error | ± 11.6%                    | ± 9.7%         | ± 8.3%   | ± 14.8%   | ± .0%                      | ± 6.3% |

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.

Table 34

**Estimated U.S. Environmental Expenditures by Medium: 2017** (in millions of dollars)

| Sector                              | Air          | Water        | Wastes       | Other        | Total         |
|-------------------------------------|--------------|--------------|--------------|--------------|---------------|
| <b>Exploration &amp; Production</b> |              |              |              |              |               |
| Capital                             | 599          | 1,093        | 221          | 875          | 2,787         |
| O&M <sup>1</sup>                    | 292          | 1,031        | 1,079        | 2,202        | 4,604         |
| Subtotal                            | 891          | 2,125        | 1,299        | 3,077        | 7,391         |
| <b>Transportation</b>               |              |              |              |              |               |
| Capital                             | 96           | 245          | 2            | 542          | 884           |
| O&M <sup>1</sup>                    | 113          | 630          | 94           | 513          | 1,350         |
| Subtotal                            | 208          | 875          | 96           | 1,055        | 2,234         |
| <b>Refining</b>                     |              |              |              |              |               |
| Capital                             | 1,688        | 305          | 15           | 53           | 2,061         |
| O&M <sup>1</sup>                    | 2,673        | 657          | 461          | 206          | 3,996         |
| Subtotal                            | 4,361        | 962          | 476          | 258          | 6,057         |
| <b>Marketing</b>                    |              |              |              |              |               |
| Capital                             | 6            | 59           | 0            | 13           | 78            |
| O&M <sup>1</sup>                    | 7            | 4            | 3            | 89           | 104           |
| Subtotal                            | 13           | 63           | 3            | 102          | 181           |
| <b>Other</b>                        |              |              |              |              |               |
| R&D                                 | 49           | 34           | 6            | 42           | 130           |
| Corporate Programs                  | 32           | 12           | 3            | 194          | 241           |
| <b>Grand Total</b>                  | <b>5,554</b> | <b>4,070</b> | <b>1,883</b> | <b>4,728</b> | <b>16,234</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.

## 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 2017, the data used to complete the survey represent a large share – from 32 percent to 69 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 \$16.2 billion in 2017 (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 6.3 percent. This means that API estimates with 95-percent certainty that expenditures were between \$15.2 billion and \$17.2 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.



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