



# Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean

*Information of ARPEL  
Member Companies for 2012*





### **ARPEL Environmental Report Nº 34-2013**

### **Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean – Information of ARPEL Member Companies for 2012**

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## 1. Executive Summary

The Environmental Benchmarking Annual Report is a compilation of environmental statistics of ARPEL member companies that has been performed since 2008.

The report analyzes indicators on spills, production water, process effluents, waste disposal and, from the present edition, also on the use of fresh water, given the sensitivity and importance of water management for the sustainability of the industry.

### Scope:

Thirteen companies from thirteen different countries, representing 67% of the refining activity and 50% of the production of liquid hydrocarbons in the region shared their data for the 2012 report.

Business line	Operation (10 <sup>6</sup> Tons of HC)	# facilities
Production (offshore)	221,989	1,332 prod. wells
Production (onshore)	131,378	14,583 prod. wells
Pipelines	13,913,112	48,827 kms of pipelines
Terminals	45,963	105 terminals
Refineries	195,259	20 refineries
Dist / Transp	414,232	NA

### Spills:

In 2012, 204 spills were registered, concentrated mainly in Production, with 129 incidents (113 in onshore production). Anyway, "Pipelines" is the line of business most affected in terms of volume spilled, with 5,089 barrels and representing 56% of the 9,122 barrels registered as released to the environment in 2012.

Regarding the final destination of the spills, there were 171 spills in land (82 %) and 33 in water (18%).

	# spills in land	# spills in water	# total spills	Vol. spilled in land (bbl)	Vol. spilled in water (bbl)	Total vol. spilled (bbl)
<b>Offshore Production</b>		16	16		177	177
Indicators		0.15	0.15		1.70	1.70
<b>Onshore Production</b>	104	9	113	2,364	282	2,646
Indicators	1.66	0.15	1.80	37.75	4.66	43.68
<b>Pipelines</b>	27	1	28	5,086	3	5,089
Indicators	0.28	0.01	0.29	52.19	0.03	52.22
<b>Terminals</b>	3	2	5	24	554	578
Indicators	0.07	0.02	0.09	0.54	12.66	13.20
<b>Dist / Transp</b>	12	1	13	230	70	300
Indicators	0.03	0.00	0.03	0.56	0.17	0.73
<b>Refineries</b>	25	4	29	298	34	333
Indicators	0.12	0.02	0.14	1.49	0.17	1.66



## 2. Introduction and scope of the data reported

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Since 2008, ARPEL compiles environmental information of its member companies with the purpose of allowing the comparison of the environmental performance among companies in the sector in order to achieve a more efficient performance.

Successive benchmarking has enabled to compare the environmental performance of companies with the trends of the industry and other companies in the sector, which is a valuable management tool with the purpose of continuous improvement in environmental performance.

In addition, through its Environment, Health and Safety Committee (CASYSIA), ARPEL promotes the improvement of environmental management through the exchange of experiences with those companies showing the best environmental performance.

Information in this report is presented based on the "country-company" criterion <sup>1</sup> for the following environmental indicators:

- Oil spills in offshore and onshore production, transportation by pipelines, movement of terminals, refineries and distribution and transportation.
- Discharges and re-injection of production water in Exploration and Production activities
- Water and hydrocarbons discharged as process effluents in refineries.
- Disposal of hazardous solid waste in onshore production and refineries
- Fresh water extracted during onshore production and refineries (incorporated as of this Report)

The indicators are classified into 5 lines of business: Production of oil and gas, transportation by pipelines, movement of terminals, distribution/transportation and refining.

The information presented refers to the operations of the companies in Latin America and the Caribbean. The companies reported the data on their environmental performance by consolidating 100% of the operations over which each company has management control, and NOT data on operations that are not managed. The operating boundary is defined as all of those facilities where the company's management has accountability and authority for sustainability (health, safety, environmental, social and/or economic) policies, systems and performance associated with the facility.

All the definitions and criteria used in the calculation of the indicators may be consulted in the "User Manual – ARPEL Database - Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean" (3rd edition, 2013) - available in the web library of ARPEL.

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<sup>1</sup> The company-country criterion implies that if a company operating in more than one country reported information from two different countries, for the purposes of the report this company will be treated as two different companies.



### Participating Companies:

- A total of 13 companies from 13 different countries shared their data for the completion of this report.
- For this report, data were reported on more than 16,000 production wells, 50,000 km of pipelines, 100 terminals and 20 refineries, thus achieving a regional representativeness of approximately 67% of the refining activity and 50% of production of liquid hydrocarbons.<sup>2</sup>
- The following tables show companies that shared their data for the Report and the countries from which the information came.

**Table 1: Companies participating in the 2012 Report**

Ancap	Petrobras	Recope
Ecopetrol	Petroperu	Refidomsa
EP-Petroecuador	Petrotrin	Repsol
Pemex	Pluspetrol	Staatsolie
Petroamazonas EP		

\* A total of 18 "country-companies" shared their data for 2012



Table 2 shows the number of "country-companies" and the consolidated magnitude of the activities reported for each line of business.

**Table 2: Consolidation of data (in 10<sup>3</sup> tons)**

Business line	Operation (10 <sup>6</sup> tons of HC)	# of facilities
Offshore Prod.	221,989	1,332 prod. wells
Onshore Prod.	131,378	14,583 prod. wells
Pipelines	13,913,112	48,827 km of pipelines
Terminals	45,963	105 terminals
Refineries	195,259	20 refineries
Dist./Transp.	414,232	NA

\* The "operation" column refers to the amount of hydrocarbons produced in fields, transported by pipelines, moved in terminals, loaded to refineries or distributed, measured in millions of tons per year. The indicators are not necessarily calculated on the basis of these values, because not all the companies report information on all indicators.

<sup>2</sup> The calculation is based on the BP Annual Statistical Review of World Energy (2013)



### 3. Environmental Indicators

#### 3.1 Oil Spills

Spills are a very important indicator of environmental performance for the oil and natural gas industry because they have a visible impact on the environment. The environmental impact degree is highly dependent on the nature of the spill, where it occurred and how it was managed later.

For the purpose of this Report, spills include all releases from company operated facilities, but DO NOT include the primary and/or secondary containment, or other impermeable surfaces, if they do not reach the environment.

**The indicators presented in this chapter are:**

**Number of spills:** # spills /  $10^6$  tons of oil operated<sup>3</sup>

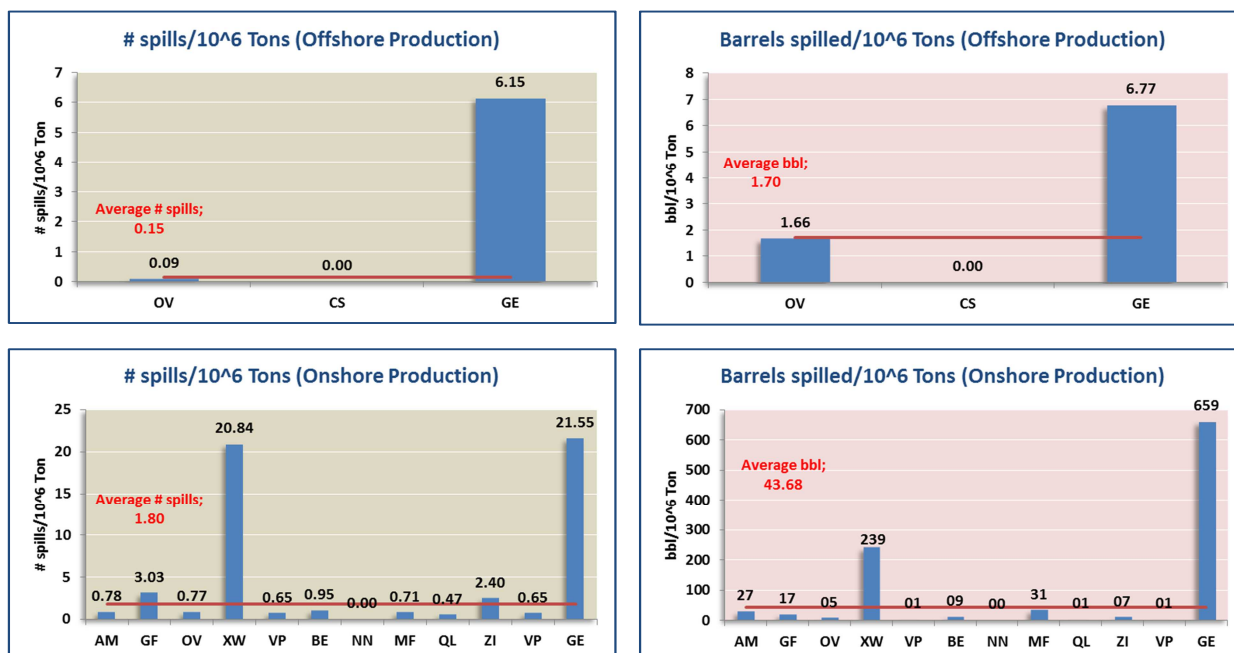
**Spill volume:** Barrels spilled /  $10^6$  tons of oil operated

**Average barrels per spill:** Total barrels spilled / # spills.

Indicators of oil spills are classified according to the final destination of the spill, i.e., if it occurred offshore or onshore.

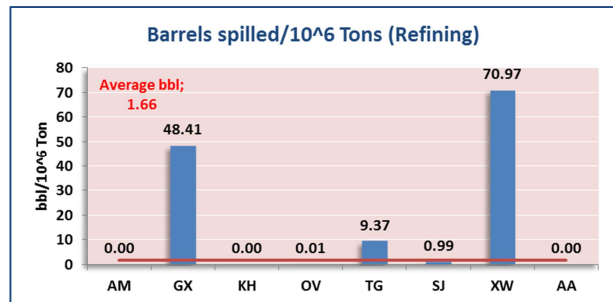
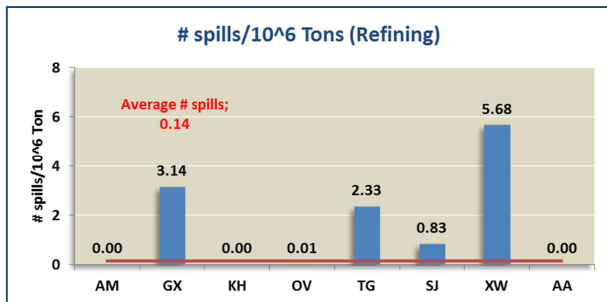
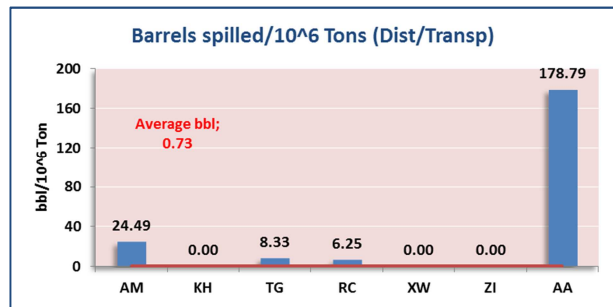
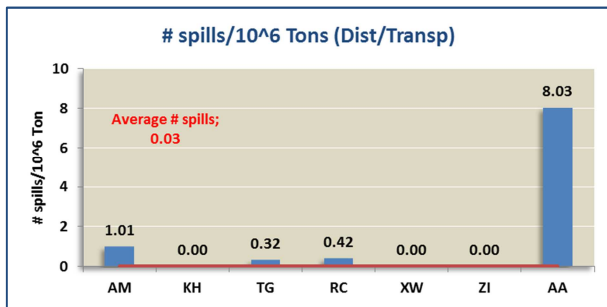
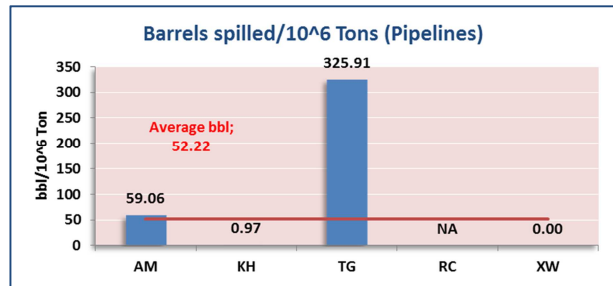
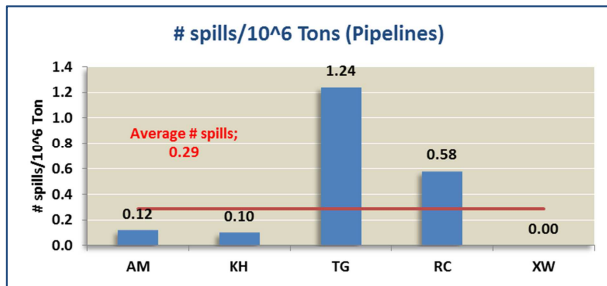
The following graphs show the indicators of number of spills and volume spilled by line of business and by company.

Table 3 shows the detail of the spills classified according to the volume spilled.



<sup>3</sup>"Operated" means produced, transported in pipelines, loaded to refineries, distributed or moved in terminals, according to the corresponding line of business.





❖ It is very difficult to draw general conclusions in terms of the performance of companies with regard to the spills, as there is a great heterogeneity for all lines of business.



**Table 3: Oil Spills**

	# spills in land	# spills in water	# total spills	Vol. spilled in land (bbl)	Vol. spilled in water (bbl)	Total vol. spilled (bbl)
<b>Offshore Production</b>	<b>0</b>	<b>16</b>	<b>16</b>	<b>0</b>	<b>177</b>	<b>177</b>
1-10 bbl		13	13		18	18
10-100 bbl		2	2		45	45
100 bbl+		1	1		114	114
<b>Indicators bbl/spill</b>		<b>0.15</b>	<b>0.15</b>		<b>1.70</b>	<b>1.70</b>
					<b>11.07</b>	<b>11.07</b>
<b>Onshore Production</b>	<b>104</b>	<b>9</b>	<b>113</b>	<b>2,364</b>	<b>282</b>	<b>2,646</b>
1-10 bbl	77	4	81	234	25	259
10-100 bbl	21	4	25	643	132	775
100 bbl+	6	1	7	1,487	125	1,612
<b>Indicators bbl/spill</b>	<b>1.66</b>	<b>0.15</b>	<b>1.80</b>	<b>37.75</b>	<b>4.66</b>	<b>43.68</b>
				<b>22.73</b>	<b>31.35</b>	<b>23.42</b>
<b>Pipelines</b>	<b>27</b>	<b>1</b>	<b>28</b>	<b>5,086</b>	<b>3</b>	<b>5,089</b>
1-10 bbl	9	1	10	32	3	35
10-100 bbl	13	0	13	428	0	428
100 bbl+	5	0	5	4,626	0	4,626
<b>Indicators bbl/spill</b>	<b>0.28</b>	<b>0.01</b>	<b>0.29</b>	<b>52.19</b>	<b>0.03</b>	<b>52.22</b>
				<b>188.37</b>	<b>3.00</b>	<b>181.75</b>
<b>Terminals</b>	<b>3</b>	<b>2</b>	<b>5</b>	<b>24</b>	<b>554</b>	<b>578</b>
1-10 bbl	2	1	3	9	1	10
10-100 bbl	1	0	1	14	0	14
100 bbl+	0	1	1	0	553	553
<b>Indicators bbl/spill</b>	<b>0.07</b>	<b>0.02</b>	<b>0.09</b>	<b>0.54</b>	<b>12.66</b>	<b>13.20</b>
				<b>7.83</b>	<b>277.00</b>	<b>115.50</b>
<b>Dist / Transp</b>	<b>12</b>	<b>1</b>	<b>13</b>	<b>230</b>	<b>70</b>	<b>300</b>
1-10 bbl	4	0	4	10	0	10
10-100 bbl	8	1	9	219	70	289
100 bbl+	0	0	0	0	0	0
<b>Indicators bbl/spill</b>	<b>0.03</b>	<b>0.00</b>	<b>0.03</b>	<b>0.56</b>	<b>0.17</b>	<b>0.73</b>
				<b>19.14</b>	<b>70.00</b>	<b>23.05</b>
<b>Refineries</b>	<b>25</b>	<b>4</b>	<b>29</b>	<b>298</b>	<b>34</b>	<b>333</b>
1-10 bbl	14	2	16	44	3	48
10-100 bbl	11	2	13	254	31	285
100 bbl+	0	0	0	0	0	0
<b>Indicators bbl/spill</b>	<b>0.12</b>	<b>0.02</b>	<b>0.14</b>	<b>1.49</b>	<b>0.17</b>	<b>1.66</b>
				<b>11.94</b>	<b>8.57</b>	<b>11.47</b>

- ❖ The line of business showing more spills was E&P, with 129 spills (113 onshore and 16 offshore).
- ❖ Onshore E&P is also the line of business with the largest number of spills according to the volume traded, with a total of 1.80 spills per million tons produced.
- ❖ In terms of volume spilled, "Pipelines" was the line of business recording the greatest volume, with a total of 5,089 barrels and 52 bbl/million tons transported.
- ❖ The largest spill was also registered in pipelines, where only 1 spill totaled 3,441 bbl.
- ❖ Of the 204 spills reported, 62% were in the range of 1 to 10 bbl; 31% between 10 and 100 bbl and 7% above 100 bbl.
- ❖ The largest spill in water was 553 barrels in the line of business "Terminals".
- ❖ While in "Distribution/Transport" and "Refining" there were no spills of more than 100 bbls, in "Pipelines" 18% of the spills (5 of 28) were in that category.
- ❖ In terms of volume spilled, only 4% came from spills from 1 to 10bbls, 20% from spills of 10 to 100bbls, and 76% from spills of more than 100 bbl.
- ❖ The total volume spilled and registered in this report was of 8,001 bbls in the soil and 1,121 in the water.



### 3.2 Discharges and re-injection of production water

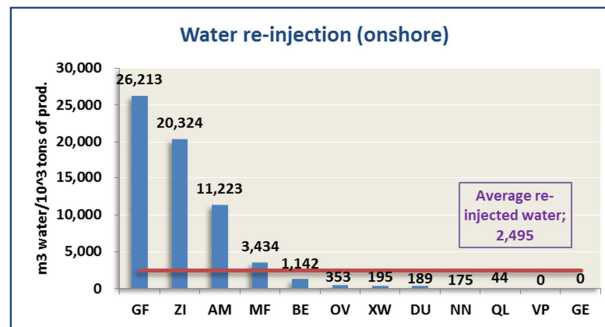
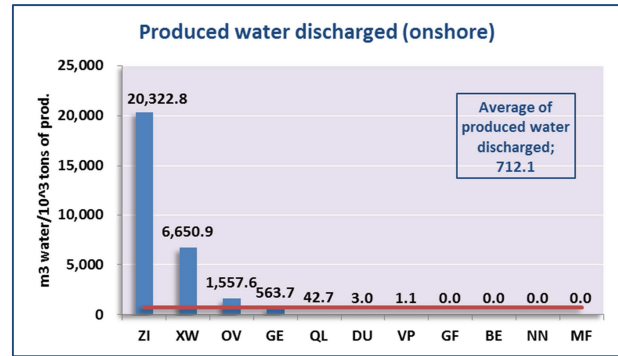
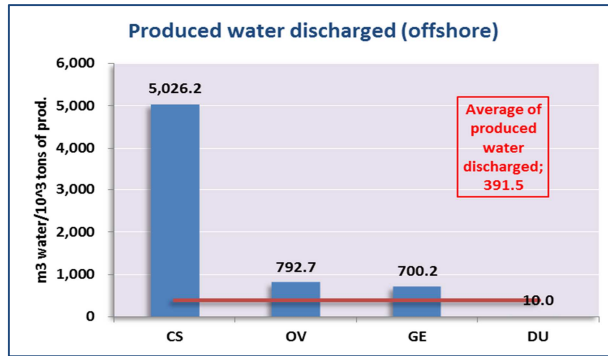
The production of hydrocarbons involves the extraction of water, usually called "production water." Production water may be discharged to the environment as it is extracted, or upon treatment, but whatever the treatment, there is always an amount of hydrocarbon dissolved in the production water. The discharge of production water into the surrounding environment may have a negative impact on it. Production water may also be re-injected into the production well. This is a fundamental practice that shows environmental and operational excellence in the production of hydrocarbons.

The indicators presented in this chapter are<sup>4</sup>:

- The amount of production water discharged (including treated water discharged onshore) for every million tons operated
- The amount of hydrocarbons discharged in production water, and (see units)
- The amount of water re-injected as a disposal management method.

		Indicators		
Company		Produced water discharged (m3 water/10 <sup>3</sup> ton HC prod)	HC discharged in water (t HC/10 <sup>6</sup> Ton HC prod)	Re-injection of water (m3 water/10 <sup>3</sup> ton HC prod)
Offshore	OV	792.7	8.0	NA
	CS	5,026.2	NA	0.0
	DU	10.0	2.9	25.4
	GE	700.2	NA	NA
	<b>Average</b>	<b>391.5</b>	<b>5.28</b>	<b>25.2</b>
Onshore	AM	NA	NA	11,223.3
	GF	0.0	0.0	26,212.9
	OV	1,557.6	15.7	353.0
	XW	6,650.9	69.8	195.1
	BE	0.0	0.0	1,142.2
	NN	0.0	0.0	175.4
	MF	0.0	0.0	3,434.5
	QL	42.7	NA	44.3
	ZI	20,322.8	NA	20,324.0
	VP	1.1	NA	0.0
	GE	563.7	0.0	0.0
	DU	3.0	0.0	188.6
	<b>Average</b>	<b>712.1</b>	<b>2.87</b>	<b>2,494.9</b>

<sup>4</sup>When analyzing the information from indicators associated with production water, other aspects not included in this report must be considered. For example: a mature production field may have a large amount of water associated to the production of the field.



- ❖ As shown in dark green, 4 reporting companies re-inject all production water, this being the most recommended environmental practice.
- ❖ Most companies do not report information regarding the discharge of hydrocarbons in production water.



### 3.3 Controlled discharges of water and hydrocarbons into process effluents

The use of water in the processes of the industry determines the potential environmental impact, both from the consumption of fresh water and from the amount of hydrocarbons dissolved or dispersed that are associated with the effluents.

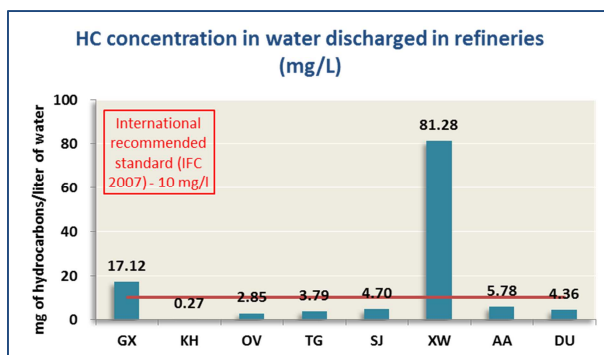
The indicators presented in this chapter are<sup>5</sup>:

**Concentration of hydrocarbons in water discharged as process effluent:** Ratio between the amount of hydrocarbons discharged and the amount of water discharged.

Discharged tons of hydrocarbons per million tons operated.

M<sup>3</sup> of water discharged per million tons operated.

Below is the concentration of hydrocarbons in the water discharged as process effluent in the "Refineries" line of business.



- ❖ In this case, the red line does not represent the regional average but the international standard recommended for the concentration of hydrocarbons in water discharged as process effluent: lower than 10 mg/l.
- ❖ In this Report, two of the eight companies that reported data for this indicator showed values higher than the standard of 10mg/l.

<sup>5</sup>When analyzing the information from indicators associated with water and hydrocarbons in process effluents, it is important to take into account that this Report does not consider the complexity of refineries.



### 3.4 Disposal of hazardous and non-hazardous solid waste

Effective waste management is an indicator of operational efficiency. Some waste, when not properly managed, can have significant environmental, social and economic impacts.

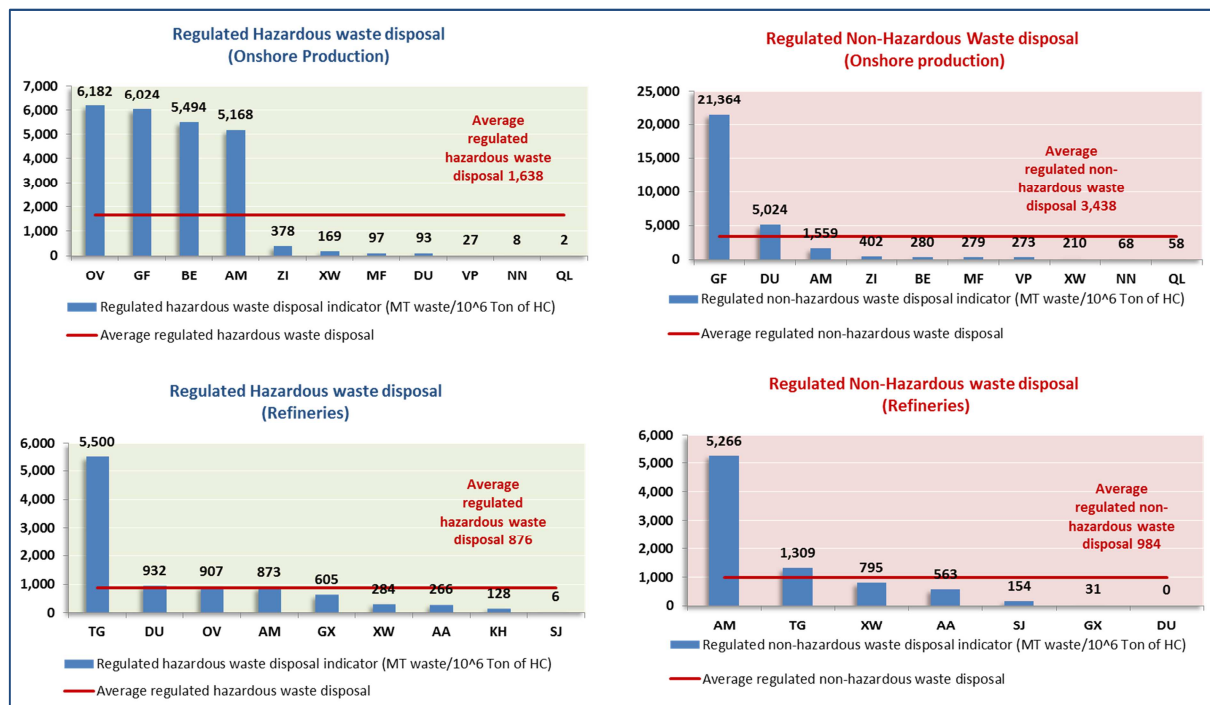
For the purpose of this Report, ‘hazardous waste’ includes all waste that is defined as hazardous, toxic, dangerous, listed, priority, special, or some other similar term as defined by a local regulatory agency or authority. ‘Local’ refers to the point of waste generation. Disposal may thus include: land filling or burning without energy recovery of waste; and/or management of waste other than reuse, recycling, reclamation or other beneficial use.

The following ARE NOT included in the results reported by the companies for this Report:

- In downstream operations, major shutdowns and periodic maintenance activities that can result in short term increases in hazardous waste generated.
- Large, one-time construction projects, remediation activities, and high-volume aqueous waste.
- For upstream operations, drilling operations, large one-time construction projects, remediation activities, and high-volume aqueous waste can result in large variations in hazardous waste generated.

The indicators presented are **tons of hazardous/non-hazardous waste** disposed of per million tons operated in the corresponding line of business.

Below are the waste disposal indicators for the lines of business "Onshore Production" and "Refining."



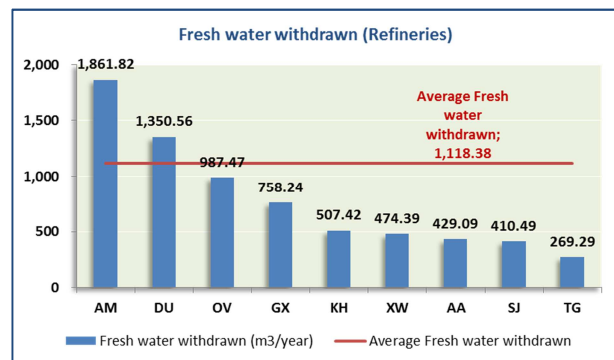
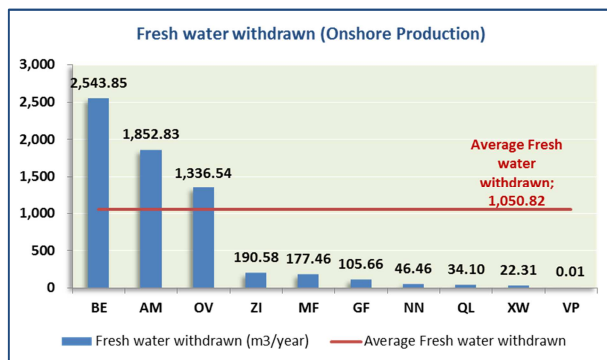


### 3.5 Freshwater

With this Report, information began to be collected on the use of freshwater, given the sensitivity of water management for the industry.

Below are the results for the indicator of fresh water extracted in onshore production and refining operations.

The indicator is calculated as cubic meters of freshwater extracted for each thousand ton of hydrocarbons.



## Regional Association of Oil, Gas and Biofuels Sector Companies in Latin America and the Caribbean

**ARPEL** is a non-profit association gathering oil, gas and biofuels sector companies and institutions in Latin America and the Caribbean. Founded in 1965 as a vehicle of cooperation and reciprocal assistance among sector companies, its main purpose is to actively contribute to industry integration and competitive growth, and to sustainable energy development in the region.

Its membership currently represents over 90% of the upstream and downstream activities in the region and includes national, international and independent operating companies, providers of technology, goods and services for the value chain, and national and international sector institutions.

Since 1976, ARPEL holds Special Consultative Status with the United Nations Economic and Social Council (ECOSOC). In 2006, the association declared its adherence to the UN Global Compact principles.

### Mission

To foster and facilitate sector integration and development, continuous operational improvement and effective management of environmental and social issues, by:

- sharing, enhancing and disseminating best practices;
- carrying out studies that translate in information of value;
- broadening knowledge and helping build required competences;
- promoting networking, interaction and cooperation among members and stakeholders.

### Vision

A growing, competitive and integrated oil and gas industry that achieves excellence in its operations and products, and effectively contributes to a sustainable energy development in Latin America and the Caribbean.

### Value proposition

ARPEL offers a unique mean for networking, sharing knowledge, joining efforts and building synergies in favor of the sector's integration, growth and sustainability. Without any distinction, Members have the opportunity to alternatively lead activities and projects, contribute with their know-how to their development, or learn from the experiences of other members.

ARPEL's value is also reflected in its condition of strategic information center about sector activities in the region and cost-effective vehicle for the development of publications on best practices and benchmarking, as well as on sectoral studies and executive reports aimed at diverse stakeholders. The Association additionally stands out for its regional conferences, forums and seminars of high impact in the industry.

ARPEL is a recognized regional body of representation for the sector that seeks to advocate in favor of the common interests of its Membership and to enhance the industry's public image and reputation.

### Socio-environmental sustainability

Operational excellence  
Sectoral development



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