

Benchmarking on Environmental Performance

in the Oil and Gas Industry in
Latin America and the Caribbean.

Statistics 2015



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BENCHMARKING



Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean – Statistics of ARPEL member companies (2015)

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1. Introduction and scope of submitted data

ARPEL compiles environmental performance information of its member companies operations in Latin America and the Caribbean since 2008, with the purpose of supporting its management in the quest for operational excellence. The Environment, Health and Safety Committee (CASYSIA) promotes the exchange of experiences with those companies that achieve a better environmental performance.

Information in this report is presented by company, broken down by country business units for the following environmental indicators:

- Oil spills in water and land.
- Discharges and re-injection and hydrocarbon concentration in water discharge.
- Water and hydrocarbons discharged as process effluents.
- Generation of hazardous and non-hazardous waste.
- Fresh water extracted and reused.
- GHG emissions

The indicators are classified into the following business lines: 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" (4th edition, 2016) - available in the web library of ARPEL.

Participating Companies:

- A total of 19 companies/country business units from 11 different countries of Latin America and the Caribbean shared their data for the completion of this report.
- For this report, data were reported on more than 30 thousand production wells, 65,000 kms of pipelines, 140 terminals and 36 refineries. Based on production and refining volumes, is estimated a regional representativeness of approximately 54% of oil and gas production activities and 71% of refining activities in Latin America and the Caribbean.¹

¹ The calculation is based on the BP Annual Statistical Review of World Energy 2016.



Table 1: Companies participating in the 2016 Report

The following tables show companies that shared their data for the Report and the countries from which the information came.

ANCAP	EP PETROECUADOR	PETROBRAS	RECOPE	TECPETROL	
AXION ENERGY	EQUION	PETROPERU	REPSOL	YPF	
ECOPETROL	PEMEX	PLUSPETROL	STAATSOLIE	YFPB TRANSPORTE	
ARGENTINA	BOLIVIA	BRAZIL	COLOMBIA	COSTA RICA	ECUADOR
MEXICO	PERU	SURINAME	URUGUAY	VENEZUELA	

Table 2 shows the consolidated magnitude of the activities reported for each line of business.

Table 2: Consolidation of data (in 10³ tons)

Business Line	# companies	Volume (10 ³ Tons of HC)*	# facilities
Offshore Production	2	235.085	+500 prod. wells
Onshore Production	13	160.935	+29.000 prod. wells
Unconventionals Production	2	3.582	+500 prod. wells
Pipelines	8	279.914	65.000 kms of pipelines
Terminals	6	96.152	140 terminals
Refineries	11	202.950	36 refineries
Distribution / Transport	2	66.418	NA

Given that only 2 companies submitted that for offshore production, unconventionals production and distribution/transport, in this report the comparative analysis is done only for onshore production, pipelines, terminals and refineries.

* The "Volume" column refers to the amount of hydrocarbons produced in fields, transported by pipelines, moved in terminals, loaded to refineries or distributed/transported by different system (excluding pipelines). The indicators are not necessarily calculated on the basis of these values, because not all the companies report information on all indicators.

2. Environmental Indicators

2.1 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.



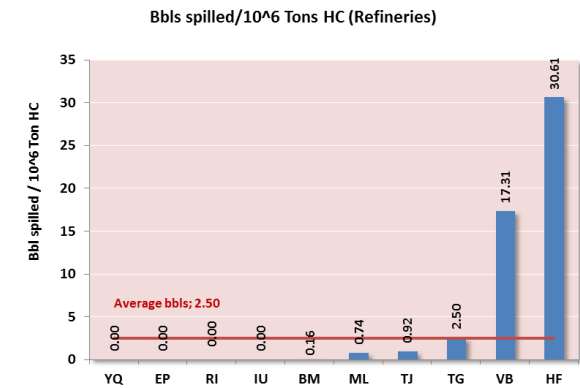
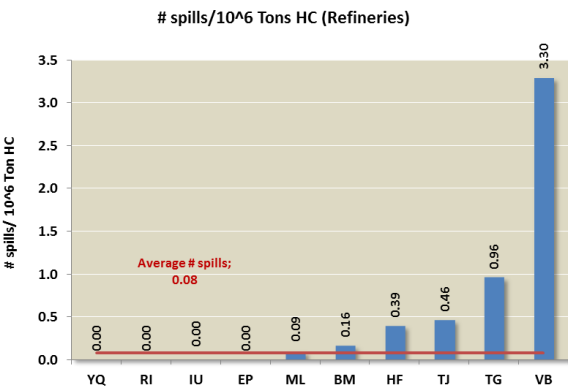
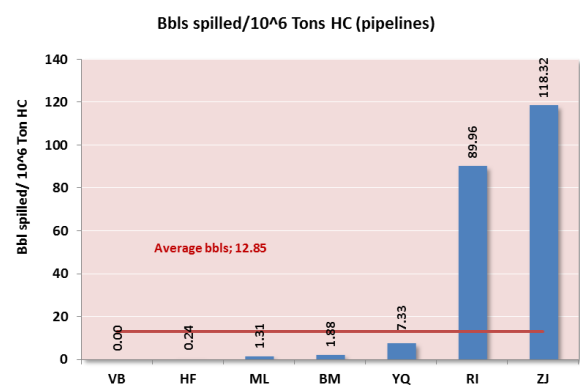
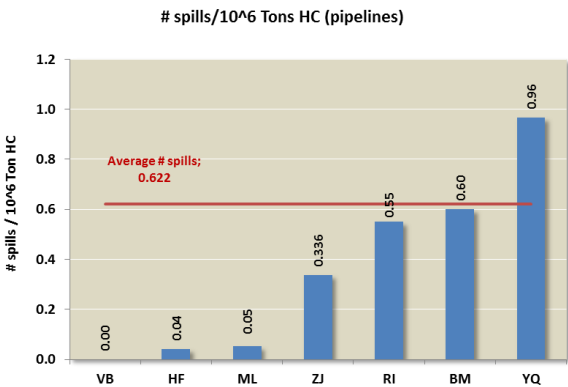
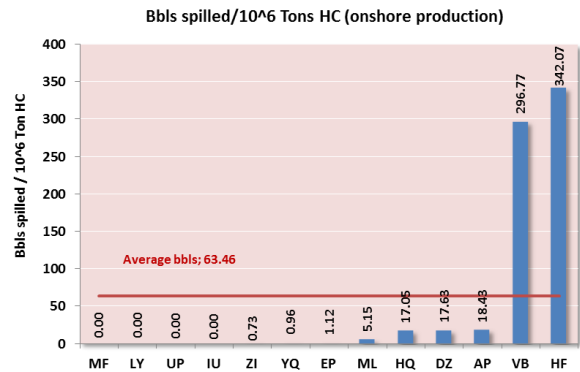
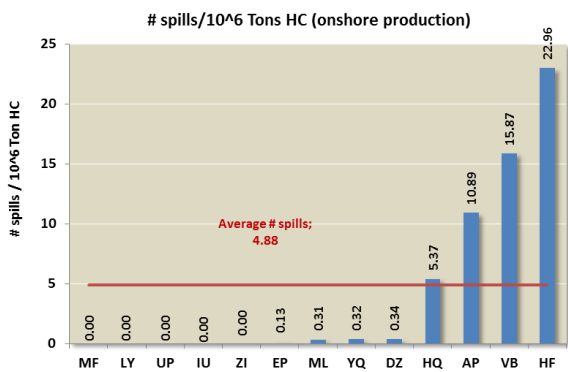
The indicators presented in this chapter are:

Number of spills: # spills / 10⁶ tons of oil operated²

Spill volume: Barrels spilled / 10⁶ tons of oil operated

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

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



²"Operated" means produced, transported in pipelines, loaded to refineries, distributed or moved in terminals, according to the corresponding line of business.

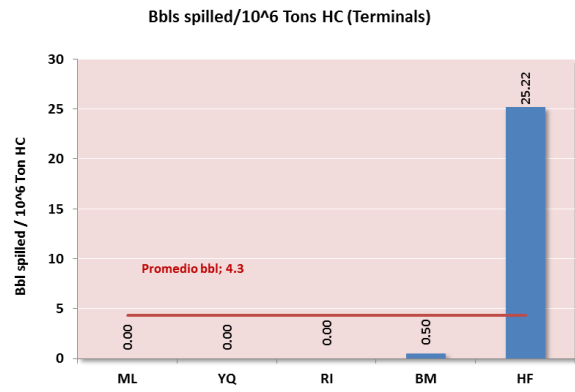
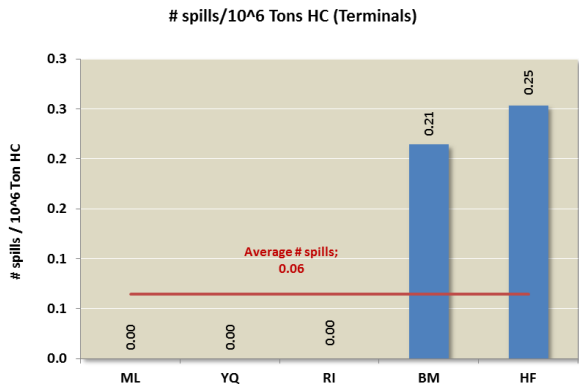




Table 3: Oil Spills

Table 3 details -for each business line- all the reported spills classified according to volume spilled and final destination of the spill, i.e, if it occurred in water or land.

	# spills in land	# spills in water	# total spills	Vol spilled in land (bbl)	Vol spilled in water (bbl)	Total vol spilled (bbl)
Offshore production	0	8	8	0.0	91.8	91.8
1-10		5	5		13	13
10-100		3	3		78	78
+ 100		0	0		0	0
# spills. or bbls. / 10 ⁶ Ton HC		0.03	0.03		0.4	0.4
bbl/spills					11.5	11.5
Onshore production	778	9	787	9,868	345	10,213
1-10	671	7	678	1,871	15	1,886
10-100	97	1	98	1,975	80	2,055
+ 100	10	1	11	6,022	250	6,272
# spills. or bbls. / 10 ⁶ Ton HC	4.83	0.06	4.88	61.32	2.14	63.46
bbl/spills				12.68	38.33	12.98
Pipelines	168	4	172	2,257	1,295	3,552
1-10	162	2	164	145	11	156
10-100	3	0	3	107	0	107
+ 100	3	2	5	2,005	1,284	3,289
# spills. or bbls. / 10 ⁶ Ton HC	1	0.01	0.62	8.17	4.69	12.85
bbl/spills				13.43	323.73	20.65
Terminals	6	0	6	403	0	403
1-10	3	0	3	9	0	9
10-100	1	0	1	20	0	20
+ 100	2	0	2	375	0	375
# spills. or bbls. / 10 ⁶ Ton HC	0.06	0.00	0.06	4.35	0.00	4.35
bbl/spills				67.14	NA	67.14
Dist/Transp	23	0	23	696	0	696
1-10	12	0	12	34	0	34
10-100	9	0	9	303	0	303
+ 100	2	0	2	359	0	359
# spills. or bbls. / 10 ⁶ Ton HC	0.4	0.0	0.4	10.7	0.0	10.7
bbl/spills				30.3	-	30.3
Refining	11	4	15	463	36	499
1-10	9	3	12	31	19	50
10-100	1	1	2	63	17	80
+ 100	1	0	1	369	0	369
# spills. or bbls. / 10 ⁶ Ton HC	0.06	0.02	0.08	2.32	0.18	2.50
bbl/spills				42.08	8.92	33.24

- ❖ A total of 1011 spills were registered, 986 of them (99,9%) had land as final destination and 25 ended in water.
- ❖ In terms of volume spilled, 15,454 bbls were reported. 89% (13,687 bbls) of them ended in land and 11% (1,768 bbls) in water.
- ❖ The business line showing more spills was Production, in which 795 spills were reported, 787 spills of them were in onshore production and 8 in offshore production.
- ❖ Production was also the business line where the highest volume of hydrocarbons were spilled, reaching a total of 10,305 barrels with an average of 12.96 barrels per spill.
- ❖ There were reported 874 spills of 1 to 10 barrels (86%) were registered, 116 spills of 10 to 100 barrels (11%) and 21 spills of more than 100 barrels (2%).
- ❖ 10,662 barrels spilled (69%) corresponds to 100 or more spills, 2,643 (17%) to spills between 10 and 100 barrels, and 2,149 (14%) to spills between 1 and 10 barrels.

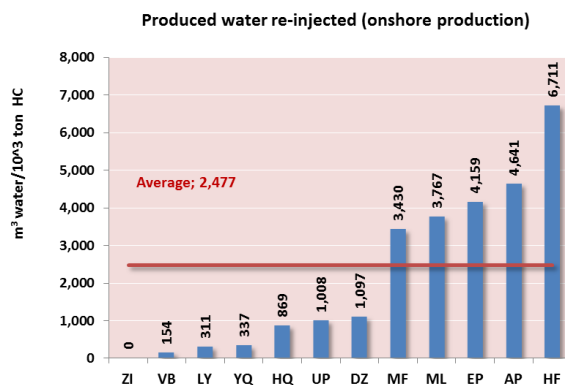
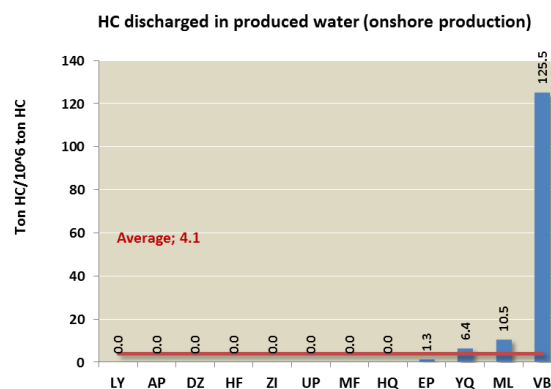
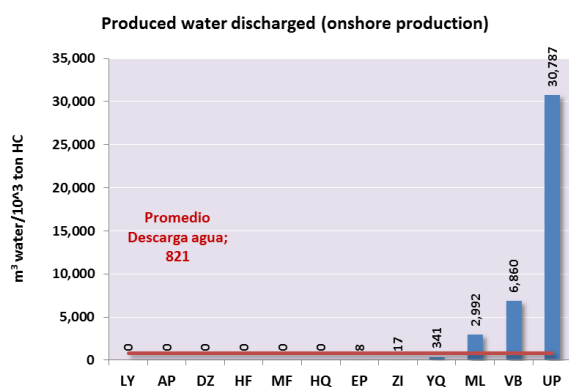


2.2 Discharges and re-injection of production water

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. 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 are³:

- The amount of production water discharged for each thousand tons produced.
- The amount of water re-injected for each thousand tons produced.
- The amount of hydrocarbons discharged associated with water production discharged for each million produced tons.



³When 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 generally increase the amount of water associated to the production of the field.



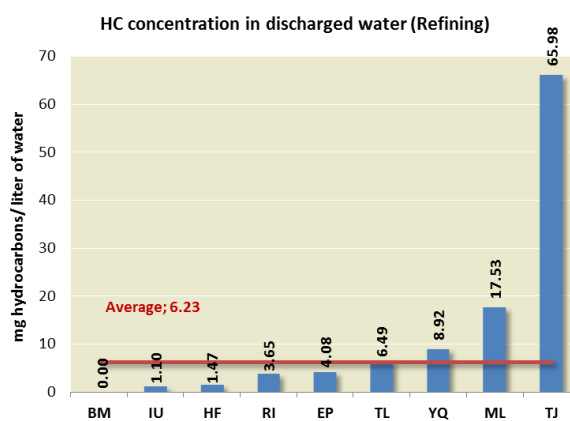
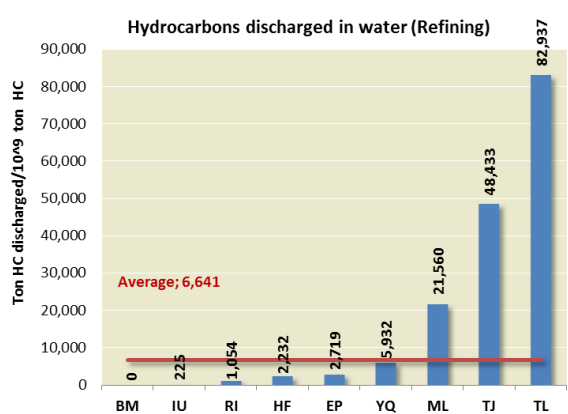
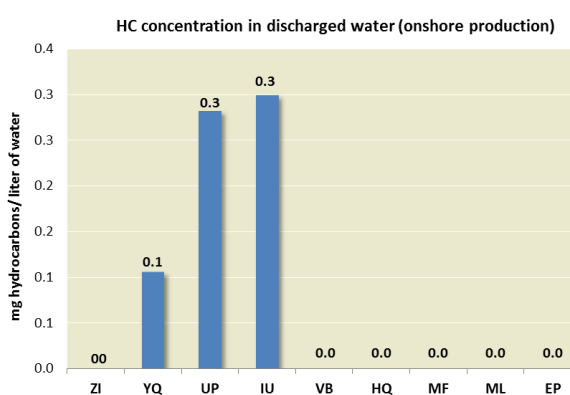
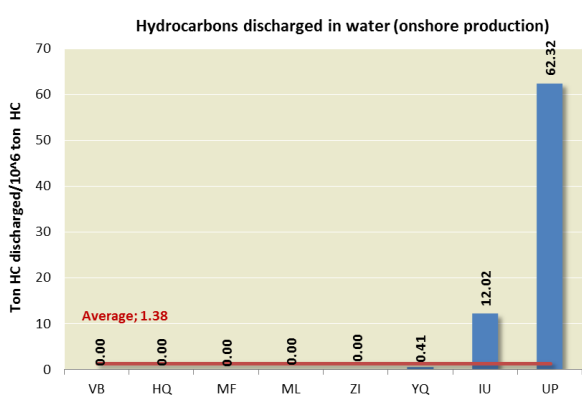
2.3 Controlled discharges of water and hydrocarbons into process effluents

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 are⁴:

- 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.

Below is the concentration of hydrocarbons in the water discharged as process effluent and the hydrocarbons discharged for the different business line.



⁴When 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.



2.4 Generation of hazardous and non-hazardous solid waste

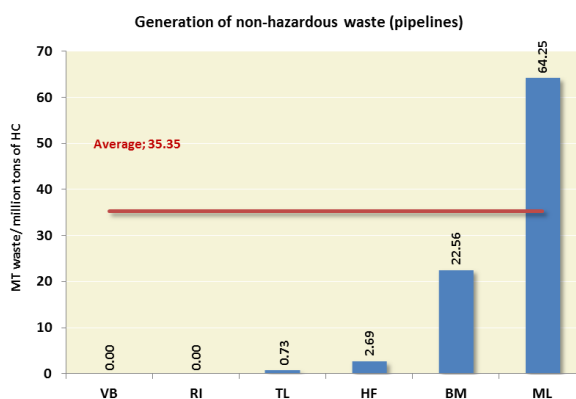
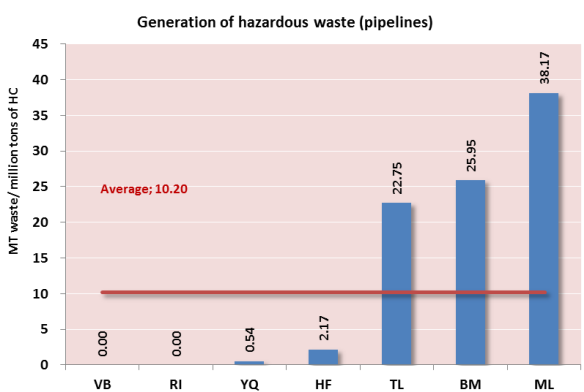
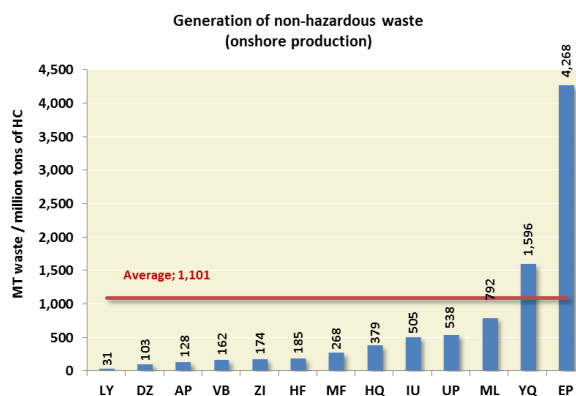
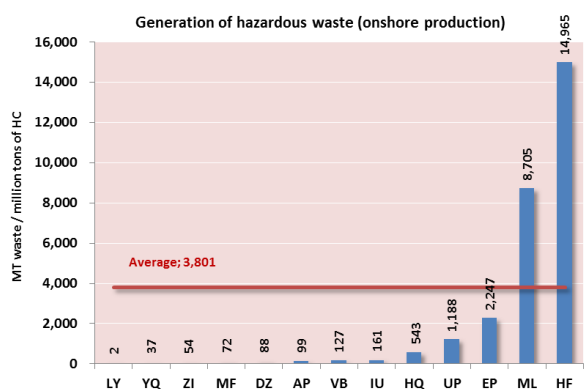
Effective waste management is an indicator of operational efficiency. Some waste, when not properly managed, can have significant environmental, social and economic impacts.

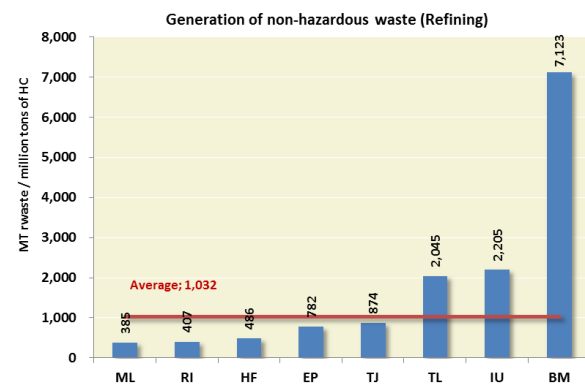
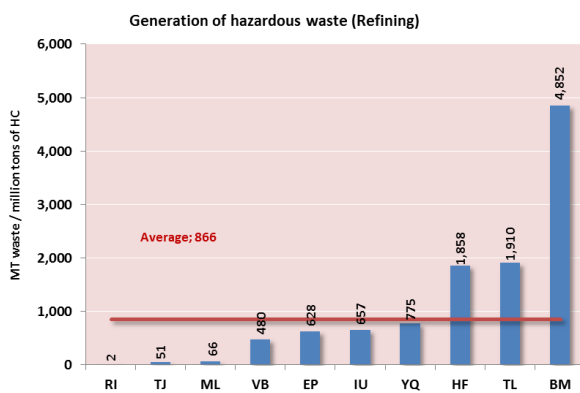
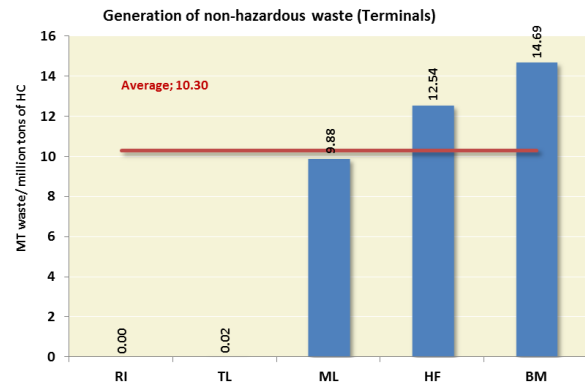
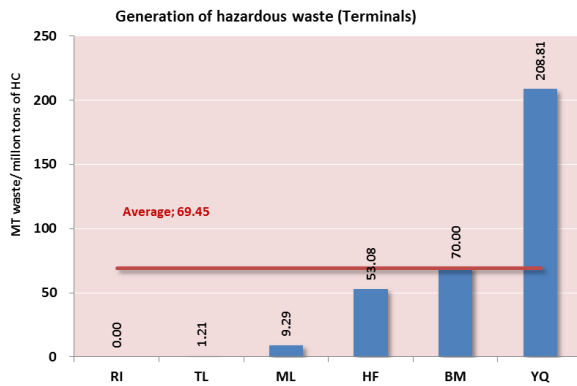
For the purpose of this Report, ‘hazardous waste’ includes all waste that is defined as hazardous, toxic, dangerous, listed, priority, special, or some other similar term as defined by a local regulatory agency or authority. ‘Local’ refers to the point of waste generation.

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** generated per million tons operated in the corresponding line of business.





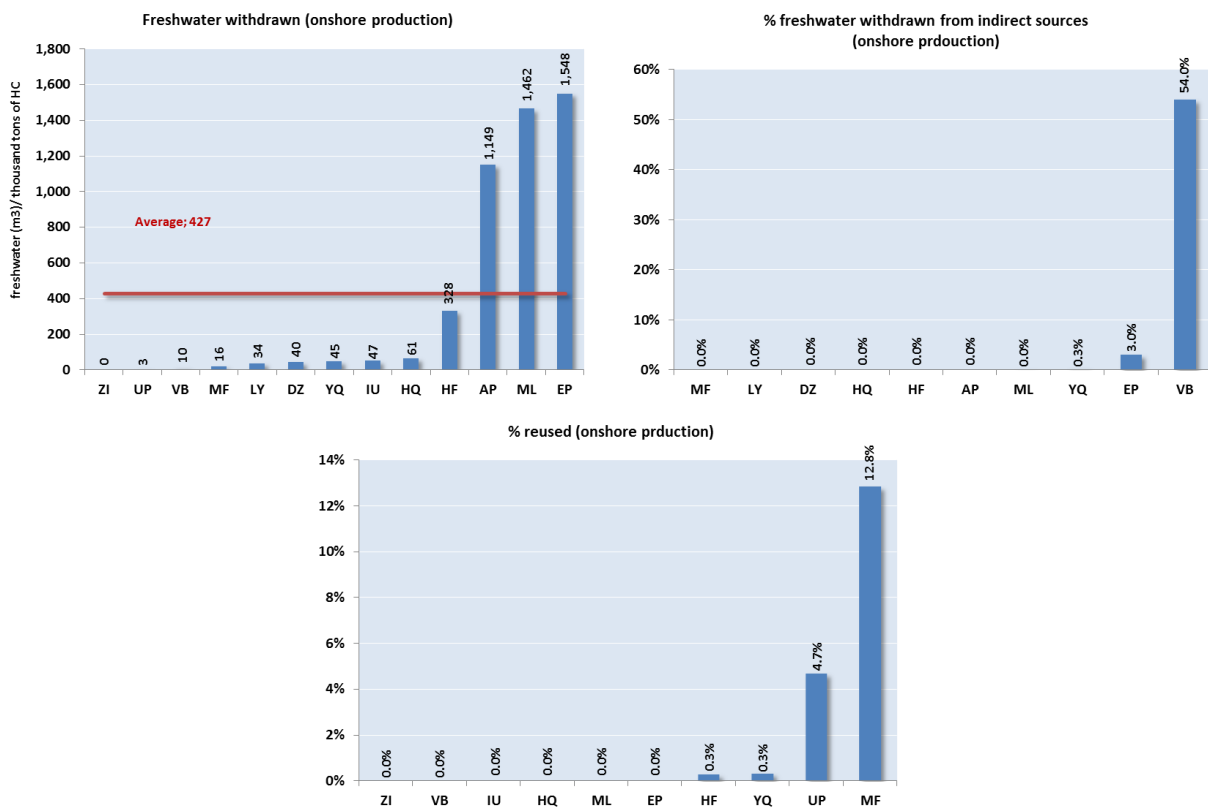


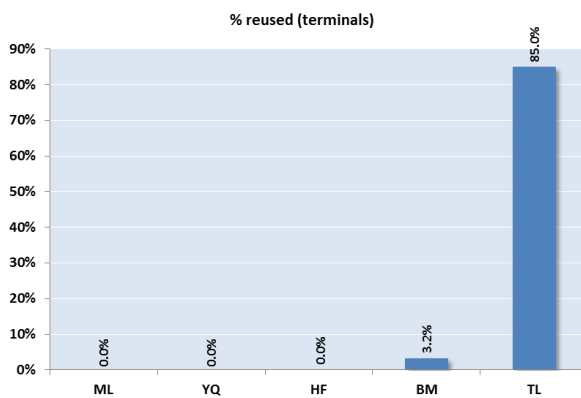
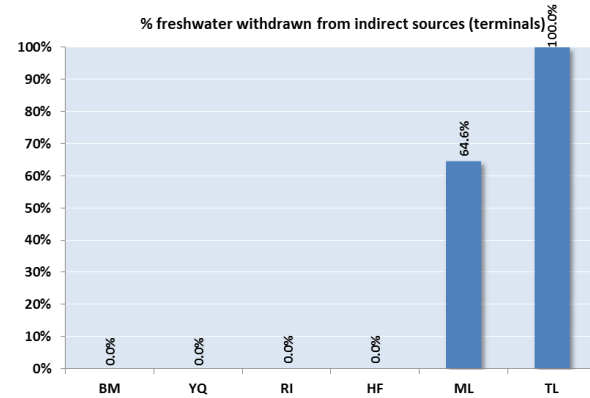
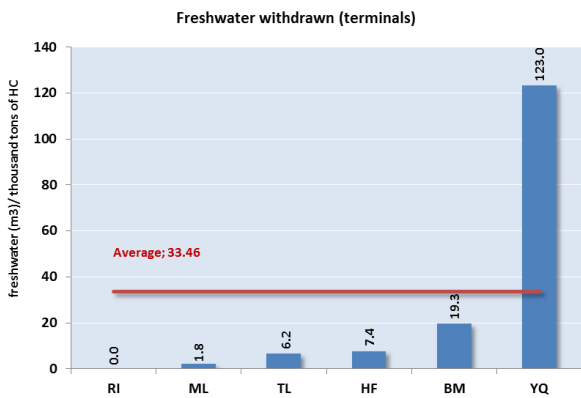
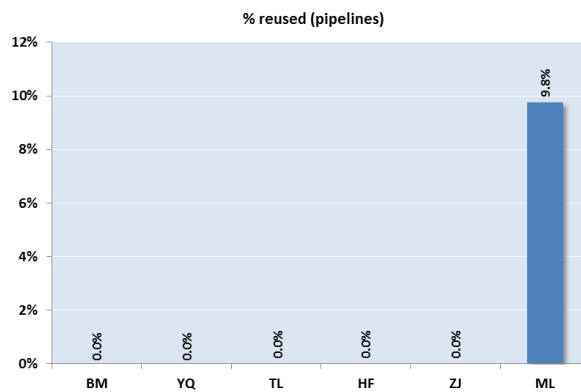
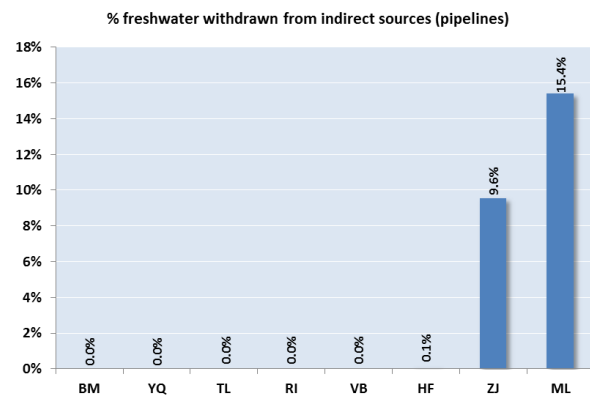
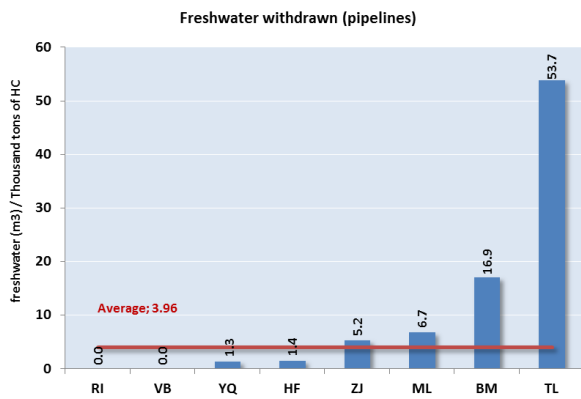
2.5 Freshwater

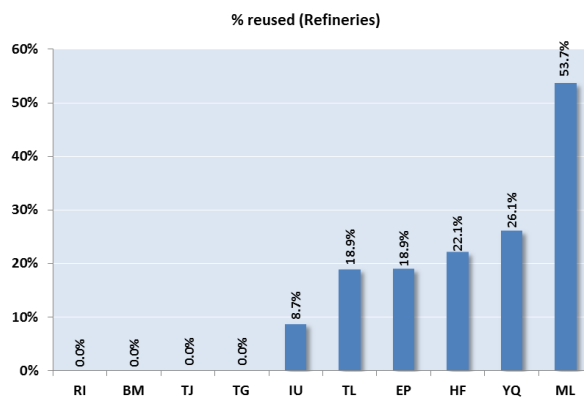
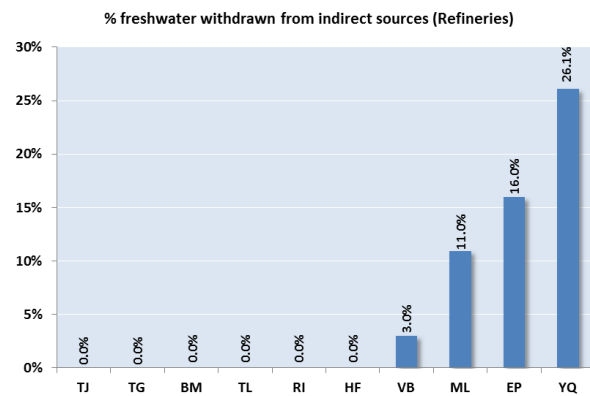
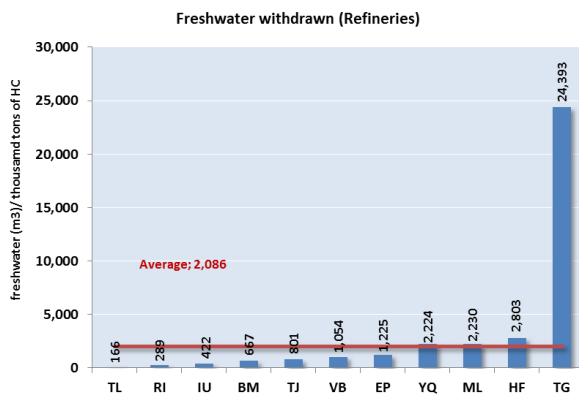
Fresh water is essential for the operations of the industry as well as for human development and agriculture. The industry competes with other uses of fresh water. It is vital to have an adequate management throughout its value chain, both in terms of freshwater withdrawn or consumed and the protection of existing water resources. These factors represent a particularly significant risk in companies whose operations occur where water scarcity is recognized and that companies must manage.

For different business line the following indicators are shown:

- ❖ Extracted Freshwater: is calculated as cubic meters of fresh water extracted per thousand tons of hydrocarbons operated.
- ❖ % of Freshwater withdrawn form indirect sources and % freshwater reused.









2.6 Greenhouse gases (GHG) emissions

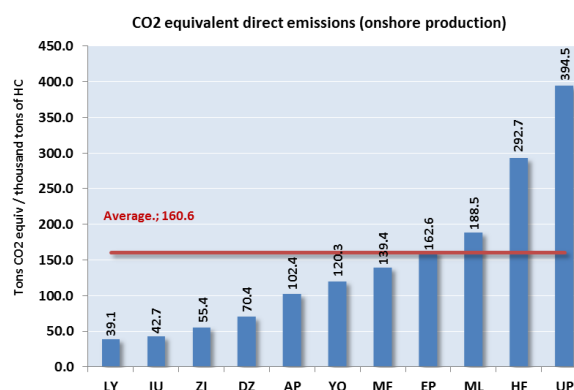
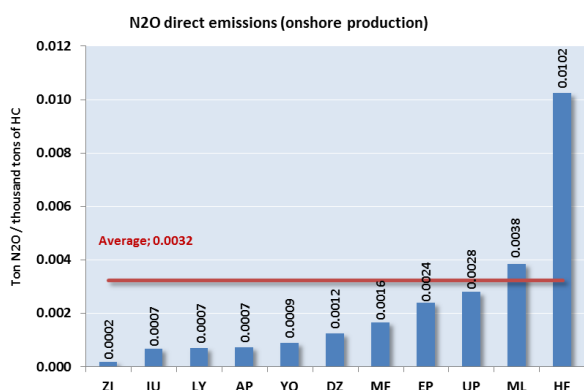
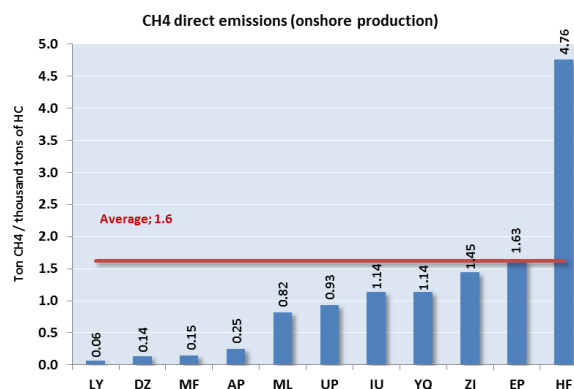
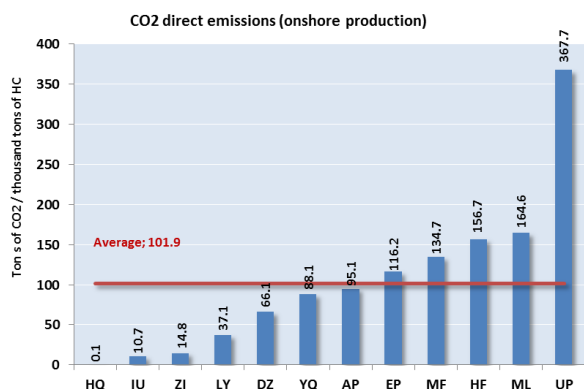
Emissions generated by the oil and gas industry activities contribute with a negative impact to the increase and disequilibrium of the planet’s natural greenhouse effect. This generates an increase in the average temperature of the Earth’s surface, accelerating the climate change. This is the reason why the management of GHG emissions by the oil and gas companies is crucial for the international cooperation in the fight against Climate Change.

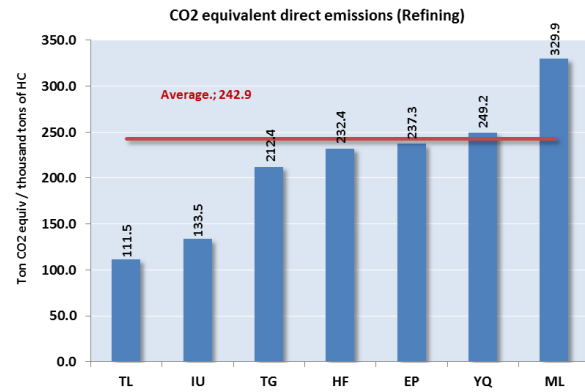
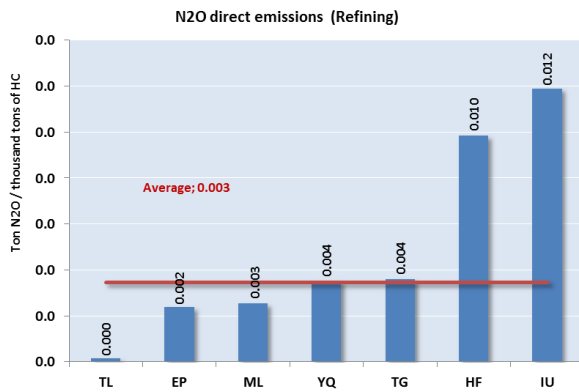
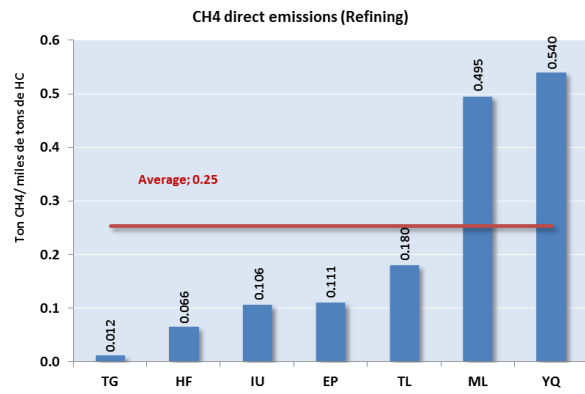
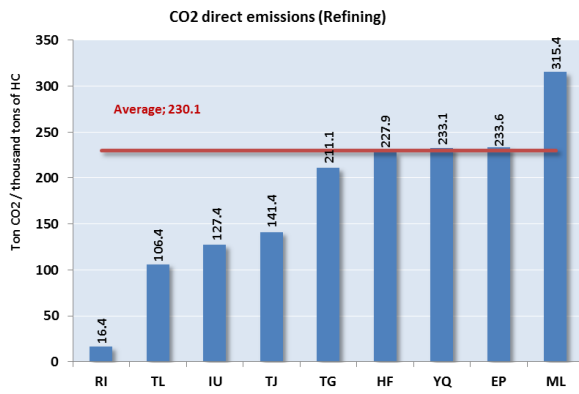
The Intergovernmental Panel on Climate Change (IPCC) considers 7 GHG, for the oil and gas industry operations the emissions of carbon dioxide (CO₂) and methane (CH₄) are generally the most relevant, followed by the nitrous oxide (N₂O) that appears in little amounts as a consequence of fossil fuels combustion. Therefore, this report considers only the three mentioned gases CO₂, CH₄ y N₂O

Below are shown the data for direct emissions for E&P onshore and Refining business lines. The conversion factors of the warming potential utilized are:

1ton CH₄= 28 ton CO₂ equivalent

1ton N₂O= 265 ton CO₂ equivalent







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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.



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