



ASOCIACIÓN REGIONAL DE EMPRESAS DEL SECTOR
PETRÓLEO, GAS Y BIOCMBUSTIBLES
EN LATINOAMÉRICA Y EL CARIBE.

Environmental Performance Benchmarking in the Oil and Gas Industry in Latin America and the Caribbean (2018 data)

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Environmental Performance Benchmarking in the Oil and Gas Industry in Latin America and the Caribbean – Information of ARPEL Member Companies for 2018

Report BE 03-2019 – December 2019 (updated ed. May 2020)

Update vs Dec.19 ed.: One upstream company reviewed its methane emissions, therefore the graphs “CH4 Direct Emissions – Onshore Production” (p.48) and “CO2 Equivalent Direct Emissions – Onshore Production” (p.50) were modified.

Author

- Pablo Ferragut, ARPEL Project Manager – pferragut@arpel.org.uy
- Reviewed by: ARPEL Environmental Benchmarking Project Team

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1. Introduction, scope and methodology

Introduction

The environmental performance benchmarking report is a compilation of environmental statistics of ARPEL member companies which has been performed since 2008, on an annual basis.

- The report analyzes indicators on:
 - Oil spills in water and land
 - Produced water discharges and re-injection
 - Hydrocarbons discharges and concentration in process effluents
 - Hazardous and non-hazardous waste generation
 - Freshwater withdraw and use
 - Direct greenhouse gases (GHG) emissions

Scope

- Fifteen companies or country business units from ten different countries submitted its data for 2018. Each company's country business unit is considered separately.
- Companies and countries:

ANCAP (Uruguay)	PCJ (Jamaica)	STAATSOLIE (Suriname)
COGA (Peru)	PEMEX (Mexico)	TECPETROL (Argentina)
OLDELVAL (Argentina)	PETROPERU (Peru)	YPF (Argentina)
PAN AMERICAN ENERGY (Argentina)	PLUSPETROL (Argentina, Bolivia y Peru)	YPFB Transporte (Bolivia)
	RECOPE (Costa Rica)	

Scope

- The environmental information is reported voluntarily by ARPEL member companies.
- The information submitted in 2018 comes from:
 - 498 offshore production wells
 - +27.000 onshore production wells
 - 1.541 non conventional production wells
 - 60.366 kms of pipelines
 - 123 terminals
 - 15 refineries

Scope

- The table below shows the total volume of hydrocarbons considered in the report

Business Line	Thousand tonnes of hydrocarbons (produced, transported, operated or refined)
Offshore production	100.800
Onshore production	101.687
Non conventional production	11.061
Pipelines	167.457
Terminals	44.399
Refineries	56.915
Distribution / Transport	17.436

2. Oil Spills

Oil Spills - Indicators

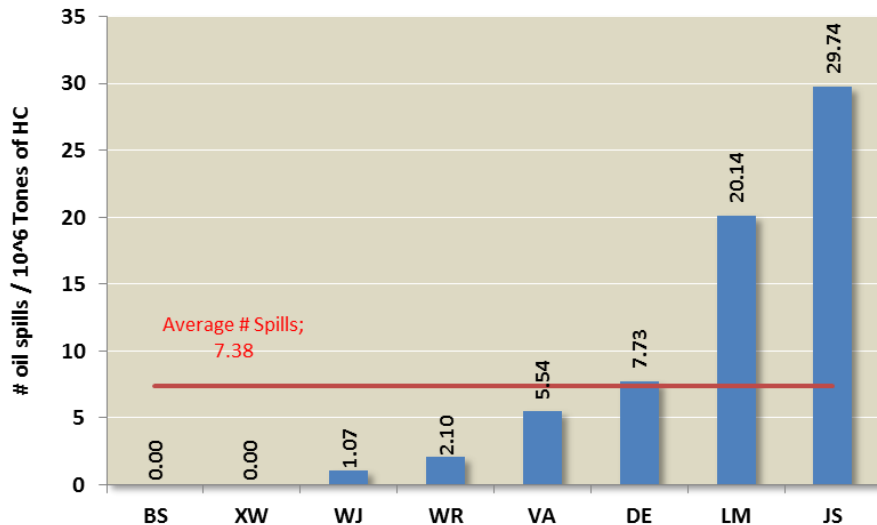
- Indicators
 - Total amount of spills and spilled volume (in barrels) per million hydrocarbon tonnes produced, processed or transported (depending on the business line).
 - Table of spills by business line
- Business Lines
 - Onshore production
 - Pipelines
 - Terminals
 - Refining
 - Distribution/Transport

Oil Spills - Definitions

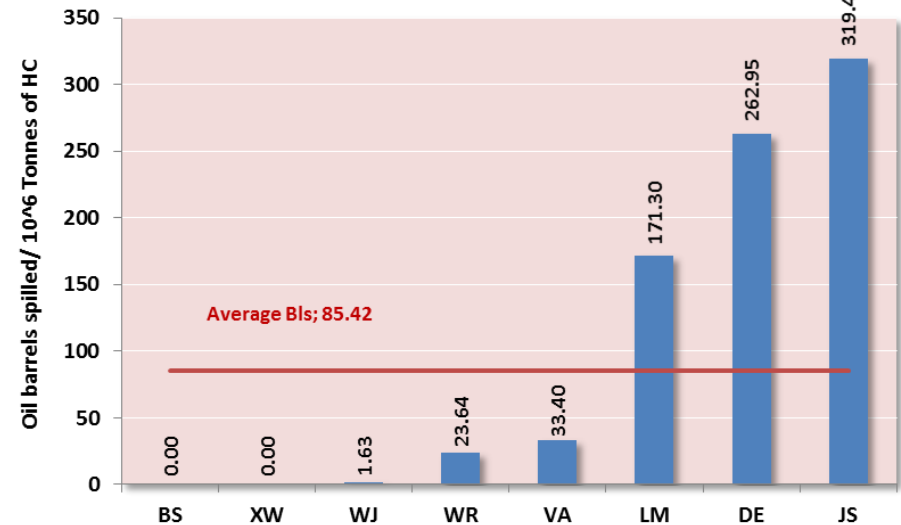
- Oil spills include:
 - Primary or secondary containment into the “environment”, including land (permeable materials like soil, sand, silts, shells, gravel, etc.), ice or water
- Water spills are those that reach surface water (fresh, salt or brackish). Offshore spills are always classified as water spills
- Oil spills do not include:
 - Primary and/or secondary containment or other impermeable surfaces if they do not reach the environment
 - Workover fluids and synthetic, oil or mineral based drilling fluids
 - Chemical spills
 - Spills of produced water or process wastewater
 - Historical or past leakage that reached the natural environment from tanks, pipes or other vessels, but is not associated with a current release

Oil Spills – Onshore Production

oil spills/10⁶ Tonnes of HC (onshore production)

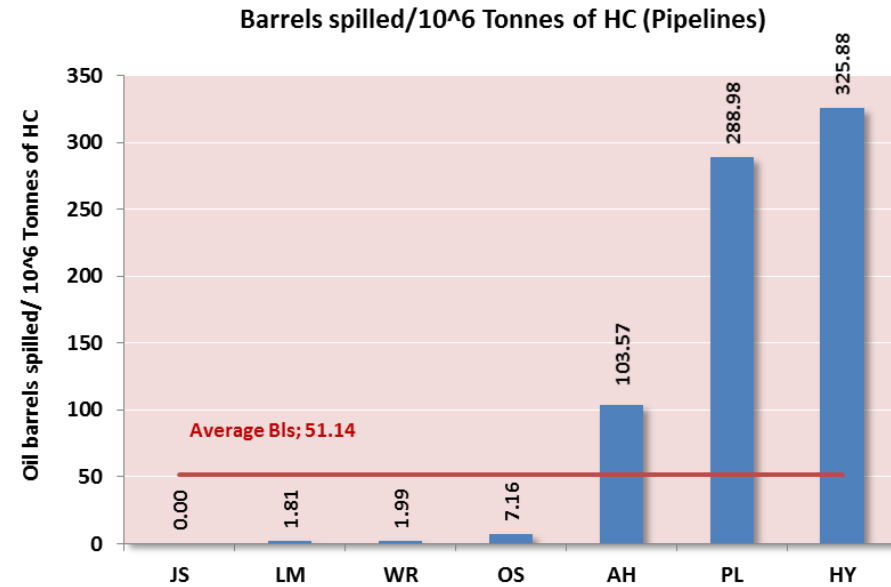
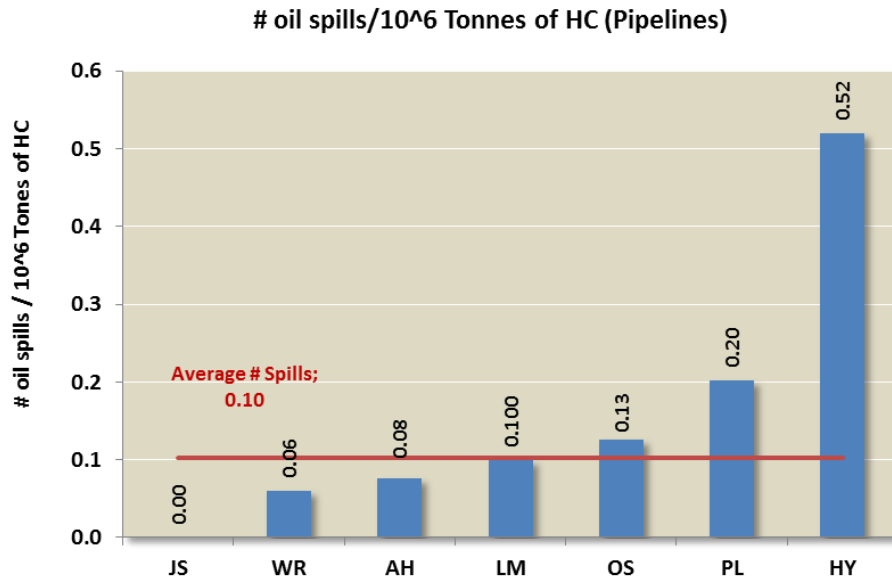


Barrels spilled/10⁶ Tonnes of HC (onshore production)



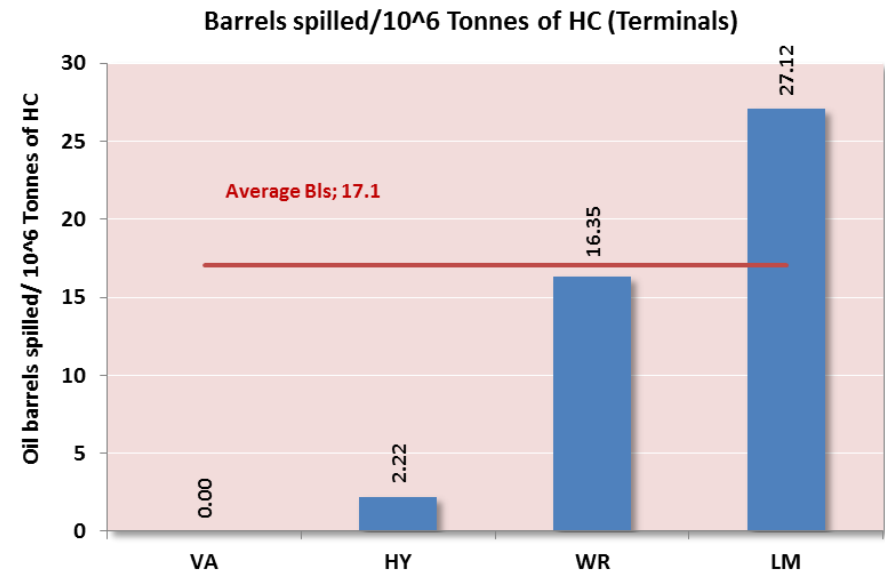
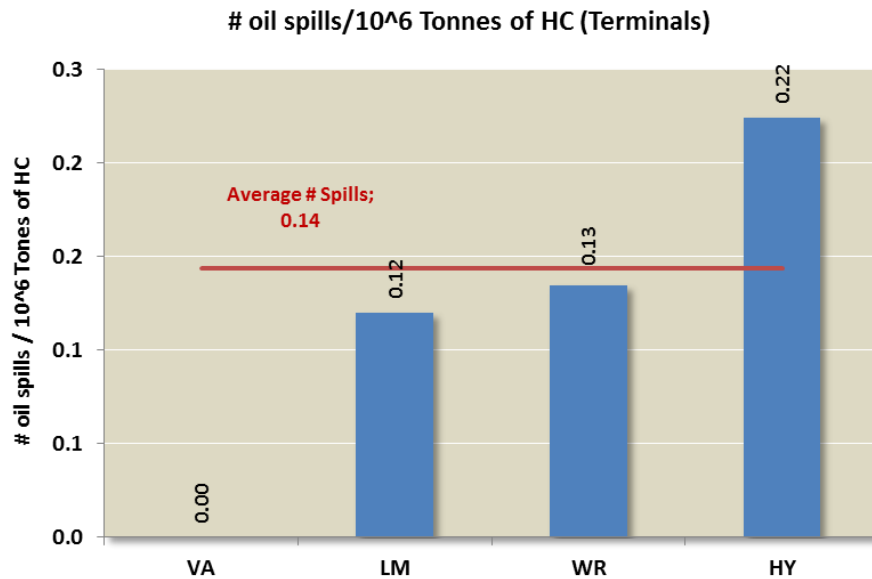
- 8 companies shared information about oil spills in onshore production.
- 2 of them did not report any oil spills.
- The average was 7.38 oil spills and 85.42 barrels spilled per million tonnes of hydrocarbons produced.

Oil Spills - Pipelines



- 7 companies submitted information about oil spills in pipelines
- The average was 0.10 oil spills and 51.14 spilled barrels per million tonnes of hydrocarbons transported.

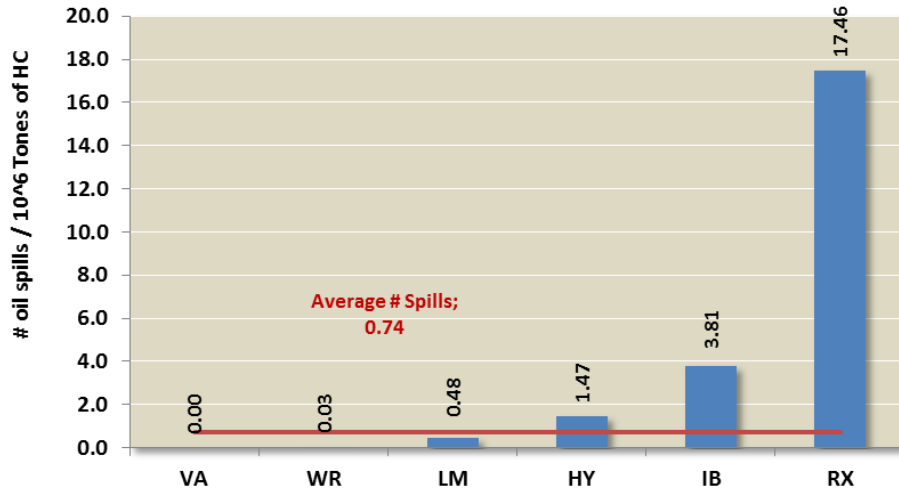
Oil Spills - Terminals



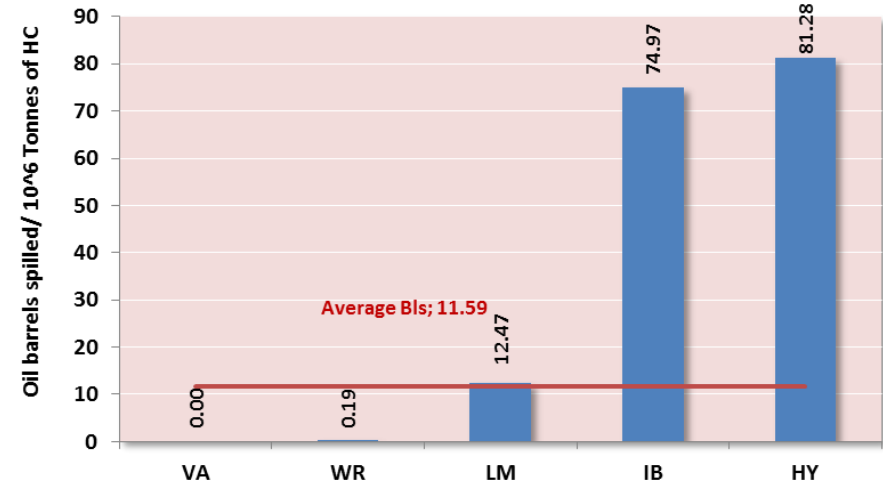
- 4 companies submitted information about oil spills in terminals.
- 1 of them did not report any oil spills.
- The average was 0.14 oil spills and 17.1 spilled barrels per million tonnes of hydrocarbons operated.

Oil Spills - Refining

oil spills/10⁶ Tonnes of HC (Refineries)



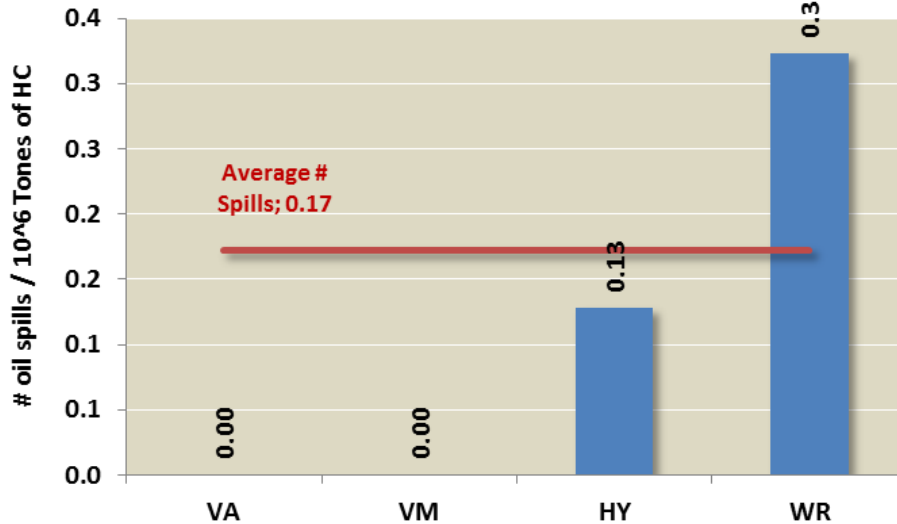
Barrels spilled/10⁶ Tonnes of HC (Refineries)



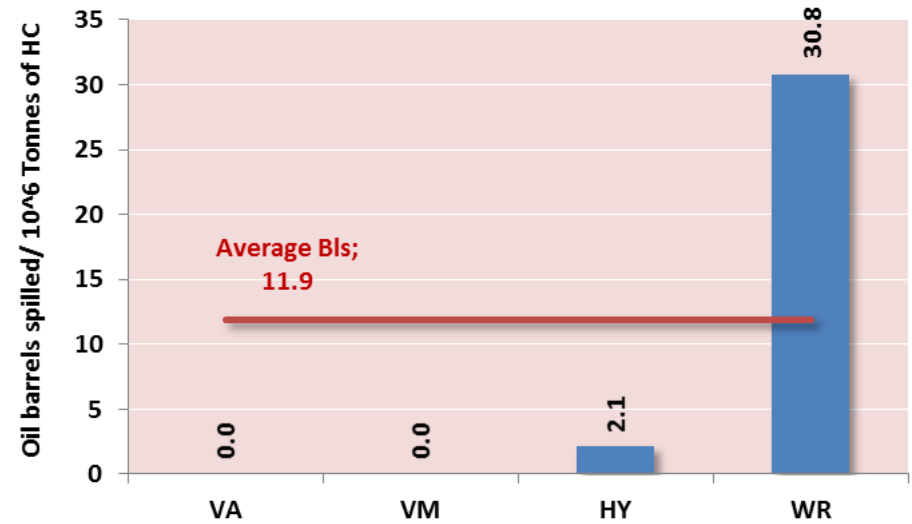
- 6 companies submitted information about oil spills in Refining activities.
- Only 1 company did not report any oil spills.
- The average was 0.74 oil spills and 11.59 spilled barrels per million tonnes of hydrocarbons processed.

Oil Spills - Distribution

oil spills/10⁶ Tonnes of HC (Dist/Transp)



Barrels spilled/10⁶ Tonnes of HC (Dist/Transp)



- 4 companies submitted information about oil spills in distribution activities and only 2 of them reported oil spills.
- The average was 0.17 oil spills and 11.9 spilled barrels per million tonnes of hydrocarbons distributed.

Oil spills by business line



	# oil spills in land	# oil spills in water	# total oil spills	Vol spilled in land (bbl)	Vol spilled in water (bbl)	Total volume spilled (bbl)
Offshore production	0	1	1	0.0	4.4	4.4
1-10		1	1		4	4
10-100		0	0		0	0
+ 100		0	0		0	0
# derr. o bbls. / 10 ⁶ Ton de HC prod		0.01	0.01		0.0	0.1
bbl/derrame					4.4	4.4
Onshore production	740	10	750	8,642	45	8,686
1-10	543	9	552	1,722	25	1,747
10-100	193	1	194	5,354	20	5,374
+ 100	4	0	4	1,566	0	1,566
# derr. o bbls. / 10 ⁶ Ton de HC prod	7.28	0.10	7.38	84.98	0.44	85.42
bbl/derrame				11.68	4.45	11.58
Pipelines	14	3	17	6,855	1,580	8,434
1-10	4	0	4	14	0	14
10-100	4	1	5	124	54	178
+ 100	6	2	8	6,716	1,526	8,242
# derr. o bbls. / 10 ⁶ Ton de HC prod	0.08	0.02	0.10	41.57	9.58	51.14
bbl/derrame				489.62	526.52	496.13
Terminals	6	0	6	714	0	714
1-10	2	0	2	7	0	7
10-100	2	0	2	91	0	91
+ 100	2	0	2	616	0	616
# derr. o bbls. / 10 ⁶ Ton de HC prod	0.14	0.00	0.14	17.09	0.00	17.09
bbl/derrame				118.96	NA	118.96
Dist/Transp	3	0	3	207	0	207
1-10	1	0	1	2	0	2
10-100	1	0	1	17	0	17
+ 100	1	0	1	189	0	189
# derr. o bbls. / 10 ⁶ Ton de HC prod	0.17	0.00	0.17	11.9	0.0	11.9
bbl/derrame				69.1	-	69.1
Refining	22	20	42	609	50	659
1-10	13	15	28	83	0	83
10-100	8	5	13	278	50	328
+ 100	1	0	1	248	0	248
# derr. o bbls. / 10 ⁶ Ton de HC prod	0.39	0.35	0.74	10.71	0.88	11.59
bbl/derrame				27.70	2.50	15.70

Oil Spills by business line

- As it is possible to see in the previous table, onshore production was the business line that showed the highest amount of oil spills and spilled volumen per million tonnes of hydrocarbons operated.
- 833 oil spills and 18.929 spilled barrels were reported.
- 96% of the oil spills were in land and only 4% of them reached surface water.
- Regarding the spilled volumen, 91% was spilled in land and 9% in water.

3. Produced Water

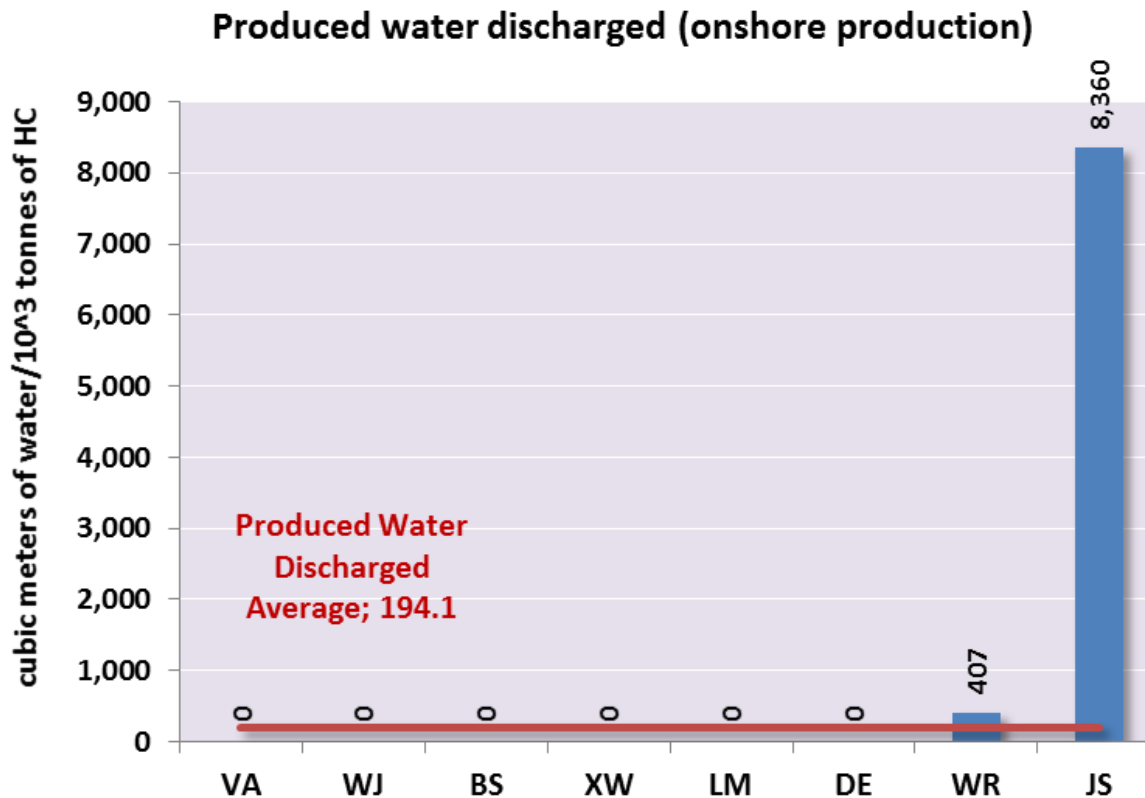
Produced Water – Indicators

- Indicators
 - Produced water discharged
 - Hydrocarbons discharged in produced water
 - Produced water re-injection
- Business Lines
 - Onshore production

Produced Water - Definitions

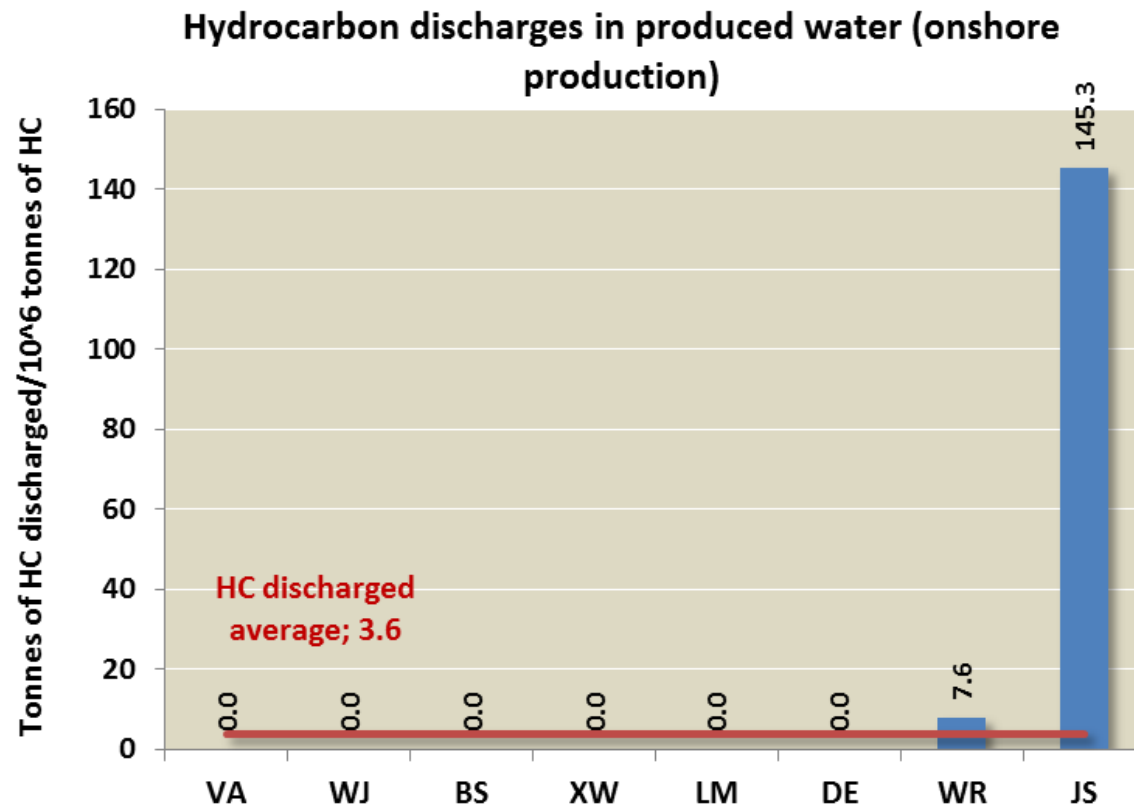
- “Produced water discharges” is the amount of produced water discharged to a water environment (both inland waterways and to the sea), including inland discharges to drainage structures that connect to waterways, as well as produced water that is treated and discharged on land.
- “Produced Water Re-injection” refers to the amount of produced water re-injected as a disposal management method, including both water disposed into injection wells, and water re-injected for secondary recovery.
- These indicators include:
 - the quantity of produced water discharged
 - the quantity of produced water that is treated and discharged on land
 - the quantity of hydrocarbon discharged to water through produced water discharges
 - the quantity of water re-injected as a disposal management method
- These indicators do NOT include:
 - Spills, upsets or accidental discharges (included in chapter 5.1)
 - Spills of oil-based drilling fluids and cuttings
 - Spills of drilling and production chemicals
 - Quantities discharged to third-party treatment facilities
 - Discharges of drilling fluids or drilling mud

Produced Water Discharges – Onshore Production

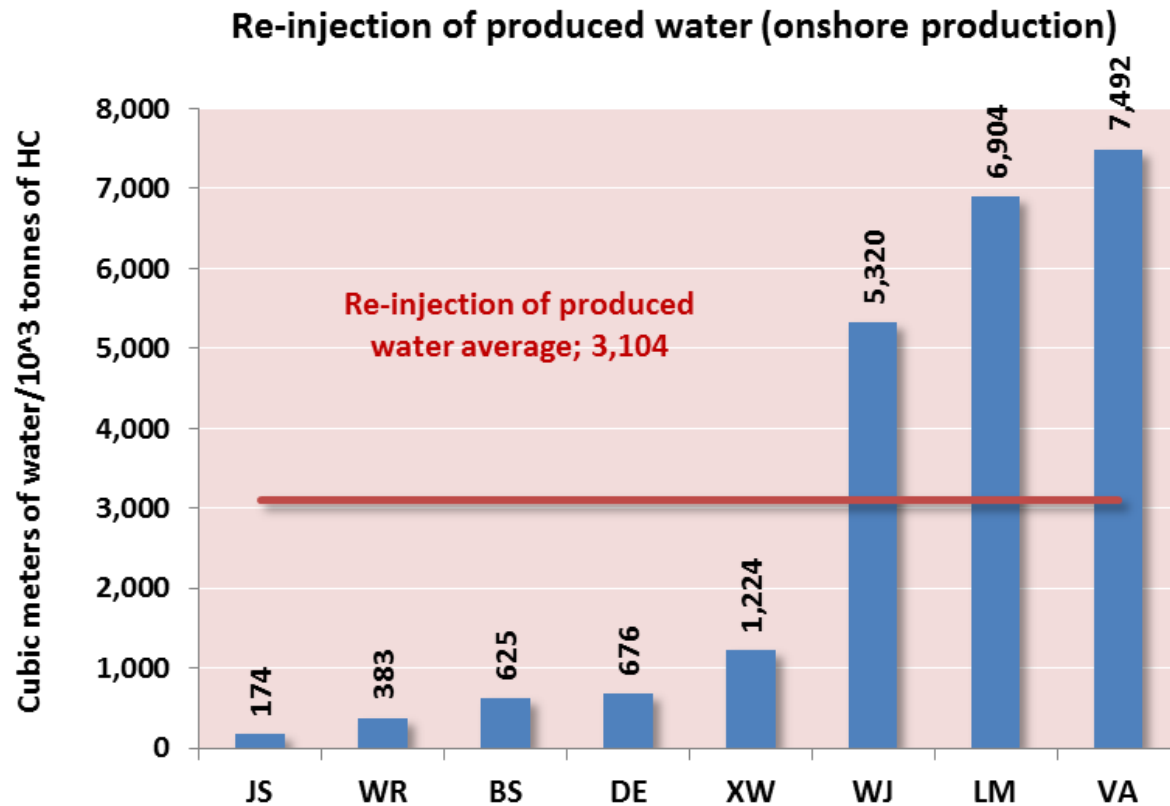


- 8 companies submitted information about produced water management.
- 6 of them re-inject into the formation all the produced water.

Hydrocarbon Discharges in Produced Water – Onshore Production



Produced Water Re-injection – Onshore Production



4. Process Effluents

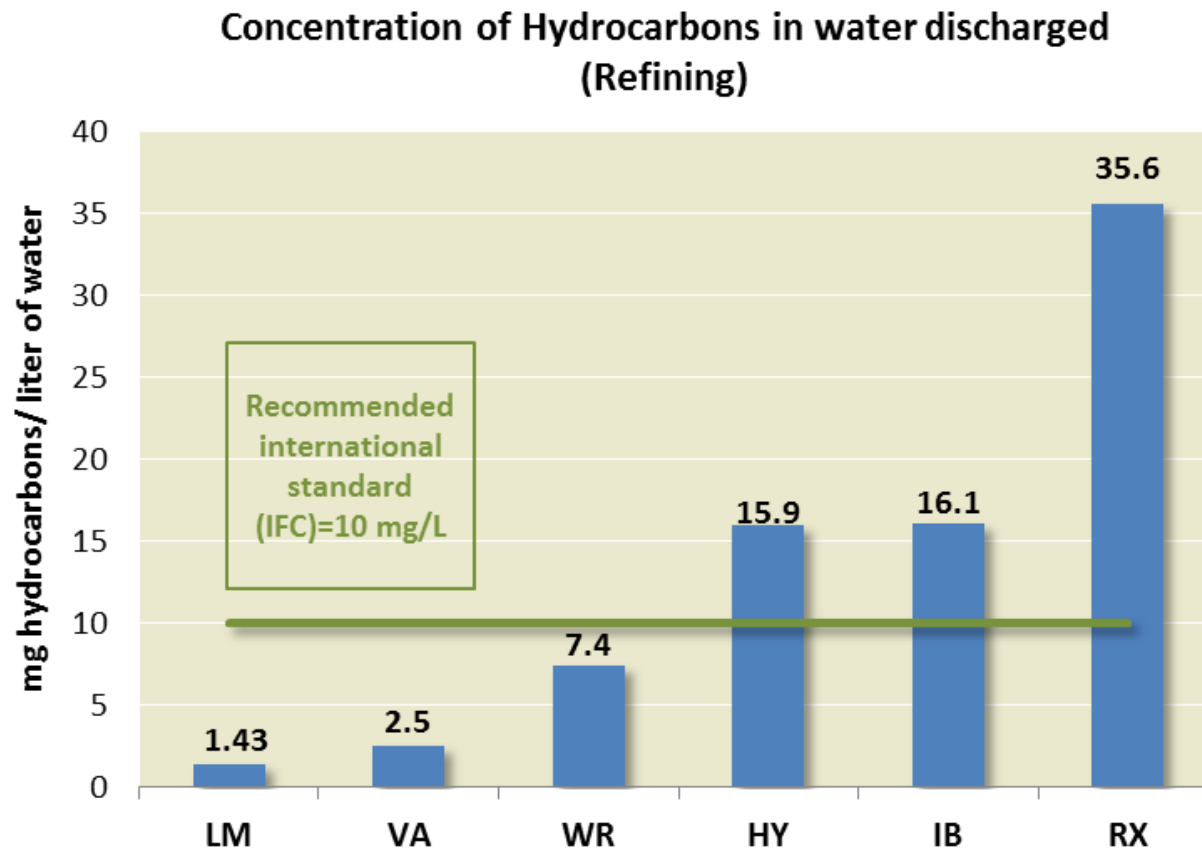
Process Effluents - Indicators

- Indicators
 - Concentration of hydrocarbons in water discharged as an effluent of the production process
- Business Lines
 - Onshore production
 - Pipelines
 - Terminals
 - Refining

Process Effluents - Definitions

- These indicators include:
 - The quantity of hydrocarbons contained in discharges of process effluents from facilities. Inland discharges to drainage structures that connect to waterways are considered.
- These indicators do NOT include:
 - Oil spills or accidental discharges
 - Spills of drill cuts or hydrocarbon-based drilling fluids
 - Spills of chemical products coming from production and drilling activities
 - Amounts discharged to third parties treatment facilities
 - Discharges of drilling fluids and mud
 - For the Production function, produced water discharges should NOT be included because they are already considered on section 3.

Hydrocarbons Concentration in Process Effluent Water – Onshore Production



5. Waste Generation

Waste Generation - Indicators

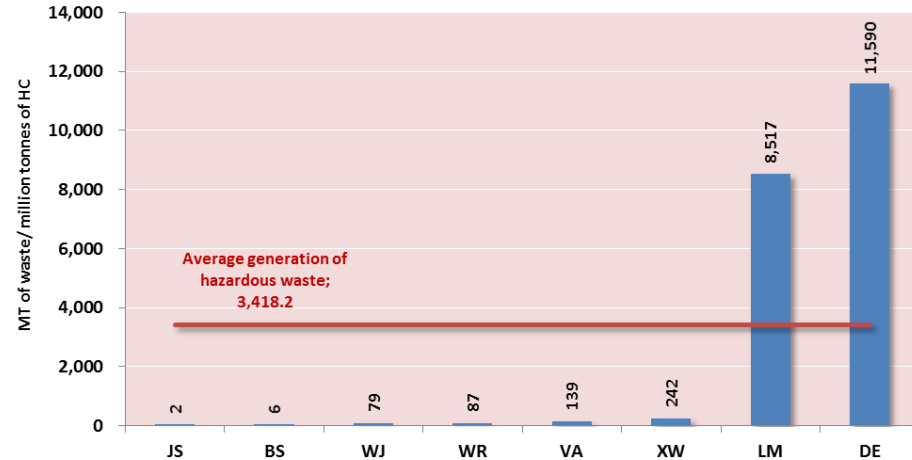
- Indicators
 - Generation of hazardous waste
 - Generation of non-hazardous waste
- Business lines
 - Onshore production
 - Pipelines
 - Terminals
 - Refining

Waste Generation - Definitions

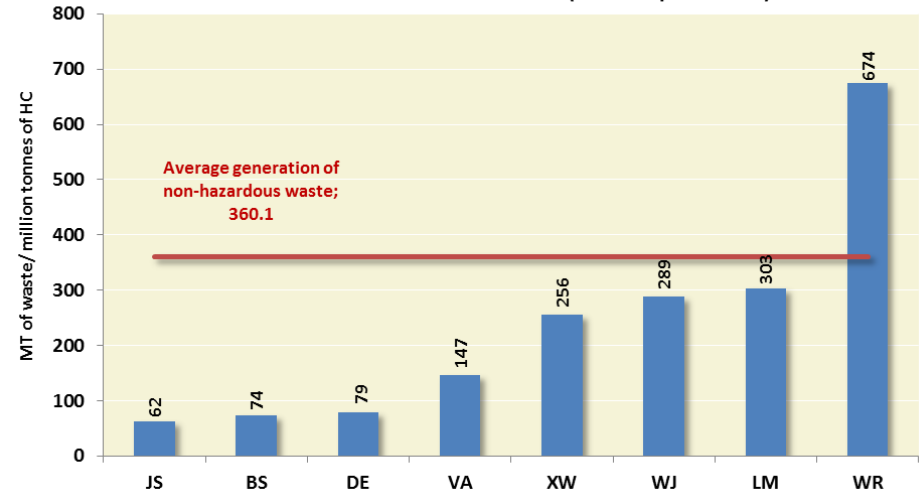
- Hazardous waste includes all waste that is defined as hazardous, toxic, dangerous, listed, priority, special, or some other similar term as defined by an appropriate local regulatory agency or authority. This metric includes both on-site and off-site disposal.
- Non-hazardous waste includes industrial wastes resulting from company operations that are not designated or listed as 'hazardous' by the appropriate local regulatory agency. 'Local' refers to the point of waste generation. This category consists of materials disposed of both on-site and off-site, including trash and other office, commercial or packaging related wastes.
- Hazardous waste do not include:
 - Hazardous wastes treated on-site and rendered non-hazardous
 - Non-hazardous waste (listed in the next section)
 - Hazardous wastes that by legitimate reuse, reclamation, or recycling cease to be regulated as hazardous wastes
- Disposal is considered any waste management option classified as 'disposal' by the appropriate local regulating authority. This could include: land filling or burning without energy recovery of waste and/or management of waste other than reuse, recycling, reclamation or other beneficial use.
- **Note:** The objective is to measure the waste generation linked with the normal production, transport and refining operations, etc. Those activities that may generate short term increases in the waste generation such as refinery maintenance, large remediation activities, construction projects, etc. should not be included in the report as they may distort the results.

Waste Generation – Onshore Production

Generation of Hazardous Waste (onshore production)



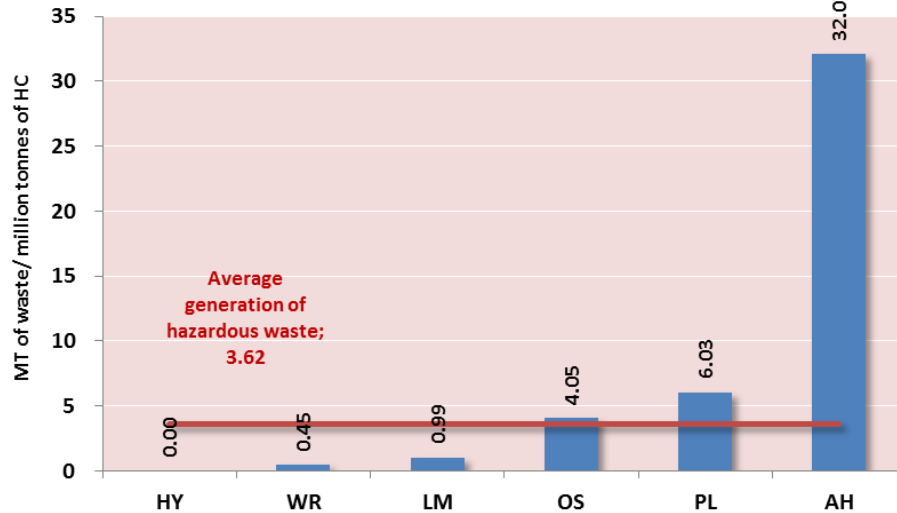
Generation of non-hazardous waste (onshore production)



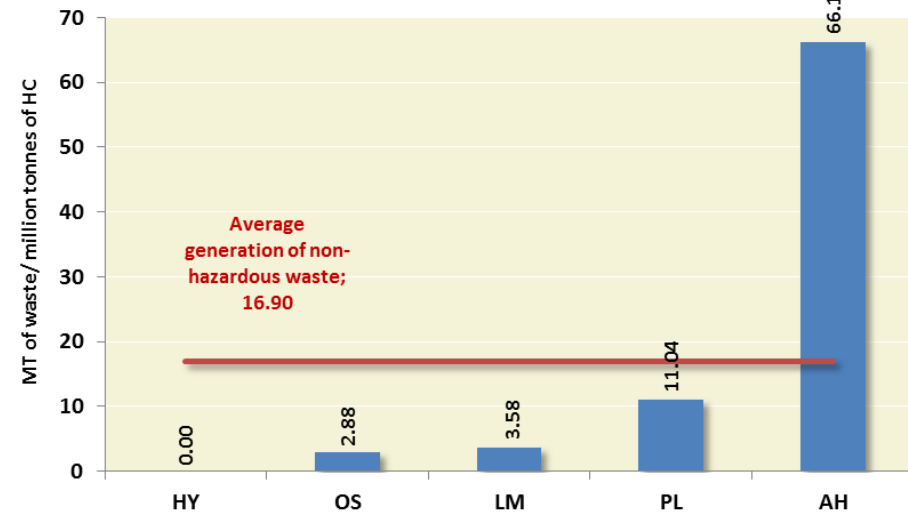
- 8 companies submitted data about waste generation in onshore production operations.
- The average waste generation was 3,418.2 MT of hazardous waste and 360.1 MT of non-hazardous waste per million tonnes of hydrocarbons produced.

Waste Generation – Pipelines

Generation of Hazardous Waste (Pipelines)

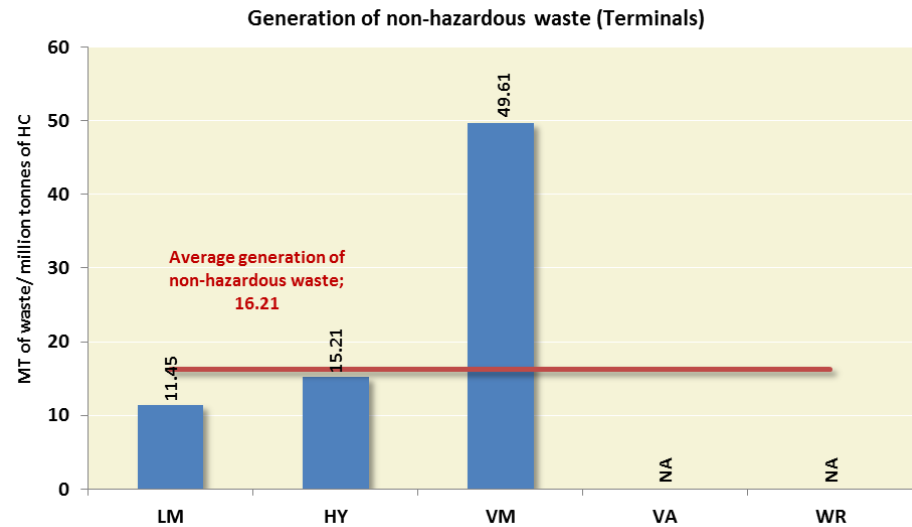
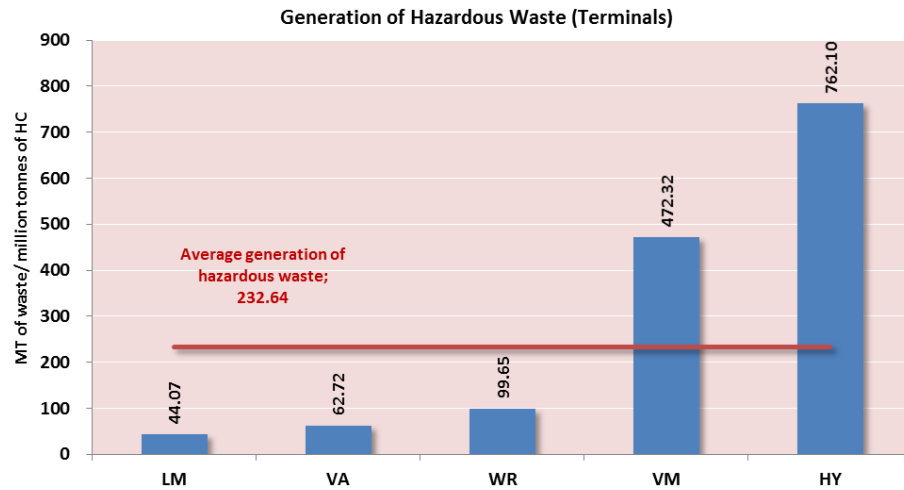


Generation of non-hazardous waste (Pipelines)



- 6 companies submitted data about waste generation in pipelines operations.
- The average waste generation was 3.62 MT of hazardous waste and 16.90 MT of non-hazardous waste per million tonnes of hydrocarbons transported.

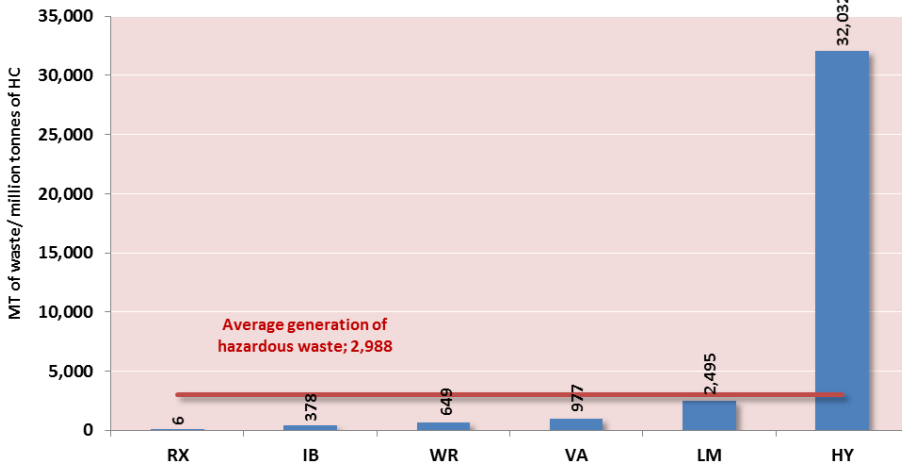
Waste generation – Terminals



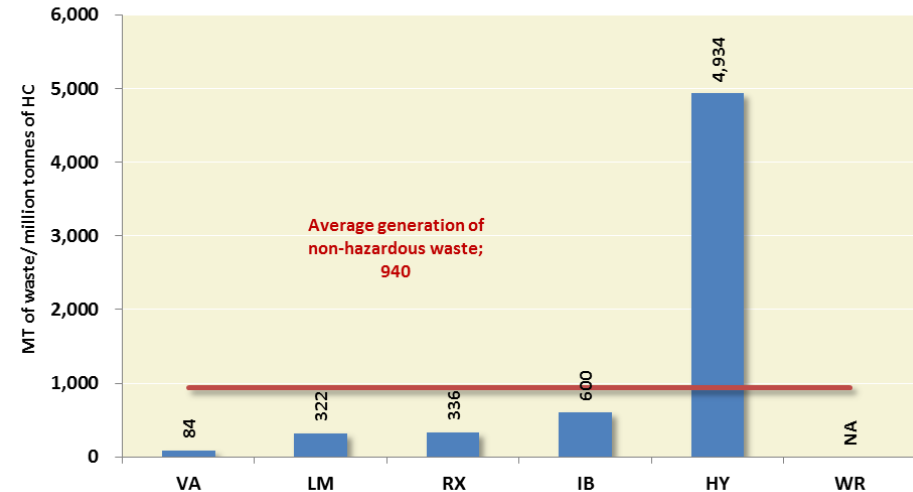
- 5 companies submitted data about waste generation in terminals operations.
- The average waste generation was 232.64 MT of hazardous waste and 16.21 MT of non-hazardous waste per million tonnes of hydrocarbons produced.

Waste Generation – Refining

Generation of Hazardous Waste (Refineries)



Generation of non-hazardous waste (Refineries)



- 6 companies submitted data about waste generation in refining operations.
- The average waste generation was 2.988 MT of hazardous waste and 940 MT of non-hazardous waste per million tonnes of hydrocarbons produced.

6. Freshwater

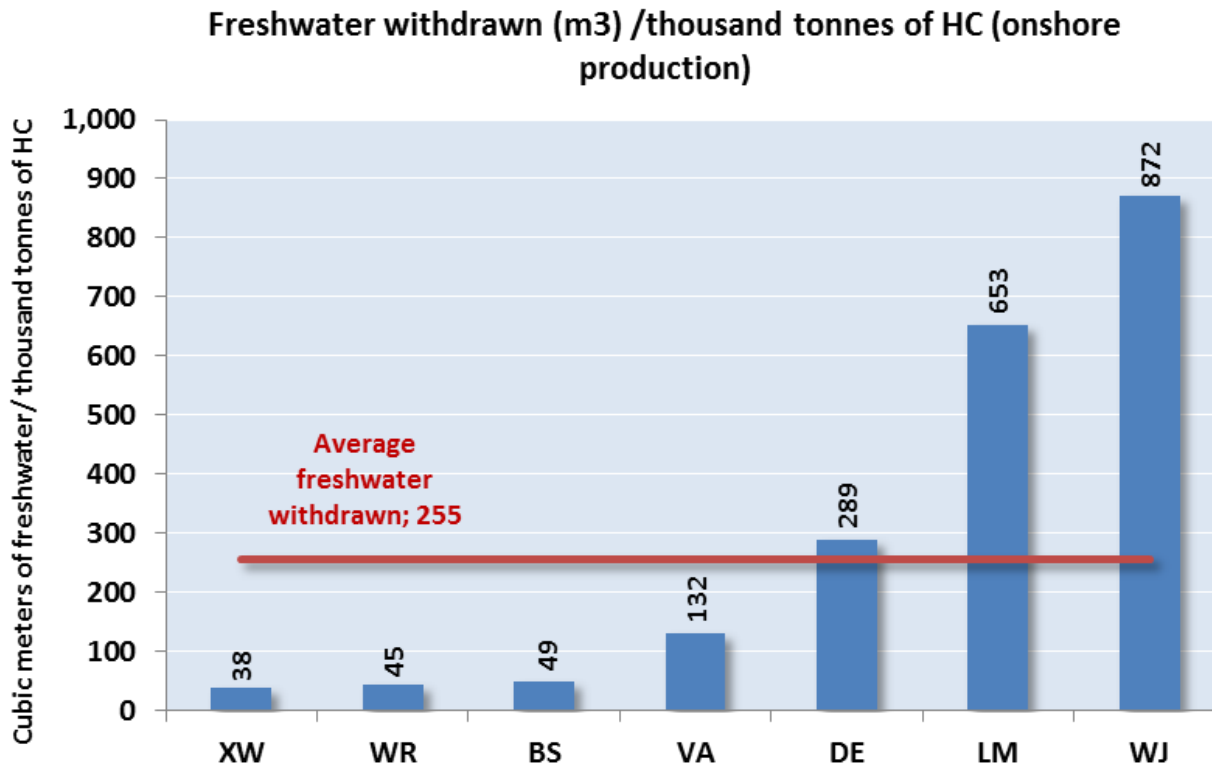
Freshwater - Indicators

- Indicators
 - Freshwater withdrawn
- Business Lines
 - Onshore production
 - Pipelines
 - Terminals
 - Refining

Freshwater - Definitions

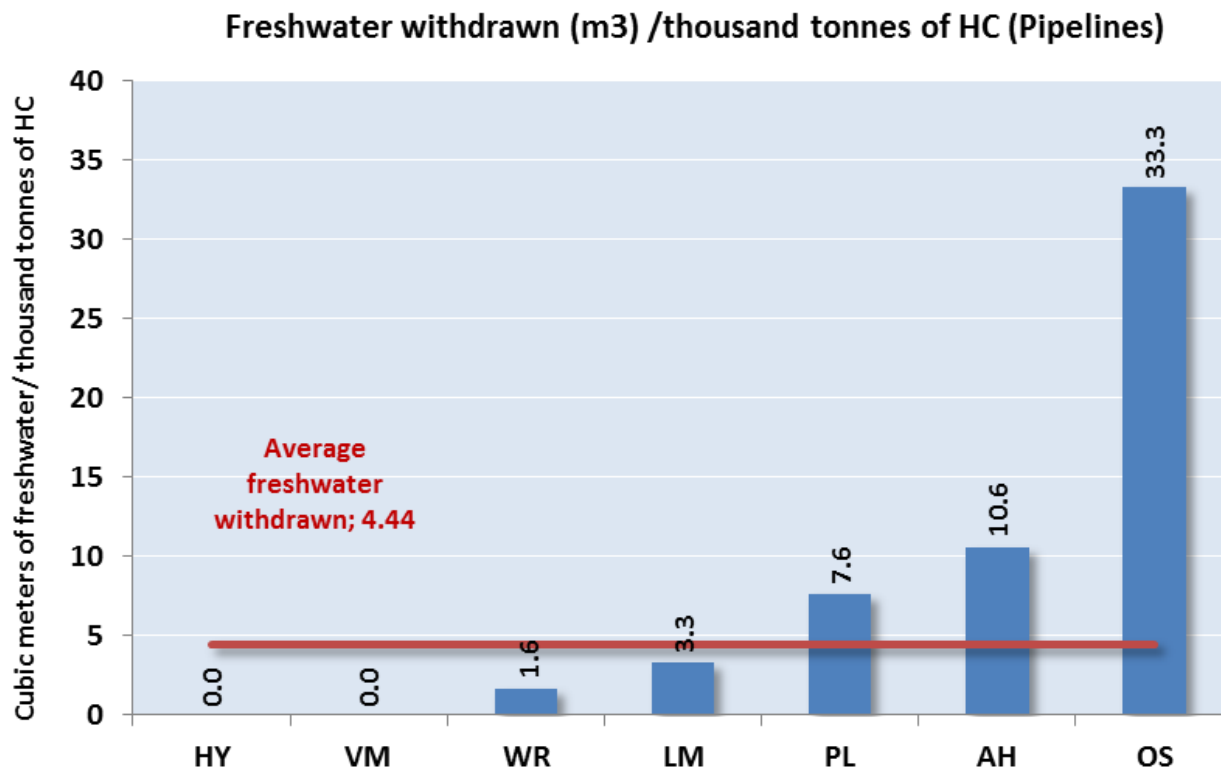
- **Fresh Water:** Non-brackish water, this includes drinking water, water used in agriculture, water used for domestic or industrial uses, etc. The total dissolved solids (TDS) concentration of this water type is up to 2000 mg/l.
- **Fresh water withdrawn:** the volume of fresh water used within the boundaries of the company (including service water) that was removed both from **direct sources** such as surface water or groundwater or **indirect sources** such as, harvested rainwater and municipal water supplies (note that only water that is used in the production processes should be considered)
- **Water reuse/recycle:** The volume of water used in more than one process (recycle), or reused more than one time in a single process (reuse), excluding cooling water.

Freshwater withdrawn – Onshore Production



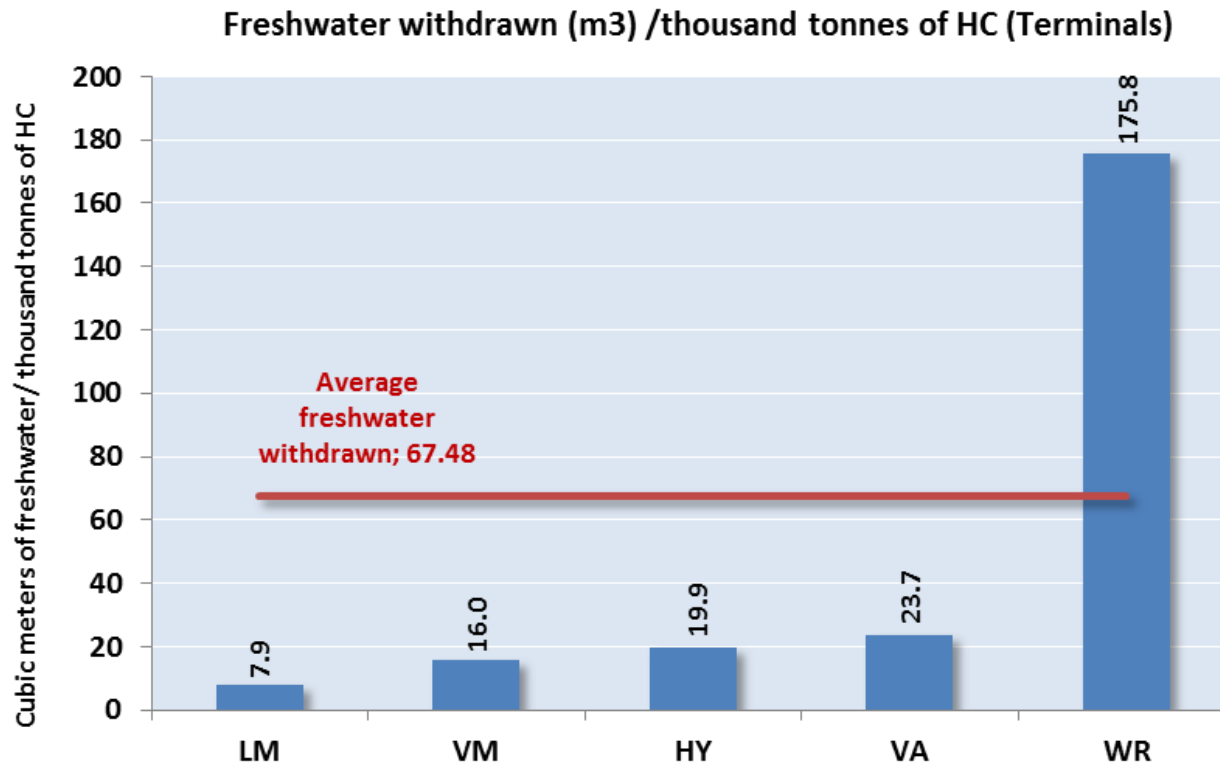
- The average freshwater withdrawn in onshore production was 255 cubic meters per thousand tonnes of produced hydrocarbons.

Freshwater withdrawn – Pipelines



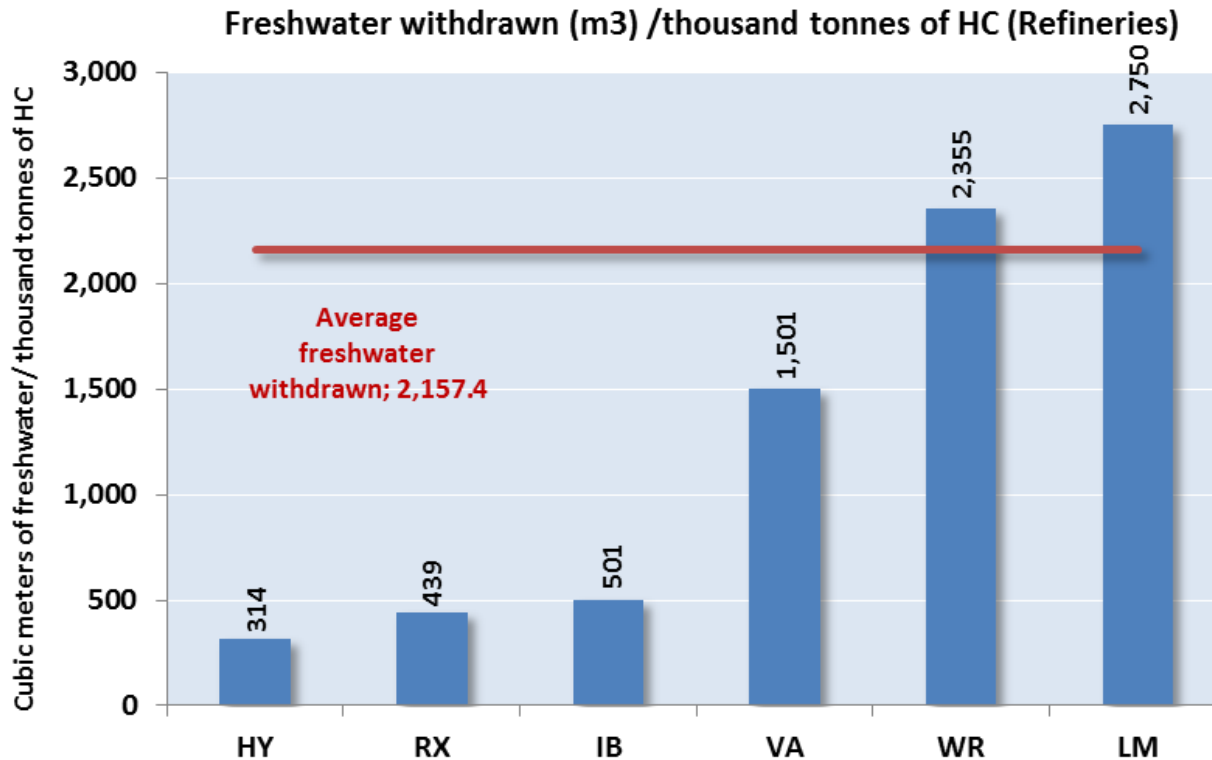
- In pipelines operations the average freshwater withdrawn was 4.44 cubic meters per thousand tonnes of transported hydrocarbons

Freshwater withdrawn – Terminals



- In terminals operations the average freshwater withdrawn was 67.48 cubic meters per thousand tonnes of transported hydrocarbons

Freshwater withdrawn – Refining



- In refining operations 6 companies submitted data and the average withdrawn freshwater was 2,157.4 cubic meter per thousand tonnes of hydrocarbons processed.

7. Greenhouse Gases (GHG) Emissions

GHG Emissions - Indicators

- Indicators
 - Direct Emissions (CO₂; CH₄; N₂O and CO₂ equivalent)
- Business Lines
 - Oshore production
 - Pipelines
 - Refining

GHG Emissions - Definitions

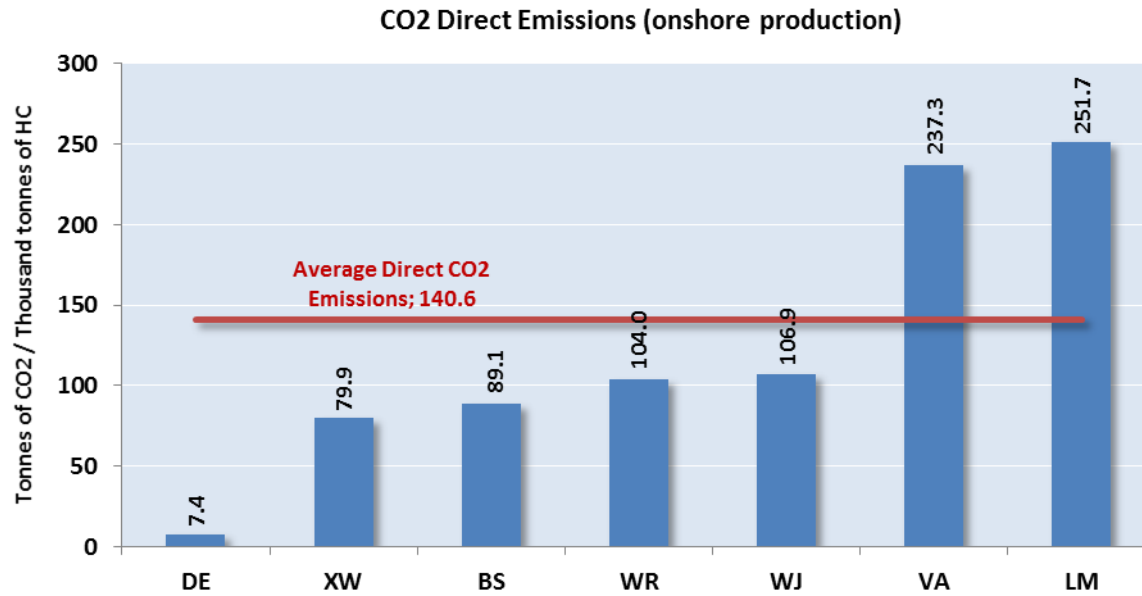
- The Intergovernmental Panel on Climate Change (IPCC) considers 7 greenhouse gases (GHG), in this report are considered only the emissions of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) which are the most significant for the oil and gas industry operations.
- GHG emissions from the following sources shall be included:
 - Combustion (e.g. fuel used for gas compression, power generation, heat, coke burning, etc.)
 - Flaring (mainly CO₂) and venting (mainly CH₄)
 - Processes (e.g. ship loading, storage tanks, glycol dehydration, sulfur recovery units, hydrogen production)
 - Fugitive emissions (including pipelines and leak units)
 - Non-routine events (e.g. pipelines maintenance, gas releases, equipment maintenance)
- Emissions estimations shall include both mobile sources as ships carrying products, tanker trucks, mobile rigs and mobile production facilities, and stationary sources as production facilities, refineries, chemical plants, terminals, rigs and offices.

GHG Emissions - Definitions

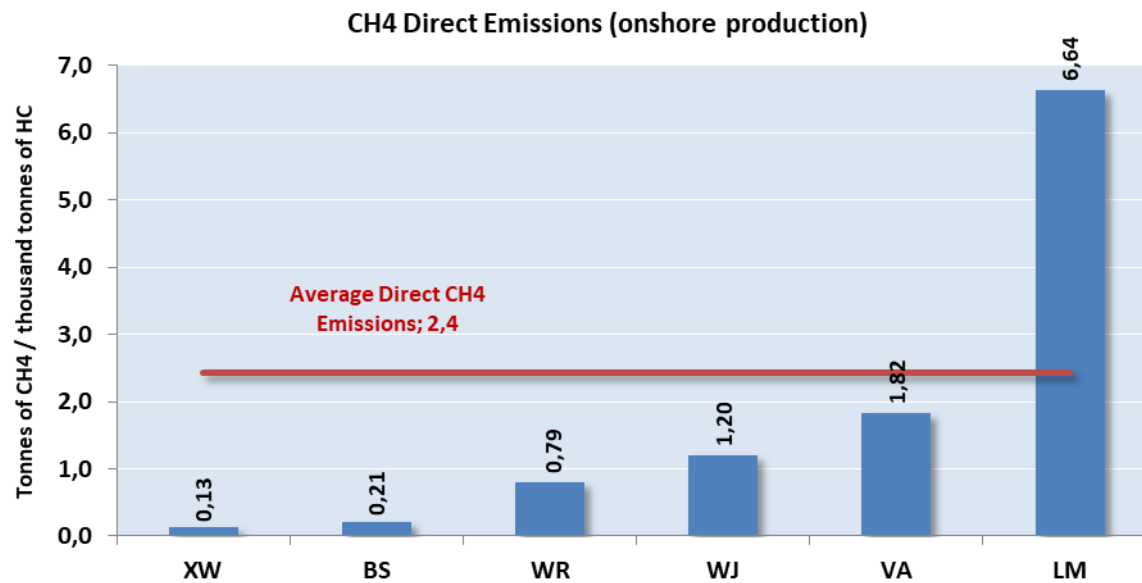
- GHG Protocol defines 2 types of emissions:
 - **Direct:** emissions from sources that belongs (partial or totally) and/or are operated by the reporting entity
 - **Indirect:** emissions that are a consequence of the activities of the reporting entity, but that are generated by sources that belong or are controlled by another entity (e.g. electricity used)
- Additionally, the mentioned protocol classifies the emissions in 3 different scopes. This manual will consider only scopes 1 and 2 which are defined below:
 - **Scope 1:** All GHG emissions (mobile or stationary sources)
 - **Scope 2:** Indirect GHG emissions coming from the consumption or purchase of electricity, steam, heat or cooling.
 - **Note:** CO₂ that is sold as a product, used for enhanced oil recovery or sequestered (e.g. through CCS), generally is not considered by companies as part of their own GHG emissions. It should be removed from GHG emissions inventory as carbon sink.

Direct GHG Emissions – Onshore Production

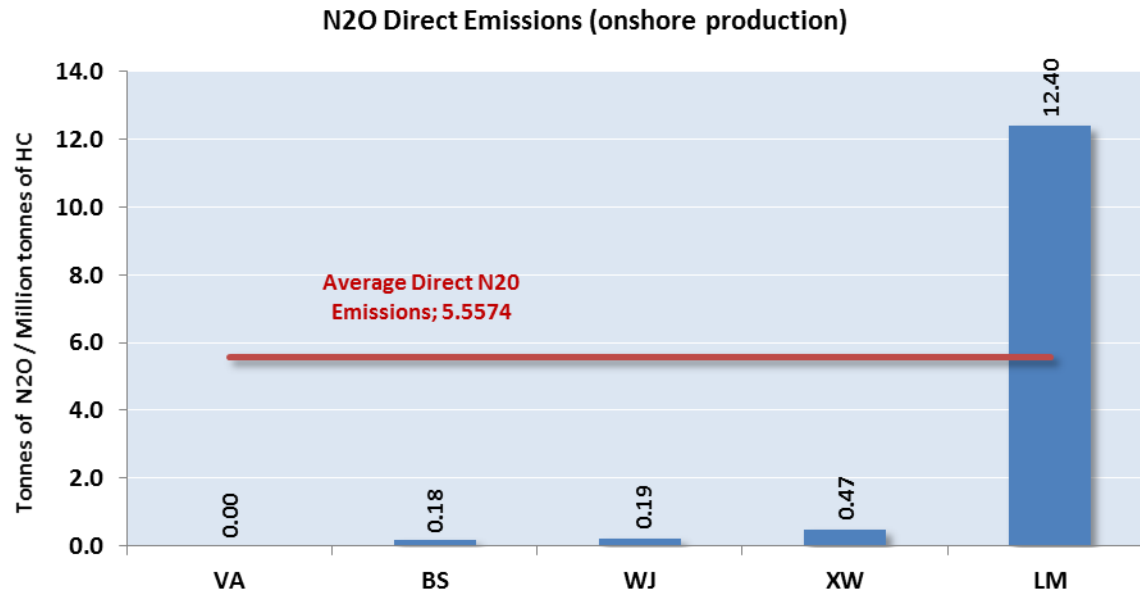
CO₂ Direct Emissions – Onshore Production



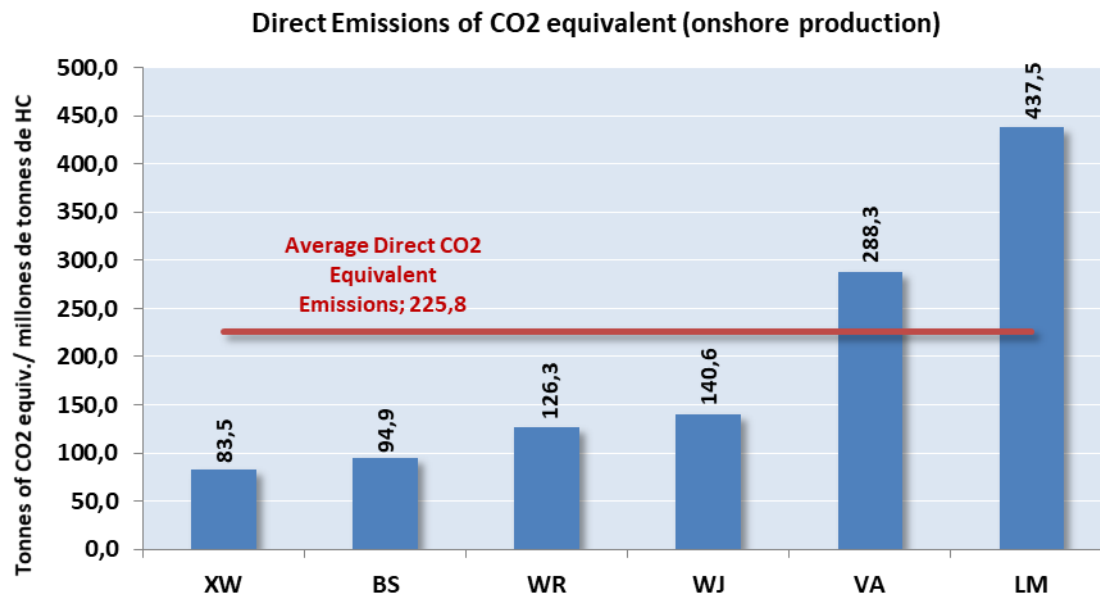
CH₄ Direct Emissions – Onshore Production



N₂O Direct Emissions – Onshore Production



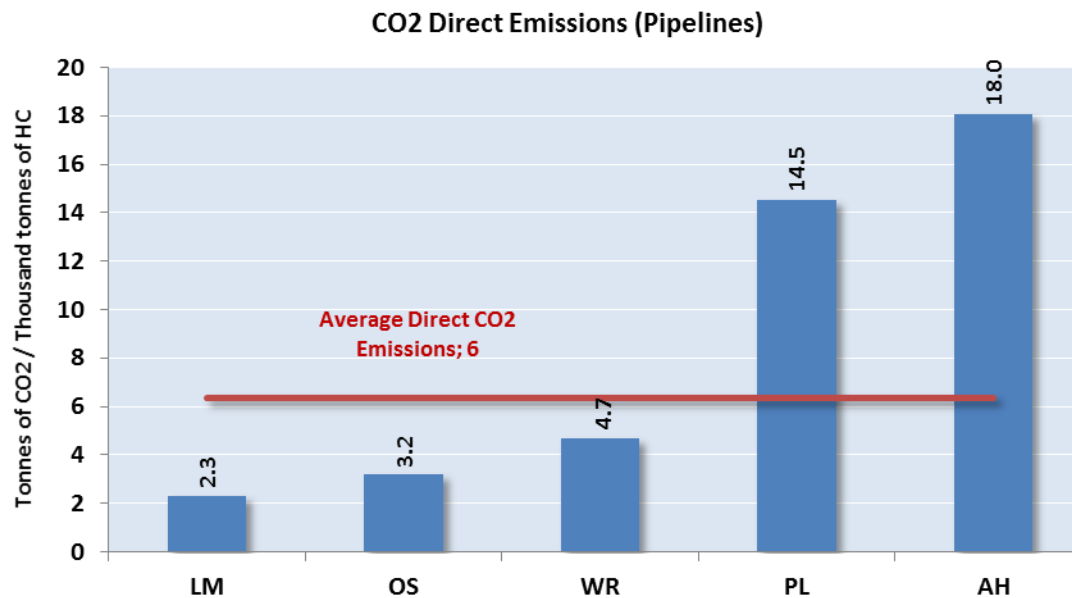
CO₂ Equivalent Direct Emissions – Onshore Production



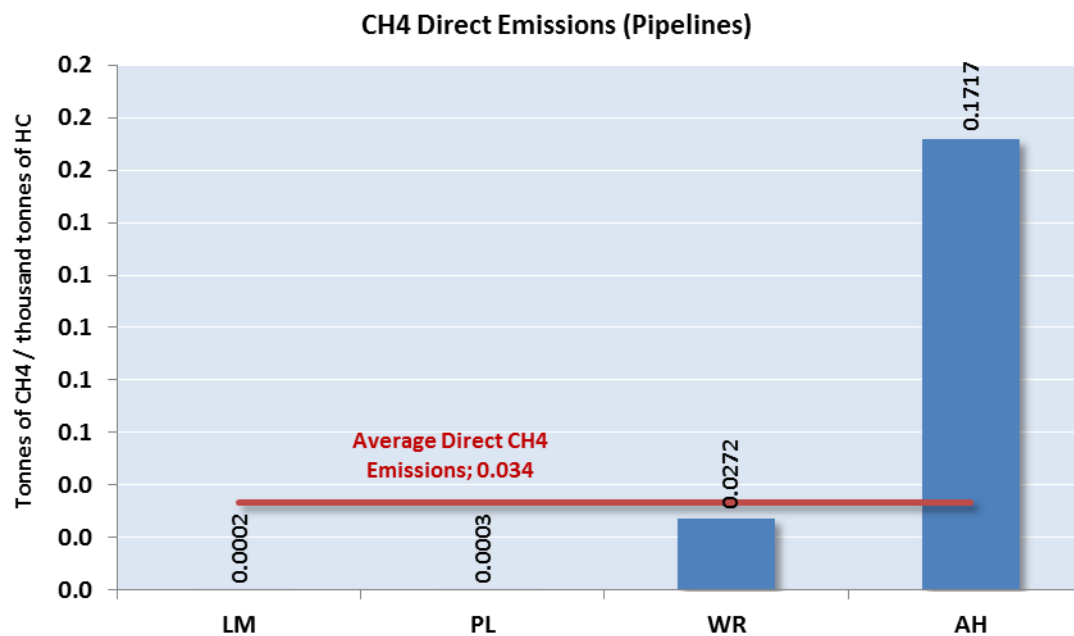
- Equivalent CO₂ is calculated only considering CO₂ and CH₄ (x28) emissions because not all companies submit data about N₂O
- The average is calculated only with the companies that report emissions of both gases, so the weighted sum of the average emissions for the different gases may not coincide with the overall average

Direct GHG Emissions – Pipelines

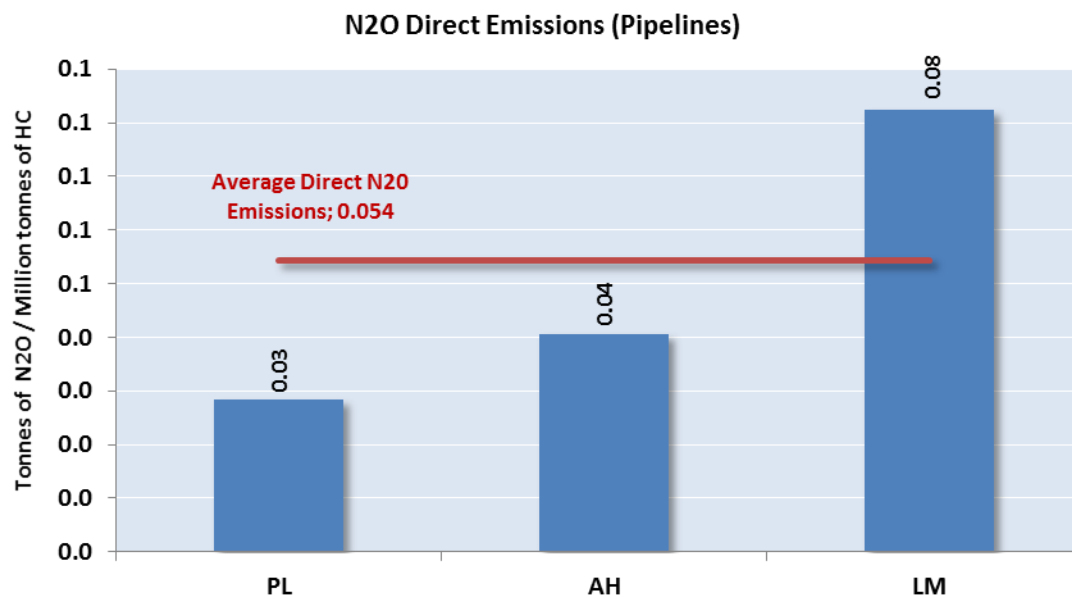
CO₂ Direct Emissions – Pipelines



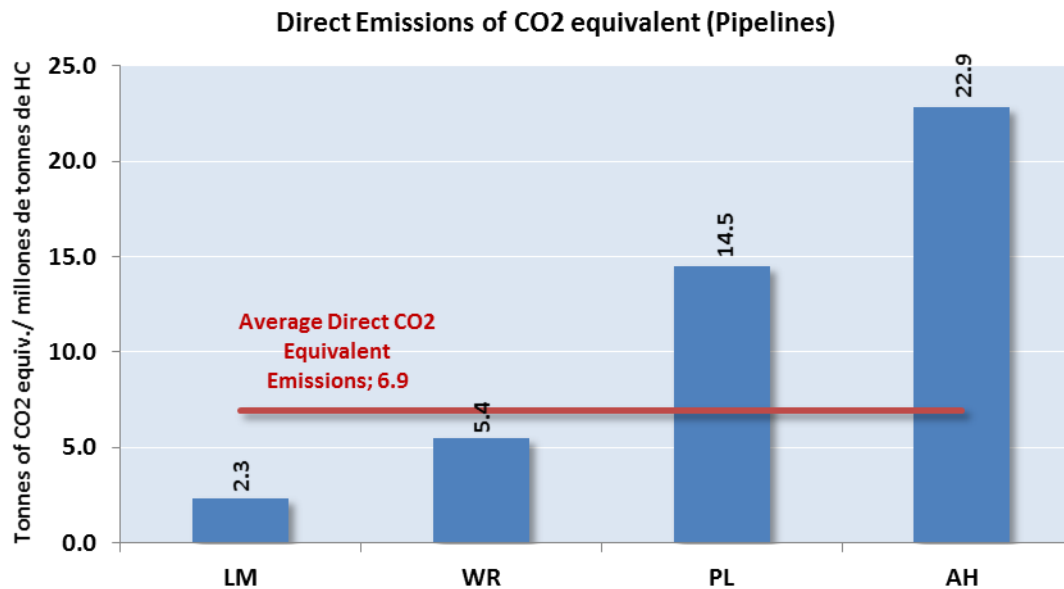
CH₄ Direct Emissions – Pipelines



N₂O Direct Emissions – Pipelines



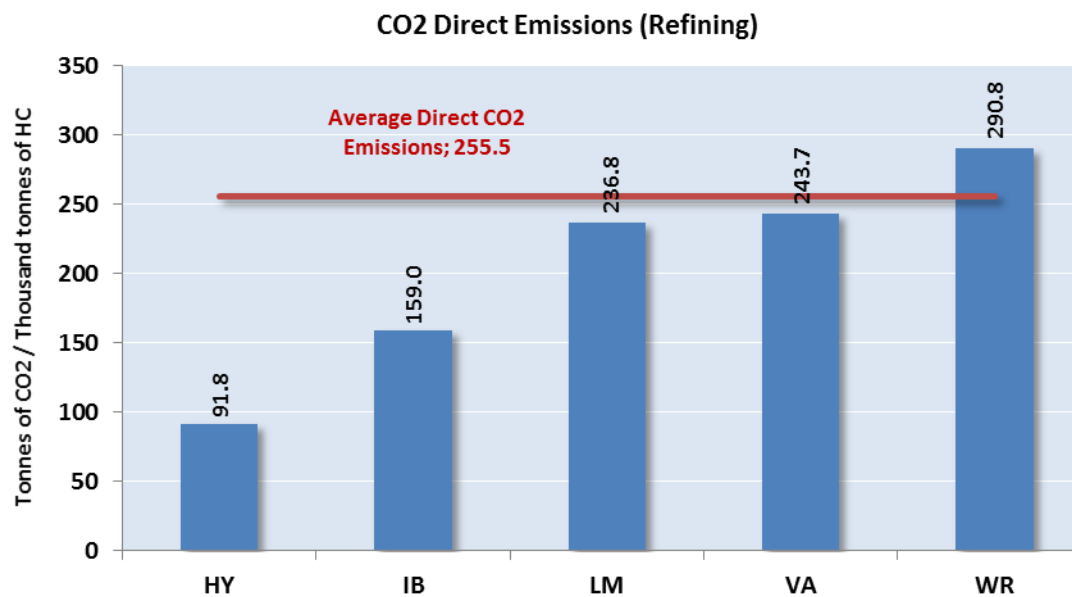
CO₂ Equivalent Direct Emissions – Pipelines



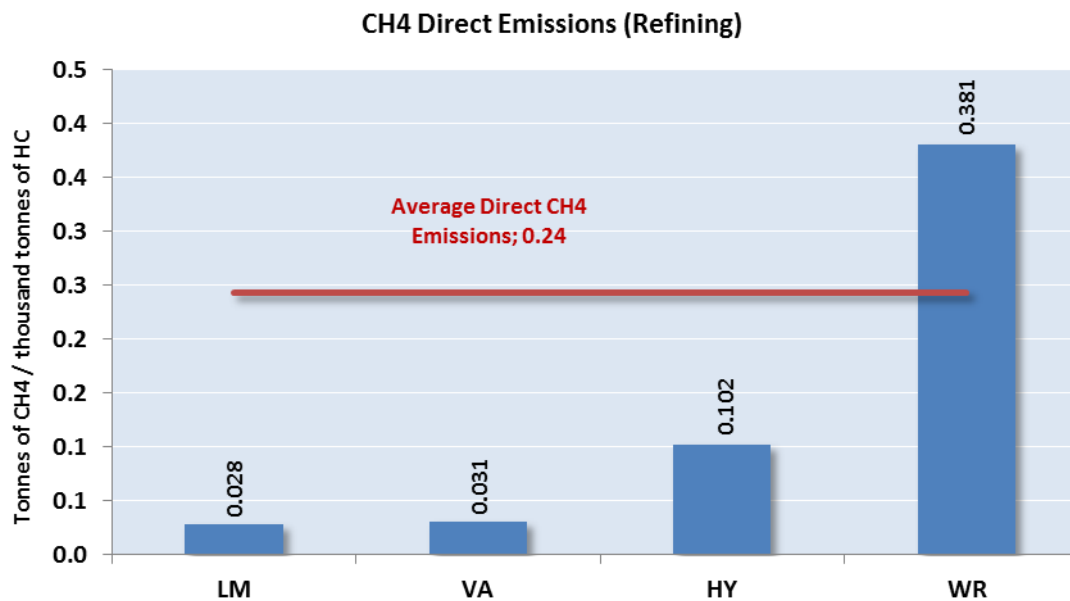
- Equivalent CO₂ is calculated only considering CO₂ and CH₄ (x28) emissions because not all companies submit data about N₂O
- The average is calculated only with the companies that report emissions of both gases, so the weighted sum of the average emissions for the different gases may not coincide with the overall average

Direct GHG Emissions – Refining

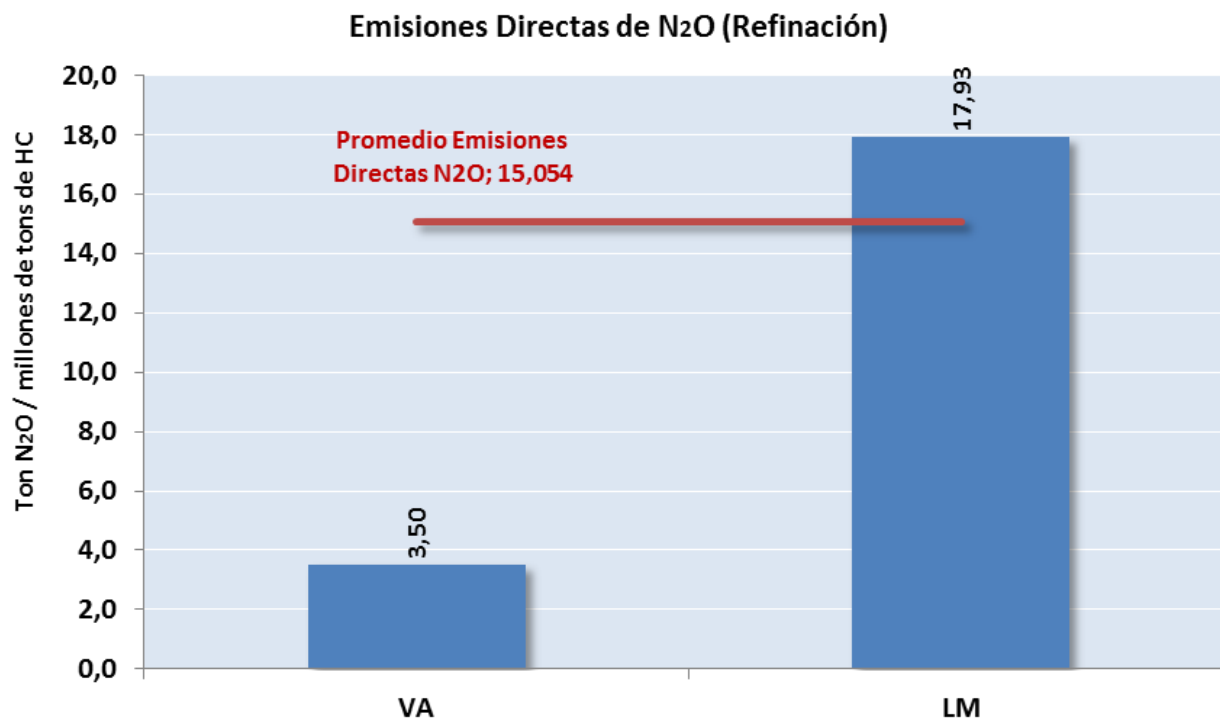
CO₂ Direct Emissions – Refining



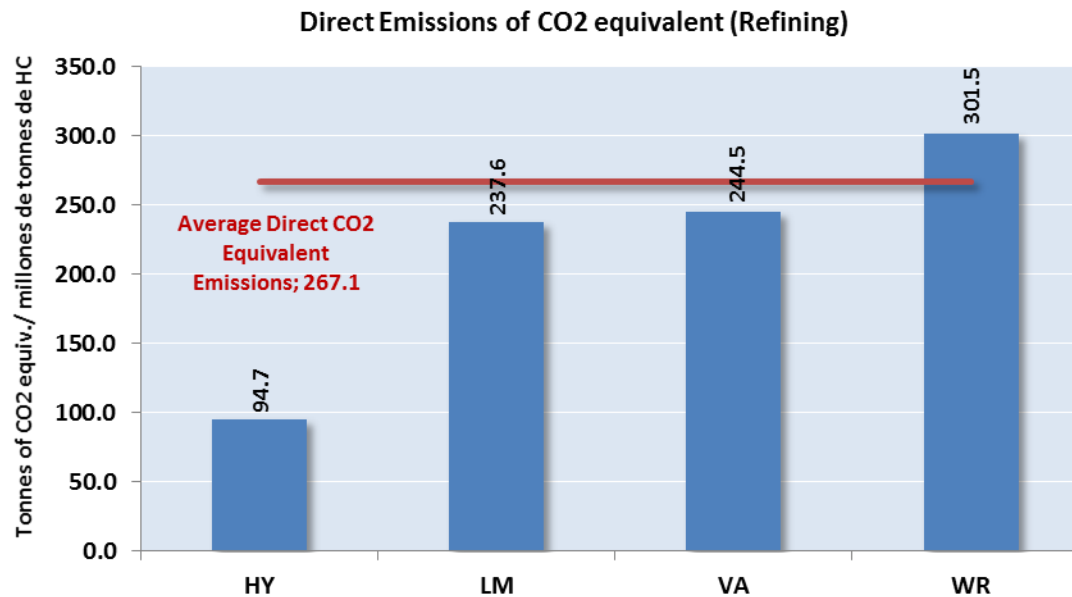
CH₄ Direct Emissions – Refining



N₂O Direct Emissions – Refining



CO₂ Equivalent Direct Emissions – Refining



- Equivalent CO₂ is calculated only considering CO₂ and CH₄ (x28) emissions because not all companies submit data about N₂O
- The average is calculated only with the companies that report emissions of both gases, so the weighted sum of the average emissions for the different gases may not coincide with the overall average

Environmental Performance Benchmarking in the Oil and Gas Industry in Latin America and the Caribbean (2018 data)

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