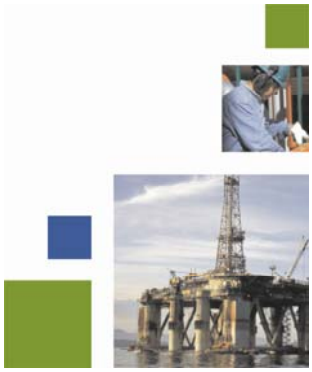
REGIONAL ASSOCIATION OF
OIL, GAS AND BIOFUELS SECTOR COMPANIES
IN LATIN AMERICA AND THE CARIBBEAN

Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean – Information of ARPEL Member Companies for 2010



ARPEL ENVIRONMENTAL REPORT

Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean – Information of ARPEL Member Companies for 2010

CONFIDENTIAL

For exclusive use of ARPEL Member Companies

Preparado por:

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Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean – Information of ARPEL Member Companies for 2010
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This is a document developed within the context of the activities of the **ARPEL Environment, Health and Safety Committee.**

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ARPEL Environment, Health and Safety Committee

The work of the Environment, Health and Safety Committee cuts across upstream and downstream operations and focuses on health and prevention of occupational incidents, the integrity of operations, and the improvement of environmental management performance - with special attention to oil spill preparedness and response.

The Committee seeks to identify emerging environment, health and safety issues and challenges, and works with members to understand their impact on the industry and to develop regional strategies and actions to address them. The Environment, Health and Safety Committee provides best practice guidance on environment, health and safety processes and management systems, and annually compiles safety performance statistics and produces a comprehensive environmental benchmarking report for the industry in the region. It actively liaises with other industry associations to maximize its industry impact.

Benchmarking on Environmental Performance Project Team

ANCAP – Rosario Martino • **ECOPETROL** – Luis Alberto Leal – Sandra Pérez • **ENAP** – Christian Brunner • **PCJ** – Che Stewart • **PEMEX** – Javier Bocanegra Reyes • **PETROBRAS** – Luis Cesar Stano - Mônica Moreira Linhares • **EPPetroecuador** – Germán Torres • **PETROPERU** – Magdaleno Saavedra • **PETROTRIN** – Garret Manwaring • **PLUSPETROL**– Mariano Zanelli • **RECOPE** – Fernando Bourrouet León • **REFIDOMSA** - Viera Lasunova • **RepsolYPF** – María Rodríguez Matanza • **STAATSOLIE** - Joan Telgt - Serinia Wongsotaroeno • **YPF** – Analía Ouviña – Juan Santángelo

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1. Executive summary

Starting in 2008, the Regional Association of Oil, Gas and Biofuels Sector Companies in Latin America and the Caribbean (ARPEL) started collecting -annually- environmental information from its member companies. The objective of this program has been to allow its member companies to compare their performance with other companies of the sector, leading to a more efficient performance.

This report summarizes the information of the activities corresponding to: Exploration and Production, Pipelines, Terminals, Distribution/Transport, Refining and Petrochemicals of ARPEL member companies that contributed with their 2010 data. A total of 16 members with operations in 15 countries of Latin America and the Caribbean[1] reported their data for the elaboration of this report. The information is integrated as "company-country" and is presented for the following environmental indicators:

- Hydrocarbons´ spills in all the functions
- Produced Water discharges and re-injection in Exploration and Production activities
- Water and oil discharged as process effluents in all the functions
- Disposal of hazardous and non-hazardous solid wastes in all the functions

As a whole, these companies represent 77.6 % of the refining activity, 56.3 % of the oil production and 44.5 % of gas production activity of Latin America and the Caribbean in 2010[2].

Some general issues to highlight from this report compared to the 2010 report:

- The number of reporting companies increased from 11 (in 2009) to 16 (in 2010), although the number of "companies-country" remained at 25.
- Regarding the total activity of Latin America and the Caribbean for each year:
  - data from refining activity increased from 71.7 % (in 2009) to 77.6 % (in 2010),
  - data from oil production activity decreased from 59 % (in 2009) to 56.3 % (in 2010),
  - data from gas production activity decreased from 47.8 % (in 2009) to 44.5 % (in 2010)

[1] *Latin America and the Caribbean include: South America, Central America, the Caribbean and Mexico*

[2] *According to BP Statistical Review of World Energy (2011) the total of Latin America and the Caribbean for 2010 is: 283,928.57x10^3 tonnes of products refined, 496.3x10^6 tonnes of oil produced, and 216.5x10^9 cubic meters of gas produced. The information on gas production reported by the companies used a conversion factor of 0.9 Tonnes per 1,000 cubic meters.*

2. Introduction and scope of the reported data

Starting in 2008, the Regional Association of Oil, Gas and Biofuels Sector Companies in Latin America and the Caribbean (ARPEL) started collecting -annually- environmental information from its member companies. The ultimate objective of this effort is to provide a representative assessment of the environmental performance of the oil and gas industry operating in Latin America and the Caribbean.

Periodically measuring environmental performance is an important management strategy to accomplish continuous improvement. By comparing (benchmarking) their environmental performance, oil and gas companies may compare their performance with industry trends and with other companies in the sector. Environmental management improvement is promoted through the ARPEL Environment, Health and Safety Committee (CASYSIA) through the exchange of experiences with those companies having a better environmental performance.

Data is integrated as "companies-country" and presented for the following environmental indicators:

- Hydrocarbons´ spills in all the functions
- Produced Water discharges and re-injection in Exploration and Production activities
- Water and oil discharged as process effluents in all the functions
- Disposal of hazardous and non-hazardous solid wastes in all the functions

Data is collected annually for each of the categories above-mentioned, based on definitions agreed to by the CASYSIA. Indicators agreed to by the CASYSIA in this stage are described in the "Users Manual – ARPEL Database – Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean" (2nd revised edition, 2011).

The Manual provides definitions, procedures, and instructions for those responsible of collecting and reporting environmental data to ARPEL, of which we highlight:

- The indicators are classified in 6 functions: Exploration and Production, Pipelines, Terminals, Distribution/Transport, Refining and Petrochemical. The scope of these functions is defined in the Manual.
- The information shown is for oil and natural gas operations in Latin America and the Caribbean.
- Companies report data of their environmental performance by consolidating 100 percent of the data or information of indicators or information of operations over which they have management control and NOT data from operations they do not manage. For the purposes of this Manual, oil and gas companies define the operated boundary as all of those facilities where the company´s management has accountability and authority for sustainability policies, systems and performance (health, safety, environmental, social and/or economic) related to the facility.

- The "Total operation" shown in Tables 2, 3, 4, 5 and 6 refers to the amount of product transported, processed, produced, etc., as defined in Chapter 6.1 of the User Manual – ARPEL Database - Benchmarking of environmental performance in the oil and gas in Latin America and the Caribbean" (2nd revised edition, 2011)

This is the third environmental benchmarking report of ARPEL. In the future, it is expected to continue adding more indicators that can be agreed on and that are useful for the objectives of continuous improvement of the environmental performance of ARPEL Member Companies and the oil and natural gas industry in general.

The Member Companies that reported data for this report are the ones shown in Table 1. It should be pointed out that:

- some companies reported data of more than one country (of the Region), resulting in a total of 22 "companies-country", which were codified so that confidentiality of the information is kept.
- not all the companies have activity in all the functions or reported data for all the indicators, so not all the indicators that appear in the following chapters contain the 22 "companies-country"
- as a whole, the magnitude of the activities of these companies represent 77.6 % of the refining activity, 56.3 % of the oil production activity and 44.5 % of the gas production activity of Latin America and the Caribbean in 2010[3].

Table 1: Companies that participated in the 2010 Report

Ancap	Petroperu
Ecopetrol	Petrotrin
Enap	Pluspetrol
EPPetroecuador	Recope
Hocol	Refidomsa
PCJ	Repsol
Pemex	Staatsolie
Petrobras	YPF

[3] *According to BP Statistical Review of World Energy (2011) the total of Latin America and the Caribbean for 2010 is: 283,928.57x10^3 tonnes of products refined, 496.3x10^6 tonnes of oil produced, and 216.5x10^9 cubic meters of gas produced. The information on gas production reported by the companies used a conversion factor of 0.9 Tonnes per 1,000 cubic meters.*

Table 2 details the number of "companies-country" and the consolidated magnitude of the activities reported for each function[4].

Table 2: Data consolidation (in 10^3 Tonnes)

		Number of "companies-country that reported data	Total of operations (in 10^3 Ton)
Gross Hydrocarbon Production	Offshore	7	227.204
	Onshore	17	148.472
	Undefined	0	0
	Total	**19**	**375.676**
Pipelines' Transportation		**11**	**15.925.084**
Terminals' Movement		**9**	**895.606**
Distribution / Transport		**9**	**1.016.020**
Refining Activity		**14**	**220.334**
Petrochemicals' Activitiy		**2**	**9.523**

[4] *If in a mixed operation, the quantities are not collected separately for onshore and offshore, the quantities are entered as* ***Undefined***

3. Environmental Indicators

3.1 Hydrocarbon spills

Spills represent a very important environmental performance indicator for the oil and natural gas industry as they have a visible impact on the environment. The degree of environmental impact is highly dependent on the nature of the spill, where it happened and how it was handled.

The graphics included in this sub-chapter show the number of spills and the volume spilled in barrels, both normalized by the magnitude of the activity in each Function.

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

Table 3 details the number of "companies-country" and the consolidated magnitude of the activities reported for each function in the "Hydrocarbon spills" indicator. The "Hydrocarbon spills" indicator is classified by:

- the destination of the spill, in which case the information is classified by spill into "In land", "In water" and "Total".
- in the case of Exploration and Production, it is –also- divided by the source of the activity, i.e., "E&P offshore", "E&P onshore" and "E&P undefined". There are no spills in land from offshore operations; therefore, Table 3 states NR (Not Relevant). "E&P undefined" spills show that the companies that report do not differentiate (in their own environmental information management systems) the source of the E&P activity that caused the spill reported. In this edition of Benchmarking, all the companies identify the origin of activity, so that no information is reported in "E&P undefined"

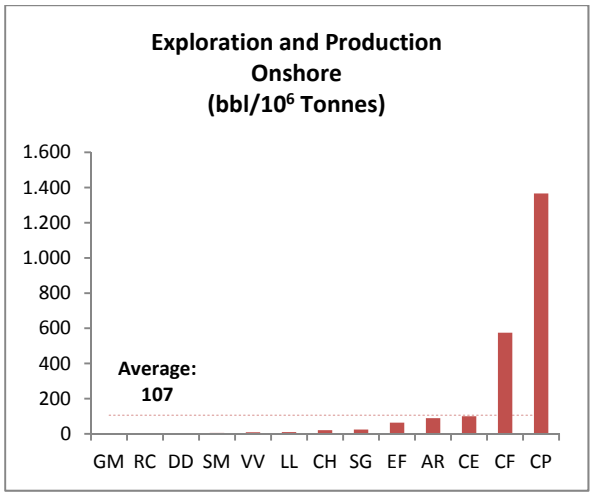
Table 3: "Companies-country" that reported 2010 data for the "Spills" Indicator

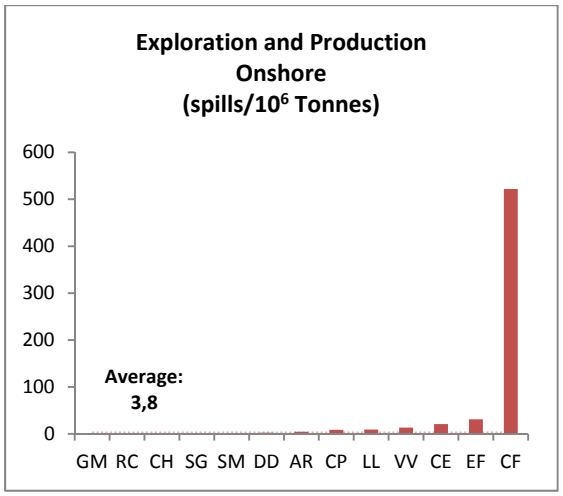
Consolidation of data (in 10^3 Tonnes) - Total reported data									
				Spills in land		Spills in water		Total of Spills	
		Number of "companies-country" that reported data	Total of operations (in 10^3 Tonnes)	Number of "companies-country" that reported data	Total of operations (in 10^3 Tonnes)	Number of "companies-country" that reported data	Total of operations (in 10^3 Tonnes)	Number of "companies-country" that reported data	Total of operations (in 10^3 Tonnes)
Gross Hydrocarbon Production	Offshore	7	227.204	NR	NR	6	125.165	6	125.165
	Onshore	17	148.472	13	109.265	13	109.265	14	129.015
	Undefined	0	0	0	0	0	0	0	0
	Total	**19**	**375.676**	**15**	**234.430**	**15**	**234.430**	**16**	**235.479**
Pipelines' Transportation		**11**	**15.925.084**	**9**	**15.819.402**	**9**	**15.819.402**	**10**	**15.844.575**
Terminals' Movement		**9**	**895.606**	**7**	**558.698**	**7**	**558.698**	**8**	**573.254**
Distribution / Transport		**9**	**1.016.020**	**6**	**948.164**	**6**	**948.164**	**8**	**949.921**
Refining Activity		**14**	**220.334**	**10**	**109.363**	**10**	**109.363**	**12**	**128.164**
Petrochemicals' Activitiy		**2**	**9.523**	**1**	**8.235**	**1**	**8.235**	**2**	**9.523**

3.1.1 Spills in Exploration and Production

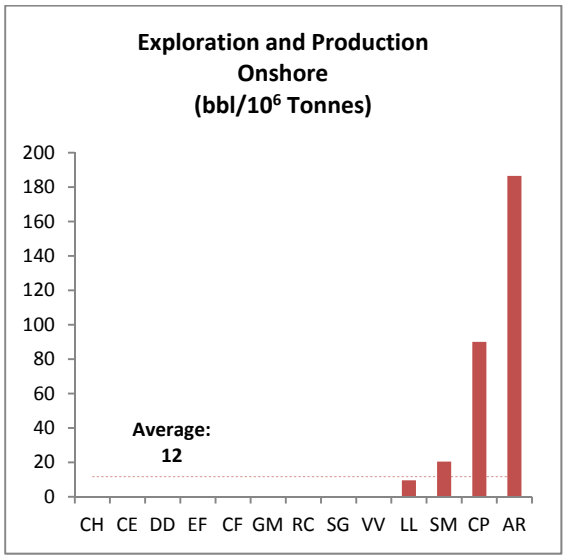
Sub-chapters 3.1.1.1, 3.1.1.2, 3.1.1.3, and 3.1.1.5, show the information in pairs of tables, the ones on the left corresponding to quantity of barrels spilled, and the ones on the right to the number of spills per million tonnes of hydrocarbon produced in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

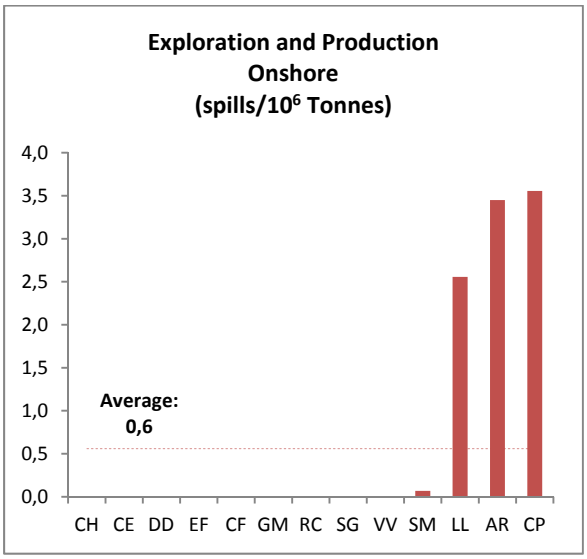
3.1.1.1 In land spills from Onshore Exploration and Production



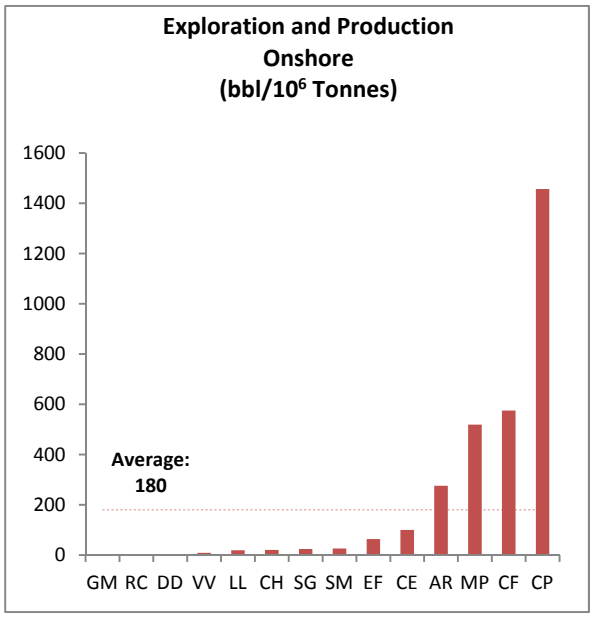


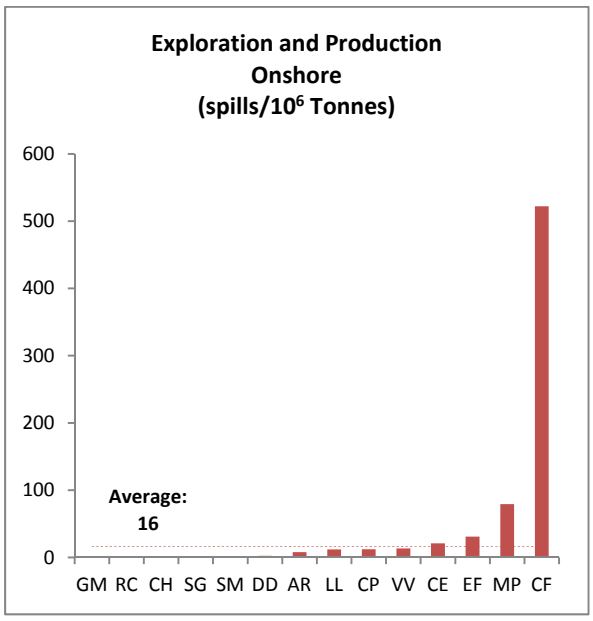
3.1.1.2 In water spills from Onshore Exploration and Production





3.1.1.3 *Total spills from Onshore Exploration and Production*

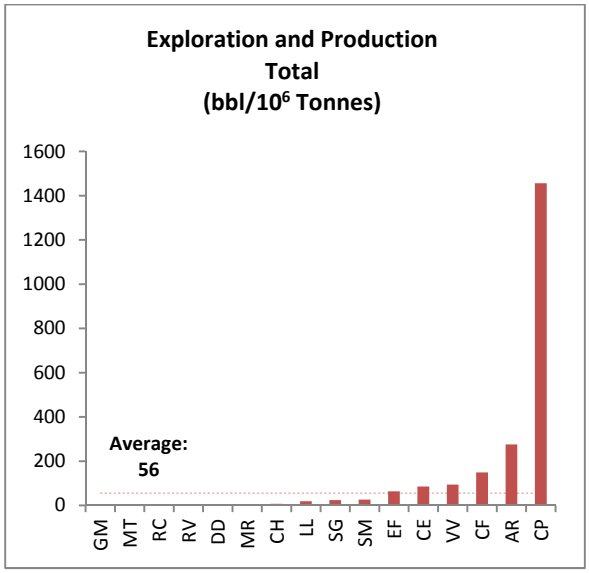


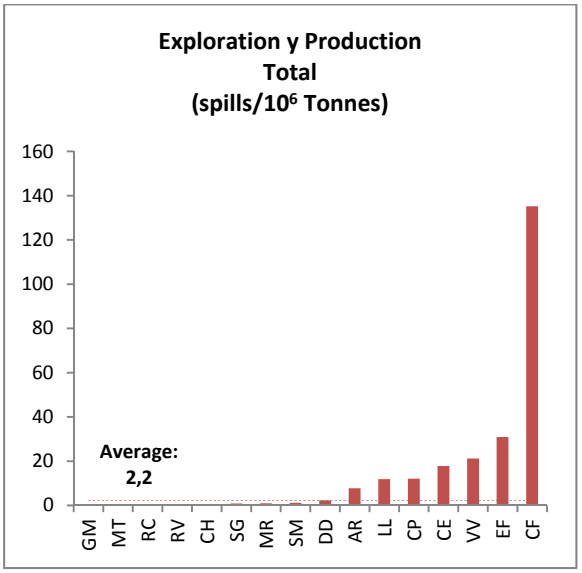


3.1.1.4 *In water spills from offshore Exploration and Production*

Only two companies, out of the 6 reporting data of spills from offshore E&P activities, reported spills in 2010. As an average there were 0,26 spills and 1,3 barrels were spilt for every 10^9 tonnes of hydrocarbons produced offshore.

3.1.1.5 *Total Spills from all the Exploration and Production activities*





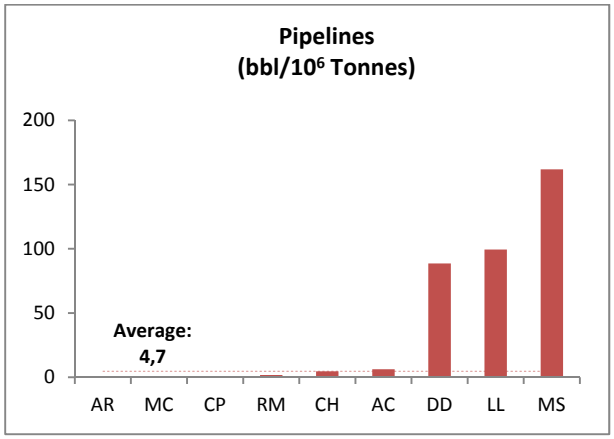
In **2010**, **ARPEL** member companies participating of this report had -as average- 2.2 spills per million tonnes of gross hydrocarbon production, and spilled 56 barrels per million tonnes of gross hydrocarbons production.

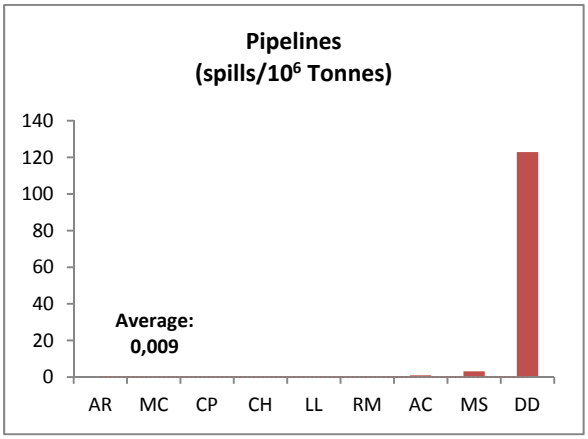
These figures can be compared with the results of **OGP** in **2010** in which companies had -as average- 1.4 spills per million tonnes of total hydrocarbon production, and spilled 37.8 barrels per million tonnes of gross hydrocarbon production.

3.1.2 Pipelines' Spills

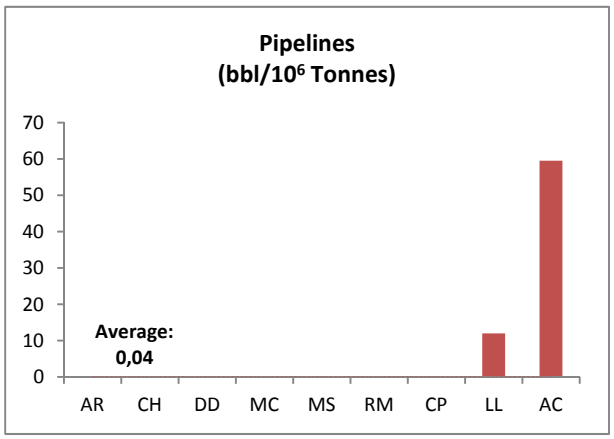
Sub-chapters 3.1.2.1 to 3.1.2.3 show the information in pairs of tables, the ones on the left corresponding to spilled barrels, and the ones on the right, to the number of spills by million tonnes of product transported by pipelines among the different Functions in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

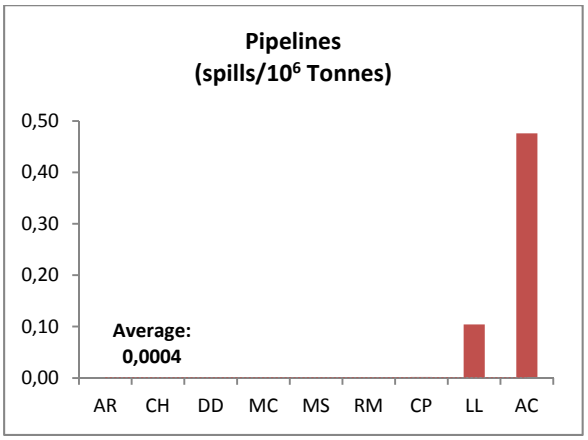
3.1.2.1 In land spills from Pipelines



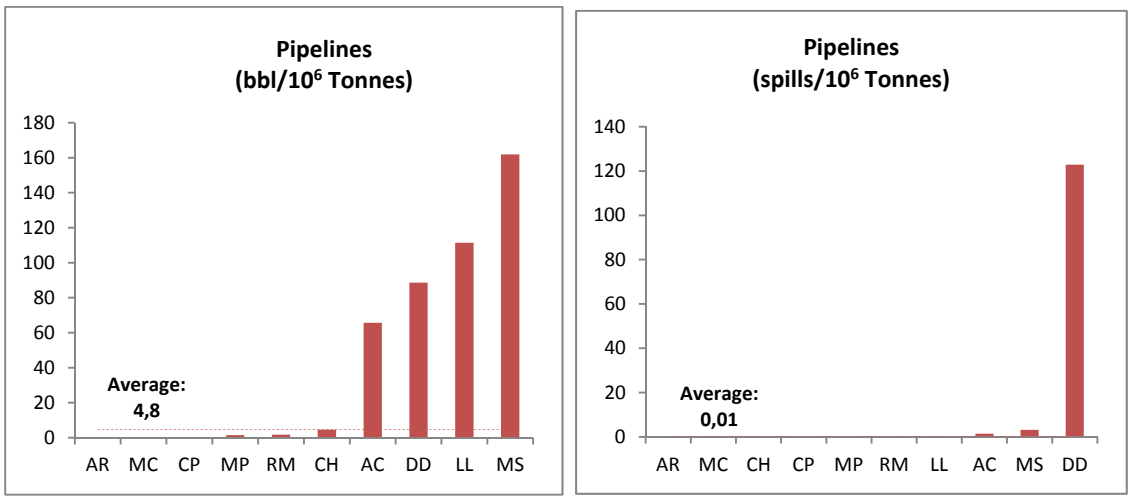


3.1.2.2 In water spills from Pipelines





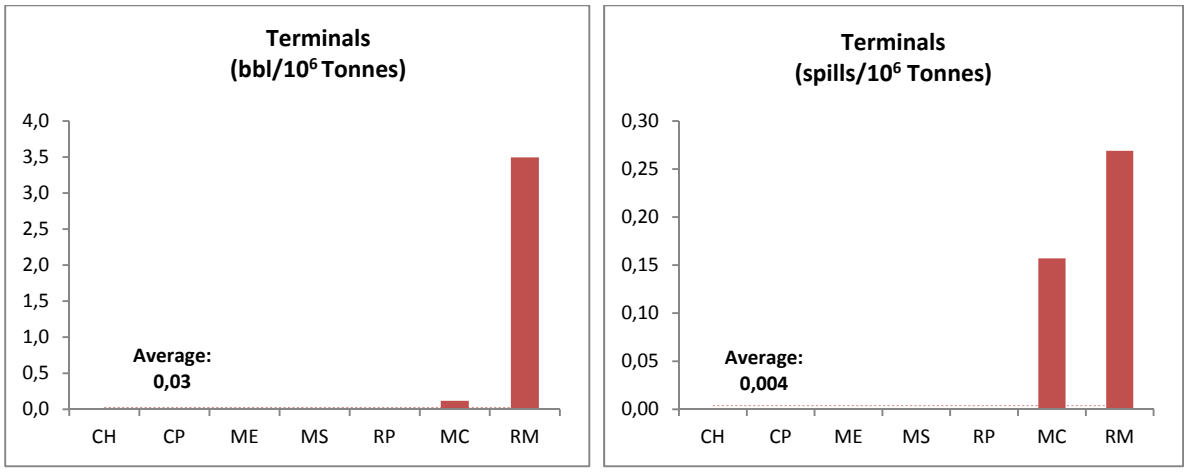
3.1.2.3 Total spills from Pipelines



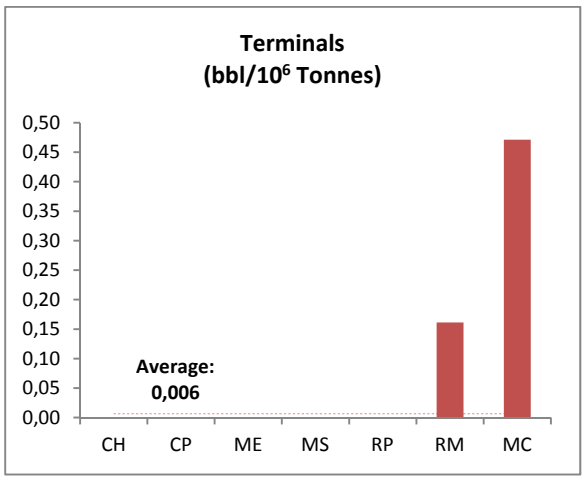
3.1.3 Spills in Terminals

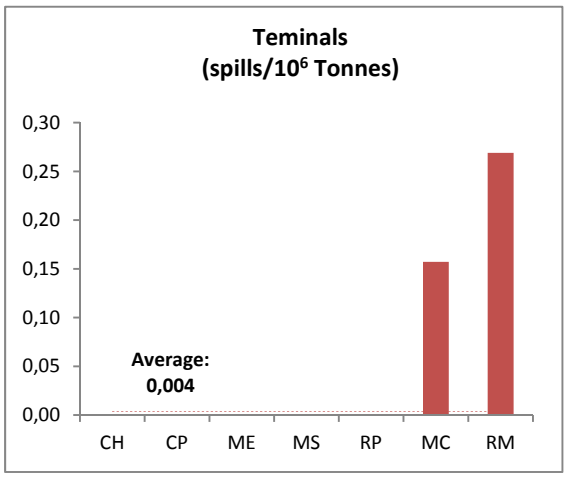
Sub-chapters 3.1.3.1 to 3.1.3.3, show the information in pairs of tables, the ones on the left corresponding to spilled barrels, and the ones on the right, to the number of spills by million tonnes of product transferred from Terminals to other Functions in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

3.1.3.1 In land spills from Terminals

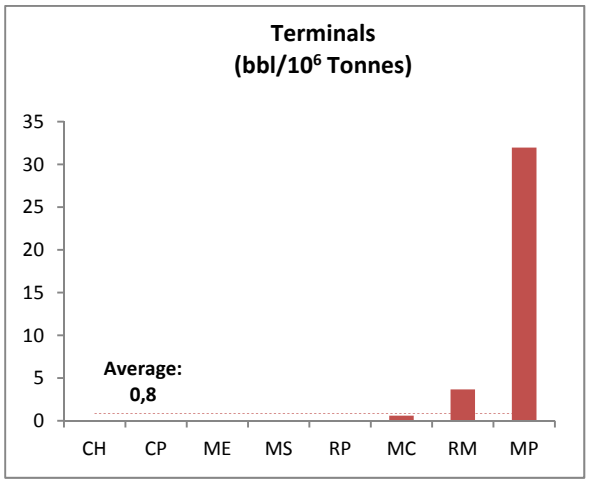


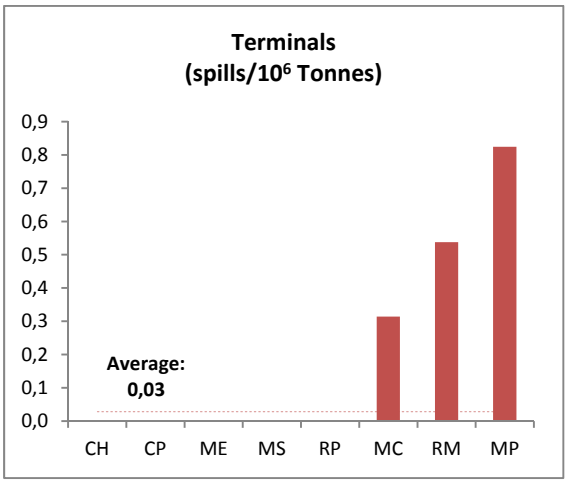
3.1.3.2 In water spills from Terminals





3.1.3.3 Total spills from Terminals

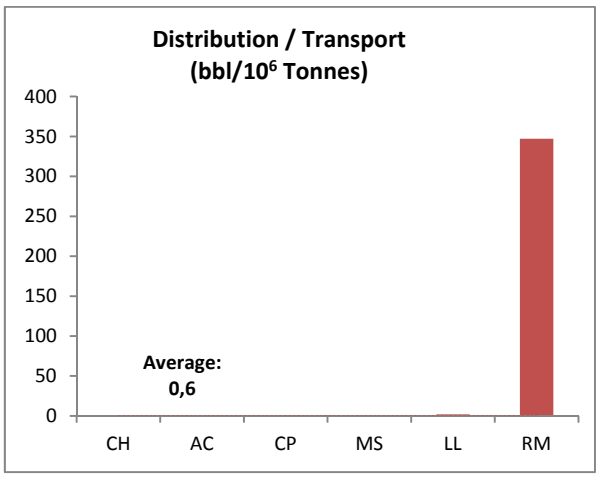


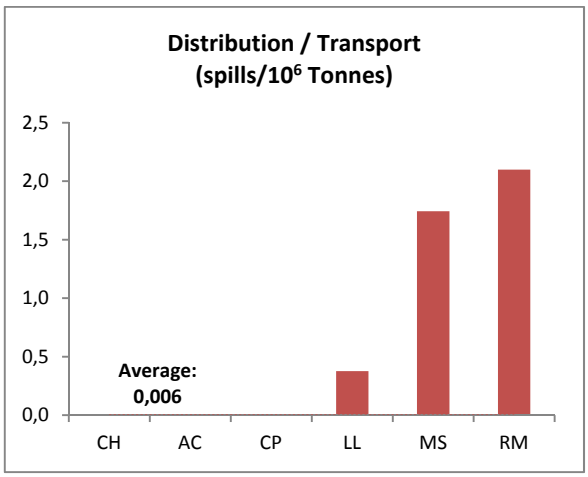


3.1.4 Distribution and Transport Spills

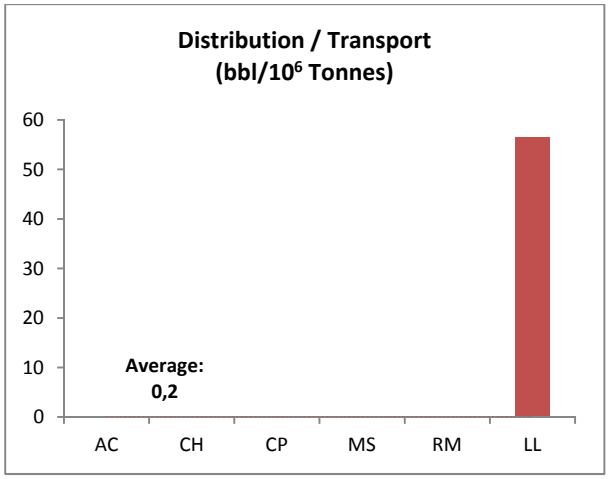
Sub-chapters 3.1.4.1 to 3.1.4.3 show the information in pairs of tables, the ones on the left corresponding to spilled barrels, and the ones on the right to the number of spills by million tonnes of product transferred to, from or within the company´s facilities, excluding pipelines, but including tankers, barges, trucks, trains and retail service stations in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

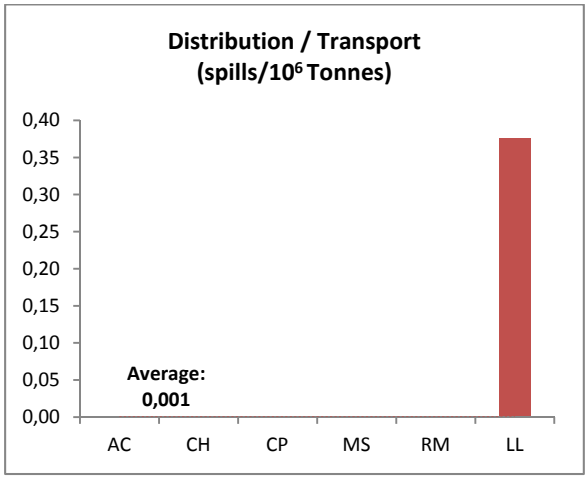
3.1.4.1 *In land spills from Distribution and Transport*



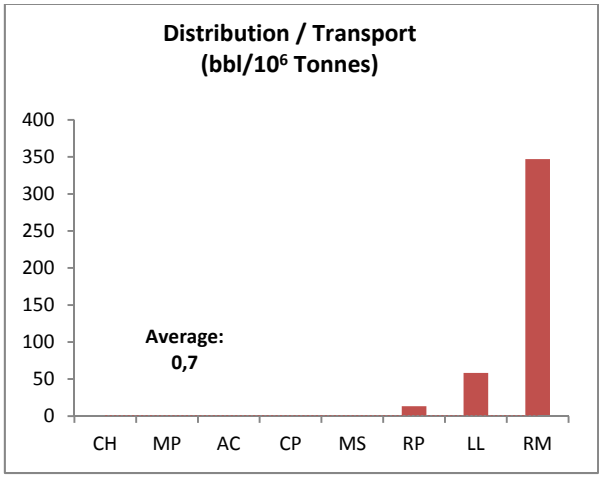


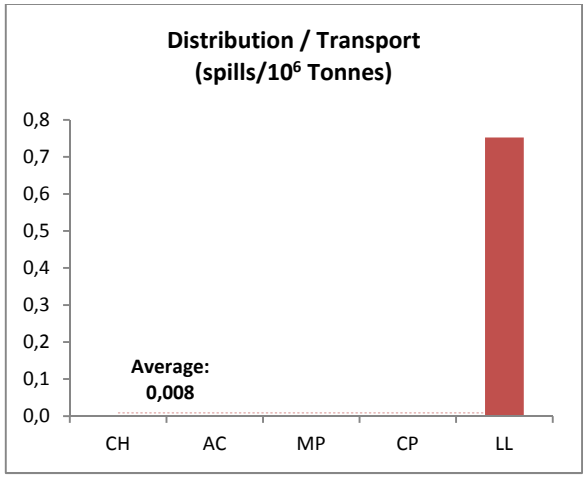
3.1.4.2 *In water spills from Distribution and Transport*





3.1.4.3 *Total spills from Distribution and Transport*

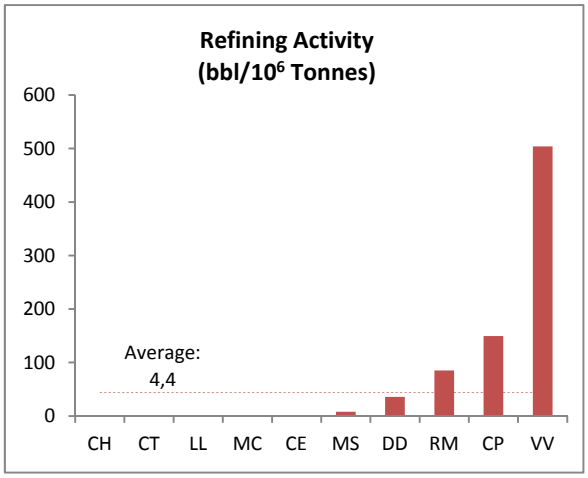


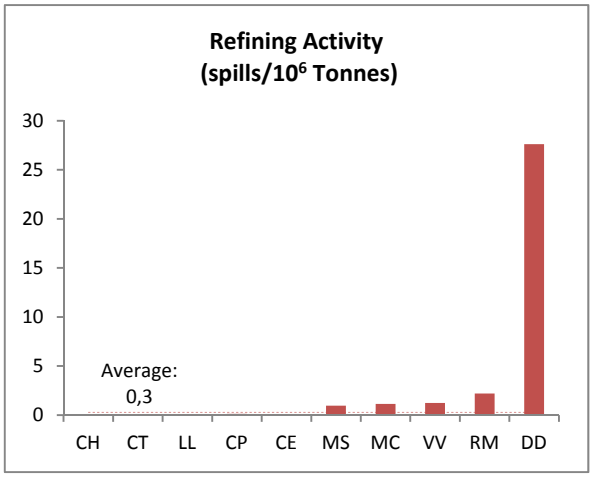


3.1.5 Refining spills

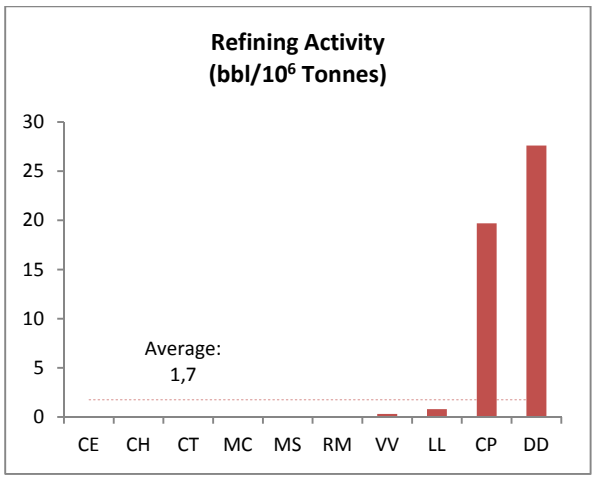
Sub-chapters 3.1.5.1 up to 3.1.5.3, the information is shown in pairs of tables, the ones on the left corresponding to spilled barrels, and the ones on the right to the number of spills by million tonnes fed to produce LPG, gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, and other products in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

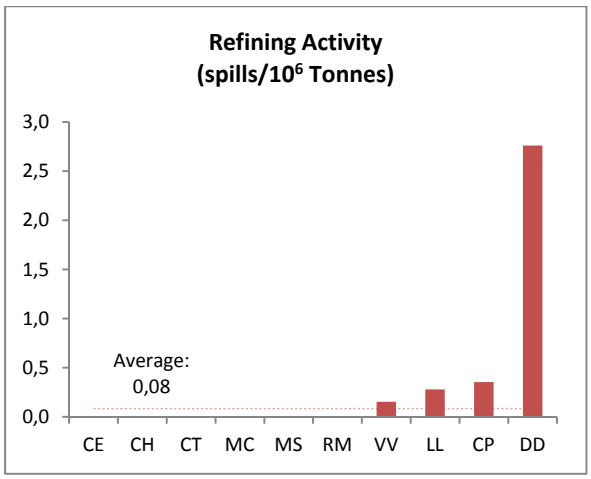
3.1.5.1 In land spills from Refining



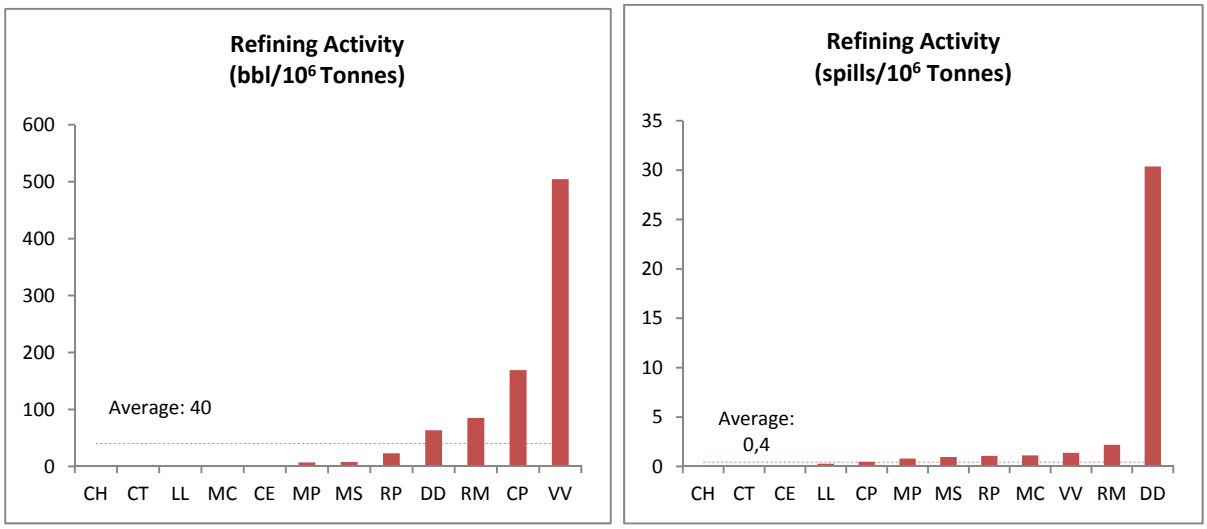


3.1.5.2 In water spills from Refining





3.1.5.3 Total spills from Refining



3.1.6 Petrochemicals' Spills

3.1.6.1 In land spills from Petrochemicals

Of the two petrochemical companies with operations, only one reported spills. The company reported a total of 0.78 spills and a volume of 3906 barrels by million tones of Petrochemical products produced or manufactured.

3.1.7 Comparing Spills for all functions

The table below compares the amount of total spills, the total volume spilled (in barrels) and the average volume of spill in each spill in 2010 for each of the Functions.

	Amount of total spills	Total volume spilled (bbl)	Average volume of spill per spill (bbl/spill)
E&P offshore	32	165.4	5.2
E&P onshore	2.044	23,188.8	11.3
E&P total	512	13,105.4	25.6
Pipelines	155	75,346.7	486.1
Terminals	16	482.8	30.2
Distribution & Transport	8	677.1	84.6
Refining	56	5,170.6	92.3
Petrochemicals	1	5,031.4	5,031.4

SUGGESTIONS FOR COMPANIES IN RELATION TO INDICATORS ASSOCIATED WITH SPILLS:

- Separate in your environmental information management systems:
  - The **source** of Exploration and Production spills. Some companies report in Table 3 "E&P onshore" and "E&P offshore", but they cannot report the spill source (Table 4) and they do it in Undefined E&P and the information processed in this way is not useful.
  - The **destination** of spills for all the functions. Some companies cannot inform if the spill was in land or in water and they load it in "Total". Environmental impact implications, as well as for the environmental, social and economic management are different if the spill was in land than if it was in water.
  - The **size** of the spills. Some companies do not classify the spills by its size and they report a total of spilled barrels. The decisions to be taken by the company in the future are different if they had 100 spills of 1 barrel than if they had 1 spill of 100 barrels.

3.2 Produced water: discharges and re-injection

The hydrocarbons´ production implies the extraction of water, usually called "produced water". This produced water can be discharged to the environment as it is extracted, or it can be previously treated. Whatever the treatment is, there is always some dissolved hydrocarbon in the produced water. The discharge of produced water to the surrounding environment can have a negative impact on the environment. Produced water can also be re-injected to the production well. The "produced water re-injection" is key for showing the environmental operative excellence during the hydrocarbons´ production.

The indicators presented in this chapter include:

- the quantity of produced water discharged (including the water that is treated and discharged on land)
- the quantity of hydrocarbon discharged in the produced water, and
- the quantity of water re-injected as a disposal management method.

Table 4 details the number of "companies-country" and the consolidated magnitude of the activities reported for Exploration and Productions in the following indicators: "Produced water discharge", "Oil discharged in produced water" and "Produced water re-injection". These indicators are classified by the source of the activity, that is: "E&P offshore", "E&P onshore" and "E&P undefined".

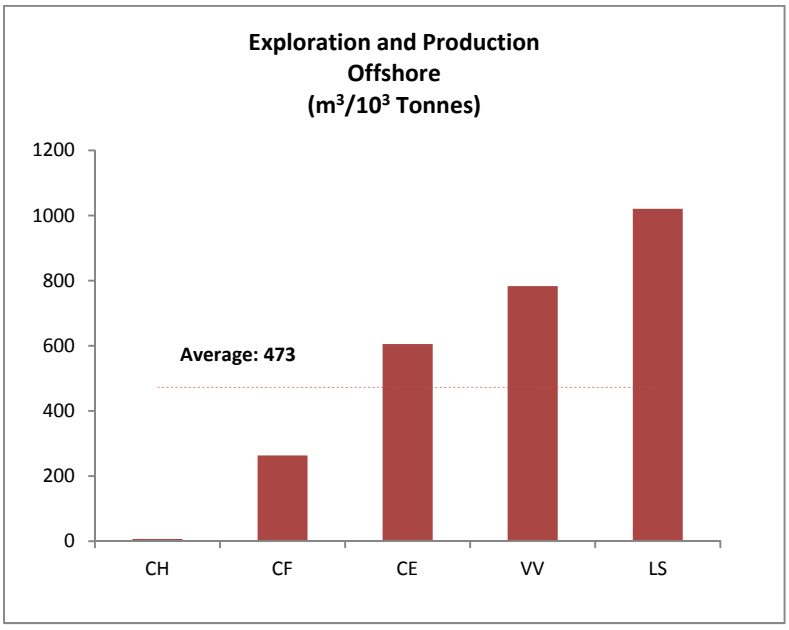
Table 4: "Companies-country" that reported data 2010 for "Produced water discharge", "Oil discharged in produced water" and "Produced water re-injection" indicators.

Consolidation of data (in 10^3 Tonnes) - Total reported data									
				Produced water discharge		Oil discharged in produced water		Produced water re-injection	
		Number of "companies-country that reported data	Total of operations (in 103 Tonnes)	Number of "companies-country that reported data	Total of operations (in 103 Tonnes)	Number of "companies-country that reported data	Total of operations (in 103 Tonnes)	Number of "companies - country that reported data	Total of operations (in 103 Tonnes)
Gross Hydrocarbon Production	Offshore	7	227.204	5	224.648	5	224.648	4	224.451
	Onshore	17	148.472	10	124.293	10	124.293	12	142.979
	Undefined	0	0	0	0	0	0	0	0
	Total	**19**	**375.676**	10	347.829	10	347.829	12	366.319

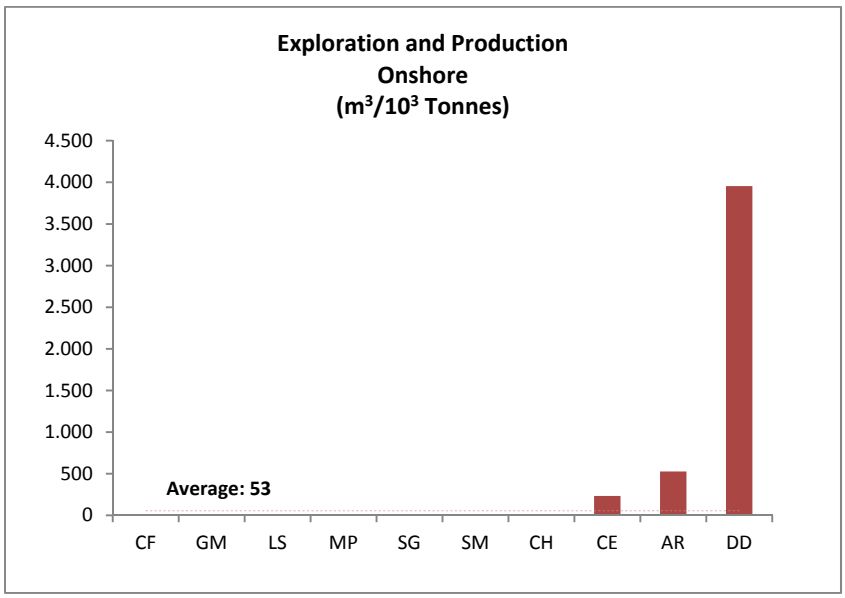
3.2.1 Produced water discharge

Sub-chapters 3.2.1.1 to 3.2.1.4 show the tables in cubic meters of produced water discharged to the environment per thousand tonnes of hydrocarbon produced in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

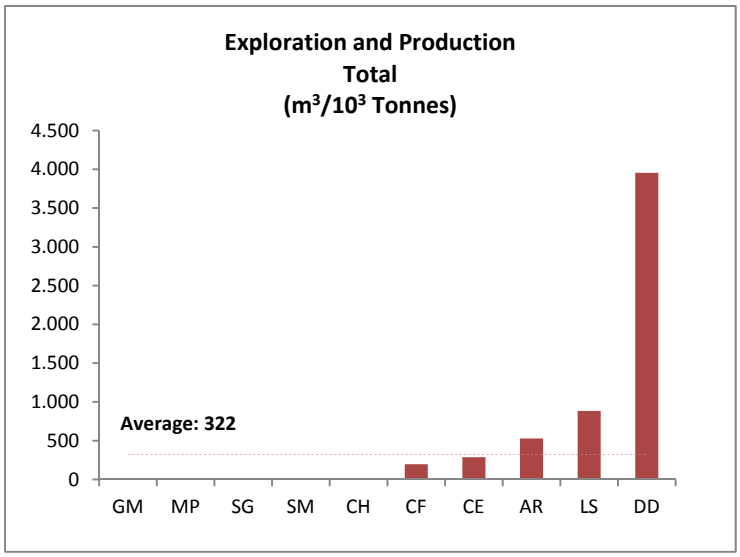
3.2.1.1 Produced water discharge from offshore Exploration and Production



3.2.1.2 Produced water discharge from onshore Exploration and Production



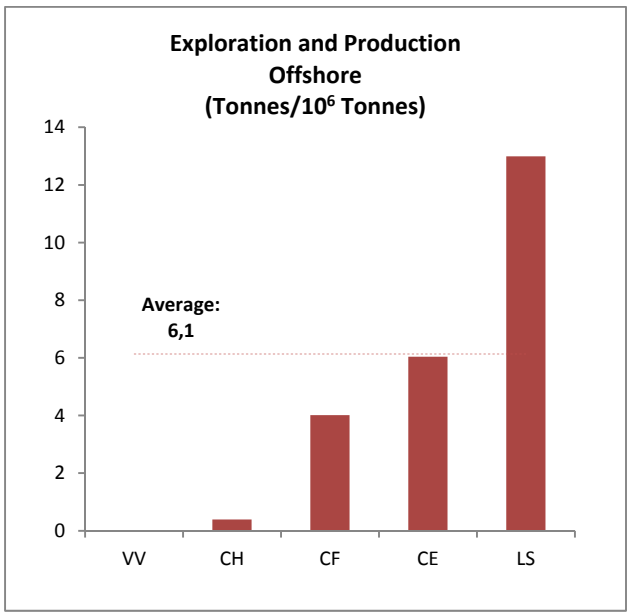
3.2.1.3 Produced water discharge from offshore and onshore Exploration and Production



3.2.2 Oil discharged in produced water

This indicator measures the tonnes of oil in produced water discharged to the environment per each million tonnes of hydrocarbons produced in 2010.

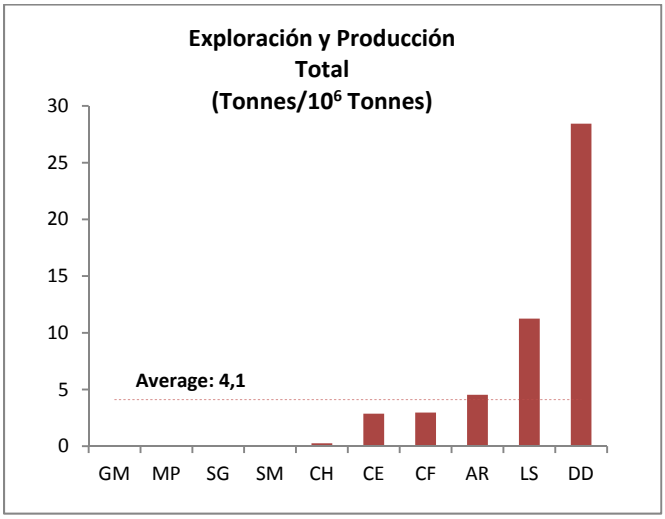
3.2.2.1 Oil discharged in produced water from offshore Exploration and Production



3.2.2.2 Oil discharged in produced water from onshore Exploration and Production

Only 4 companies, out of the ten that reported data of produced water discharged from onshore E&P activities, reported the quantity of oil contained in the discharged water. These 4 companies -as average- discharged 0.4 tonnes per million tonnes of hydrocarbons produced onshore. The other 6 companies reporting discharges of produced water of their onshore operations did not measure the oil content in the water discharged.

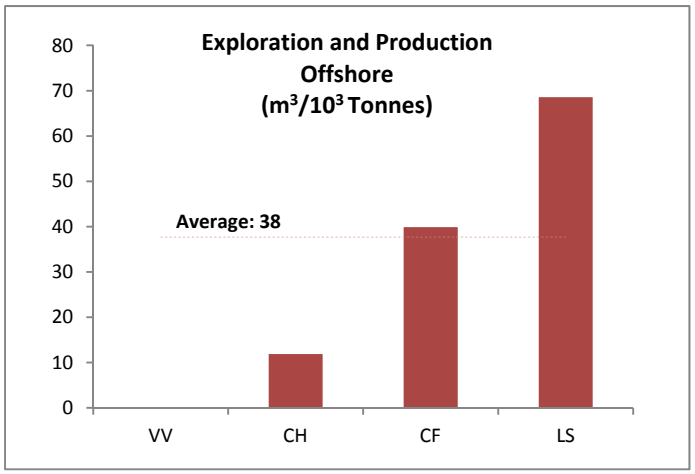
3.2.2.3 Oil discharged in produced water from total Exploration and Production



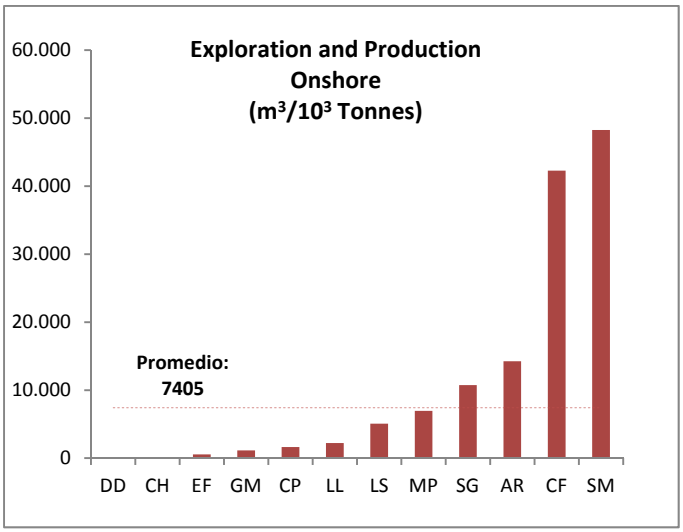
3.2.3 Produced water re-injected

Sub-chapters 3.2.3.1 to 3.2.3.3 show the tables of cubic meters of produced water re-injected per thousand tonnes of hydrocarbon produced in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

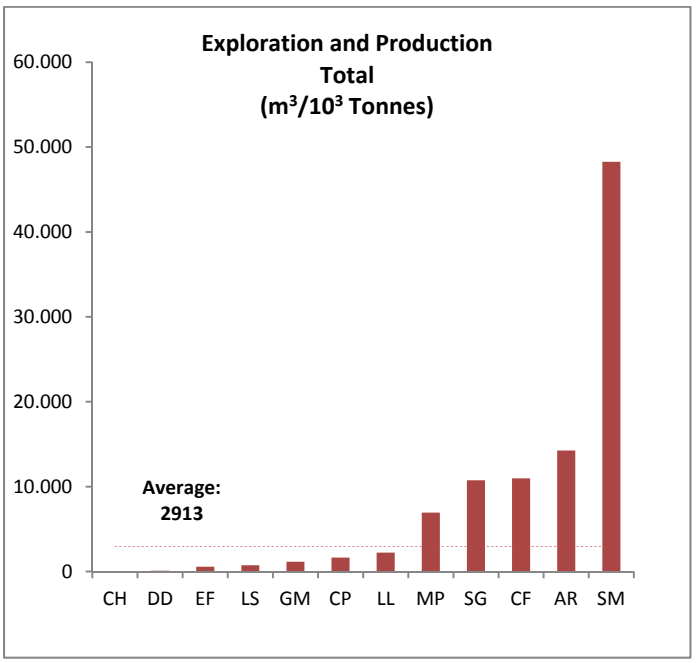
3.2.3.1 Produced water re-injected in offshore Exploration and Production



3.2.3.2 Produced water re-injected in onshore Exploration and Production



3.2.3.3 Produced water re-injected in total Exploration and Production



Note:

In **2010**, **ARPEL** member companies participating of this report -as average- discharged 322m^3 (see 3.2.1.4.) and re-injected 2913 m^3 (see 3.2.3.4.) per thousand tonnes of gross hydrocarbon production.

These figures can be compared with **OGP** results in **2010** in which companies -as average- discharged 600 tonnes and reinjected 1,000 tonnes per thousand tonnes of gross hydrocarbon production.

SUGGESTIONS FOR COMPANIES IN RELATION TO INDICATORS ASSOCIATED WITH PRODUCED WATER:

- It is vital that companies measure the quantity of oil associated to the discharge of produced water **and that they split, in their environmental information management system, if these quantities correspond to onshore or offshore E&P operations. Not doing it is an inadequate environmental practice that could even have legal implications since the oil content in the produced water discharged is regulated.**
- When analyzing the information on indicators associated with produced water, aspects that are not analyzed in this report should be taken into account. For example: a mature production field can have a great quantity of water associated to its production.

3.3 Controlled water and hydrocarbons discharges in process effluents

The use of water in the industry processes determines the possible environmental impact, due to the consumption of fresh water as well as to the quantity of dissolved or discharged hydrocarbons associated with the effluents. This indicator refers to the Exploration and Production, Pipelines, Terminals, Refining, Petrochemical and Distribution/Transport functions and it is used to establish the quantity of hydrocarbon discharged as effluent of facility processes- including onshore discharges to drain structures that connect to watercourses – for the reporting year. It has two elements:

- The quantity of water discharged (in m^3) normalized by the magnitude of the activity in each Function;
- The quantity of hydrocarbon discharged (in tonnes) normalized by the magnitude of the activity in each Function;

The ratio between the second and the first element is the concentration of hydrocarbons in the water discharged and the table calculates it automatically in the last column.

For the Exploration and Production function, these indicators DO NOT include produced water discharges or oil associated to produced water since they do not correspond to processes associated to the extraction of hydrocarbons but rather to the extraction of hydrocarbons itself and were already recorded in chapters 3.2.1 and 3.2.2..

Table 5 details the number of "companies-country" and the consolidated magnitude of the activities reported for each function in the following indicators: "Water discharged as process effluent" and "Hydrocarbon discharges in process effluents". The "Concentration of hydrocarbons in process effluents" indicator, is automatically calculated for those companies that reported information for the two first indicators[5].

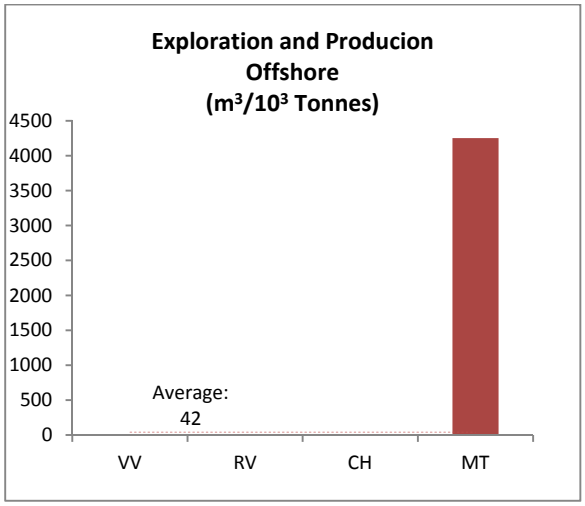
[5] *If companies report (zero) in "Water discharged as process effluent", then the "Concentration of hydrocarbons in process effluents" is not calculated.*

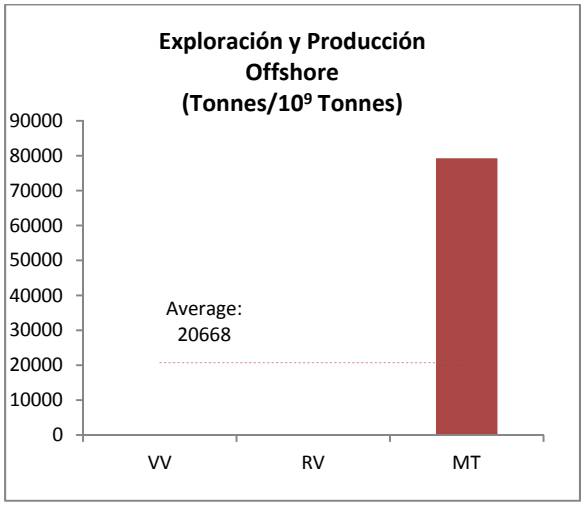
Table 5: "Companies-country" that reported for "Water discharged as process effluent", "Hydrocarbons discharge in process effluent" and "Concentration of hydrocarbons in process effluent" indicators

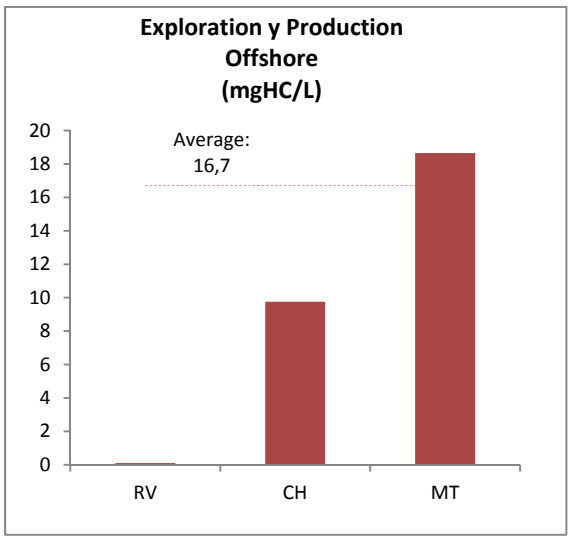
Consolidation of data (in 10^3 Tonnes) - Total reported data									
				Water discharged		Oil discharged in water		Concentration of Hydrocarbons in water	
		Number of "companies-country" that reported data	Total of operations (in 10^3 Tonnes)	Number of "companies - country" that reported data	Total of operations (in 10^3 Tonnes)	Number of "companies - country" that reported data	Total of operations (in 10^3 Tonnes)	Number of "companies - country" that reported data	Total of operations (in 10^3 Tonnes))
Gross Hydrocarbon Production	Offshore	7	227.204	4	124.196	3	3.668	3	123.085
	Onshore	17	148.472	11	126.526	9	90.939	6	70.786
	Undefined	0	0	0	0	0	0	0	0
	Total	**19**	**375.676**	13	351.649	12	331.899	9	193.871
Pipelines' Transportation		**11**	**15.925.084**	**7**	**15.419.214**	**6**	**15.371.211**	**3**	**15.365.226**
Terminals' Movement		**9**	**895.606**	**8**	**890.814**	**8**	**890.814**	**8**	**890.814**
Distribution / Transport		**9**	**1.016.020**	**6**	**349.555**	**5**	**348.238**	**4**	**346.809**
Refining Activity		**14**	**220.334**	**12**	**196.761**	**10**	**175.928**	**10**	**175.928**
Petrochemicals' Activitiy		**2**	**9.523**	**2**	**9.523**	**2**	**9.523**	**2**	**9.523**

3.3.1 Water and hydrocarbons – Offshore Exploration and Production

The tables in this sub-chapter show the quantity of discharged water (in m^3) per thousand tonnes (upper left) and the quantity of hydrocarbon discharged (in tonnes) per thousand million tonnes (upper right) of offshore produced hydrocarbons in 2010. The third table shows the concentration of hydrocarbons in discharged water in milligrams of hydrocarbon per litre. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

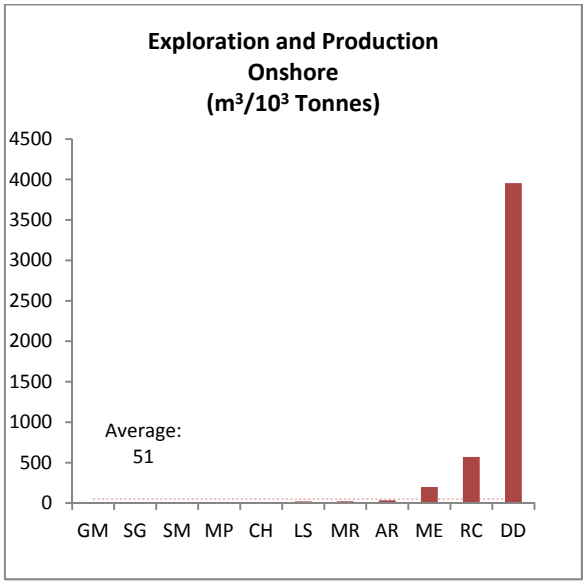


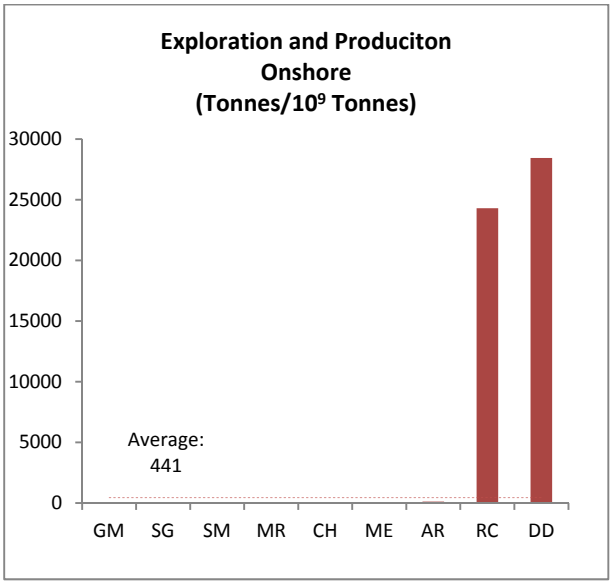


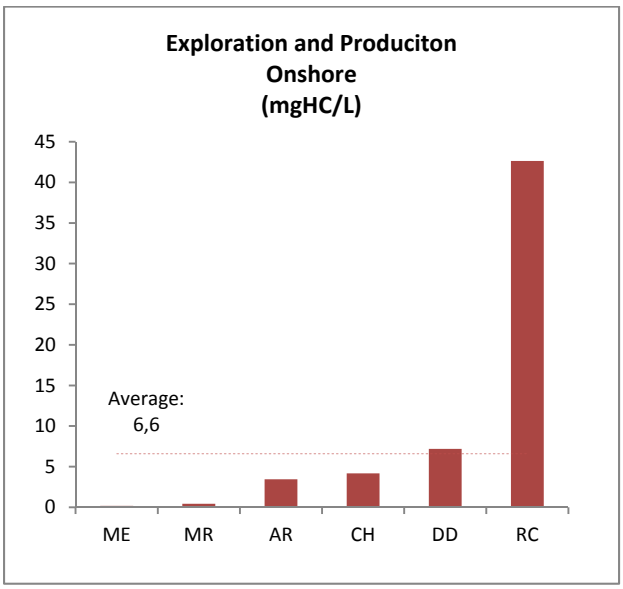


3.3.2 Water and hydrocarbons – Onshore Exploration and Production

The tables in this sub-chapter show the quantity of discharged water (in m^3) per thousand tonnes (upper left) and the quantity of hydrocarbon discharged (in tonnes) per thousand million tonnes (upper right) of onshore produced hydrocarbons in 2010. The third table shows the concentration of hydrocarbons in discharged water in milligrams of hydrocarbon per litre. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

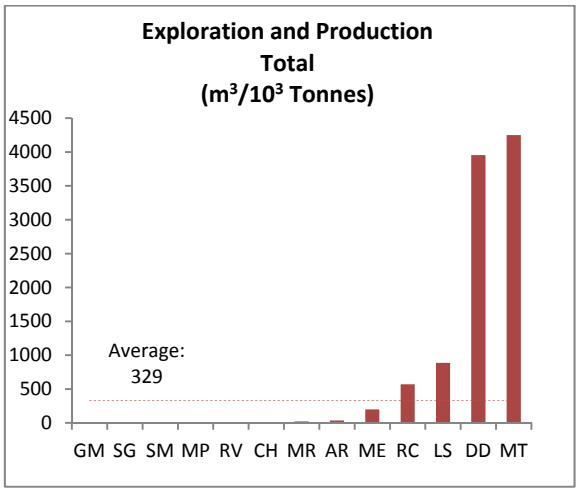


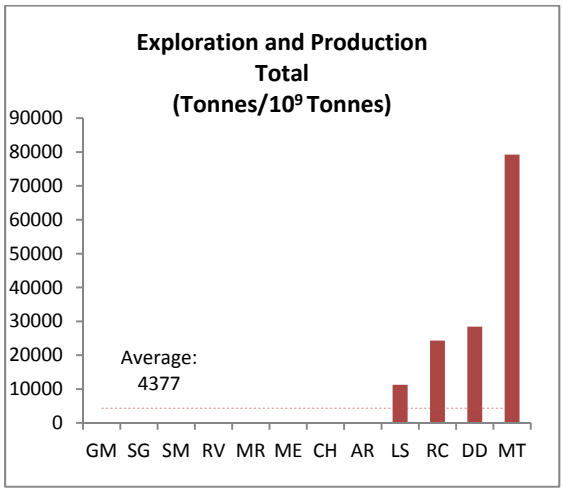


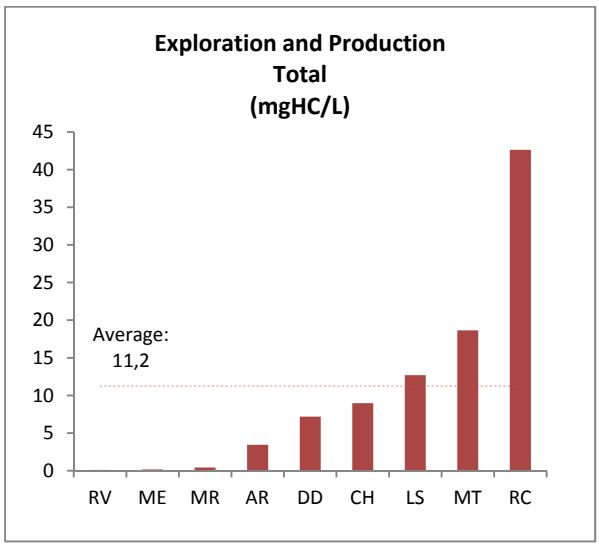


3.3.3 Water and hydrocarbons - total Exploration and Production

Tables in this sub-chapter indicate the quantity of water discharged as process effluent (in m^3) per thousand tonnes (upper left) and the quantity of hydrocarbons discharged (in tonnes) per thousand million tonnes (upper right) of hydrocarbons produced in 2010 from all sources: offshore, onshore and undefined. The third table indicates the concentration of hydrocarbons in water discharged as process effluent in milligrams per litre. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

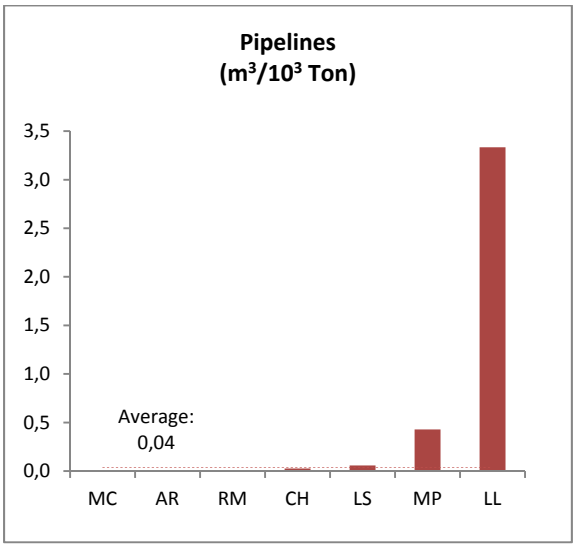






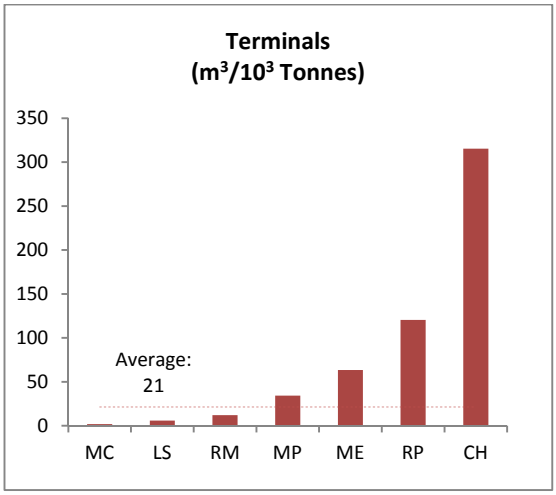
3.3.4 Water and hydrocarbons - Pipelines

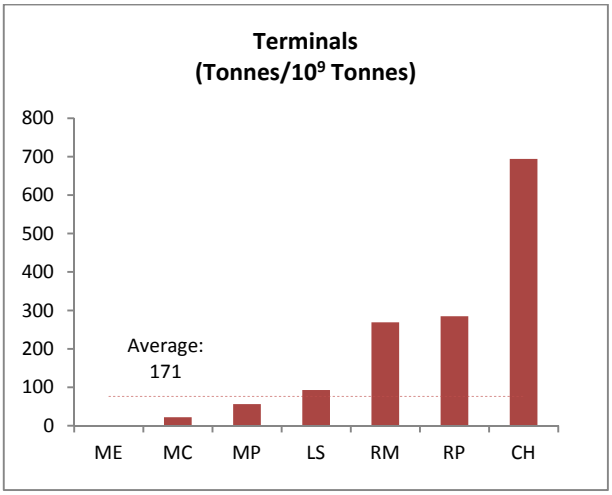
The tables in this sub-chapter show the quantity of discharged water (in m^3) per thousand tonnes. In the horizontal axis are the codes of each "company-country" reporting data of this indicator. Only one company reported data of hydrocarbons discharged (in tones) per thousand million tones and reported 0.22 Ton/10^9 Ton of product transported by pipelines among the different Functions in 2010. The concentration of hydrocarbons in water discharged was of 7.5 milligrams of hydrocarbons per litre.

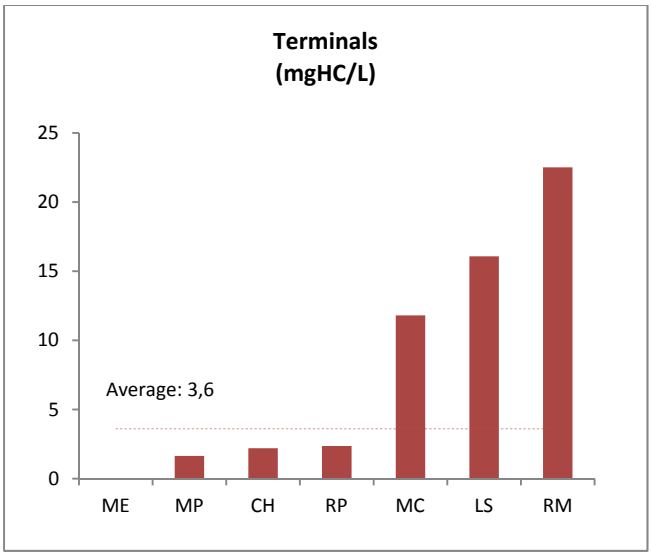


3.3.5 Water and hydrocarbons - Terminals

The tables in this sub-chapter show the quantity of discharged water (in m^3) per thousand tonnes (upper left) and the quantity of hydrocarbons discharged (in tonnes) per thousand million tonnes (upper right) of products transferred from the Terminals to other Functions in 2010. The third table shows the concentration of hydrocarbons in discharged water in milligrams of hydrocarbon per litre. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

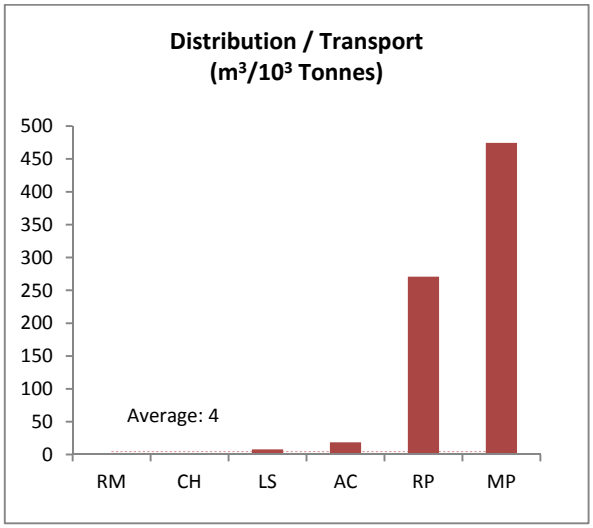


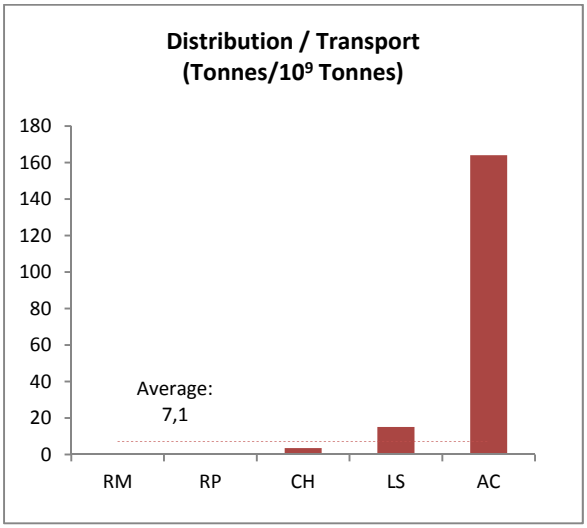


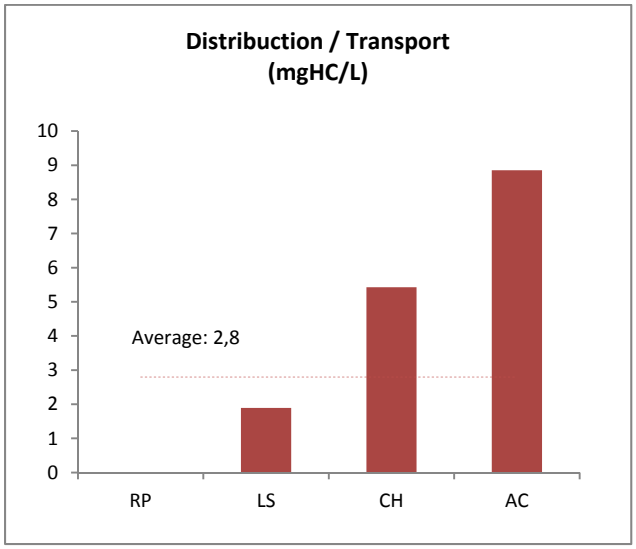


3.3.6 Water and hydrocarbons – Distribution/Transport

The tables in this sub-chapter show the quantity of discharged water (in m^3) per thousand tonnes (upper left) and the quantity of hydrocarbons discharged (in tonnes) per thousand million tonnes (upper right) of products transferred to, from or within the company´s facilities, excluding pipelines, but including tankers, barges, trucks, trains and retail service stations in 2010. The third table shows the concentration of hydrocarbons in discharged water in milligrams of hydrocarbon per litre. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

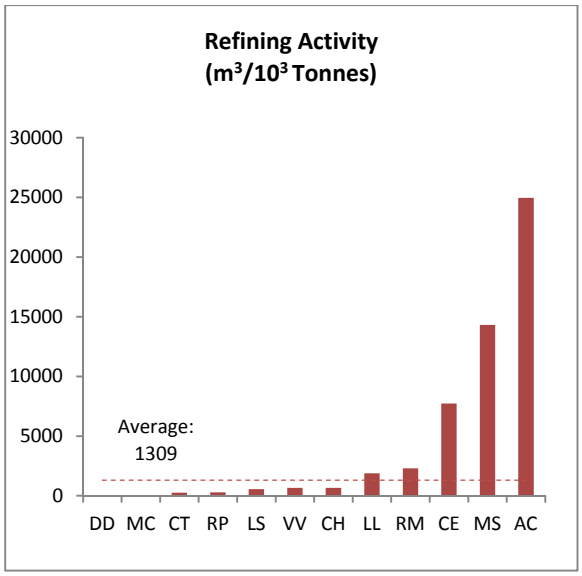


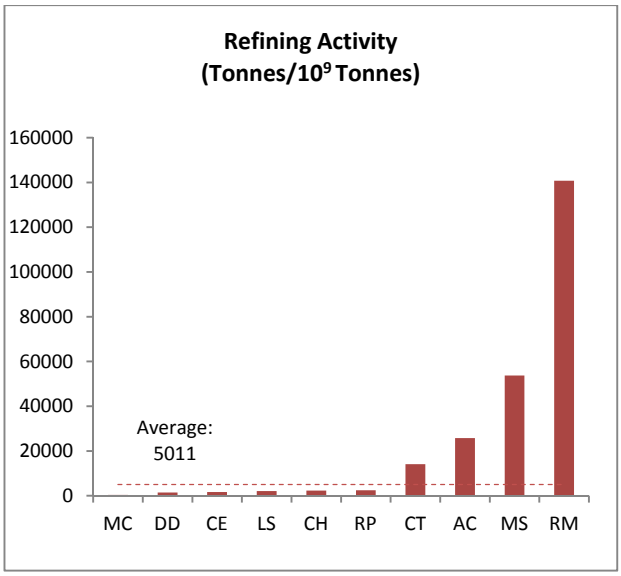


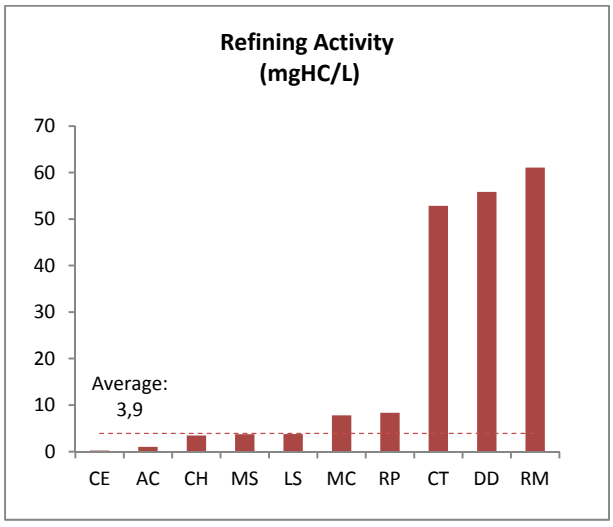


3.3.7 Water and hydrocarbons - Refining

The tables in this sub-chapter show the quantity of discharged water (in m^3) per thousand tonnes (upper left) and the quantity of hydrocarbons discharged (in tonnes) per thousand million tonnes (upper right) fed to produce LPG, gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants and other products in 2010. The third table shows the concentration of hydrocarbons in discharged water in milligrams of hydrocarbon per litre. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.







3.3.8 Water and hydrocarbons - Petrochemicals

As an average, 2861 m^3 of water per thousand tonnes and 6502 tonnes of hydrocarbons per thousand million tonnes of petrochemicals produced or manufactured where the chemicals are derived from petroleum or petroleum products in 2010 were discharged. The average concentration of hydrocarbons in water discharged was of 2.3 milligrams of hydrocarbons per litre.

SUGGESTIONS FOR COMPANIES IN RELATION TO INDICATORS ASSOCIATED WITH WATER AND HYDROCARBONS IN PROCESS EFFLUENTS:

- When analyzing the information on indicators associated with water and hydrocarbons in process effluents, aspects that are not analyzed in this report should be taken into account. For example: a more complex refinery may require a greater process water consumption than one that is less complex.
- Process effluents CAN NOT have 0 (zero) concentration of hydrocarbons. Should it be so, it would look like what is being measured is cooling water or other type of water stream that -although it might be part of the environmental information system, it must NOT be added to the calculation of water requested in this part since this indicator does NOT include "Water used in utilities and does not get in contact with hydrocarbons and is returned to the source" (see chapter 5.2.2 of the "Users Manual – ARPEL Database – Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean" - 1st revised edition, 2010)
- A larger data recording of water and hydrocarbons is noted for the Refining function, which seems logical given that the environmental control of refineries has long history in the countries of the region. However, it is recommended to measure and/or discriminate in the environmental information management system the concentration of hydrocarbons in the process effluents of all Functions.
- Hydrocarbons concentration in Refining process effluents for some companies (see 3.3.8.) is quite higher to the commonly accepted standard of 10 mgHC/L[6]. They should consider this issue and try to implement better practices to reduce this concentration to stricter standards.

[6] *See* IFC's Environmental, Health, and Safety Guidelines for Petroleum Refining (April 2007)

3.4 Disposal of hazardous and non-hazardous solid wastes

Effective waste management is an indicator of operational efficiency. Some hazardous wastes, when not properly managed, can have significant environmental, social and economic impacts. For the purpose of this report, "hazardous wastes" includes all waste that is defined as hazardous, toxic, listed, priority, special, or some other similar term as defined by an appropriate local regulatory agency or authority. "Local" refers to the point of waste generation. Disposal can then include: land filling or burning without waste recovery for energy; and/or management of waste other than with reuse purposes, recycling, reclamation or other beneficial use.

The following is NOT part of the results reported by 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 wastes
- For upstream operations, drilling operations, large one-time construction projects, remediation activities, and high-volume aqueous wastes that can result in large variations in hazardous wastes generated

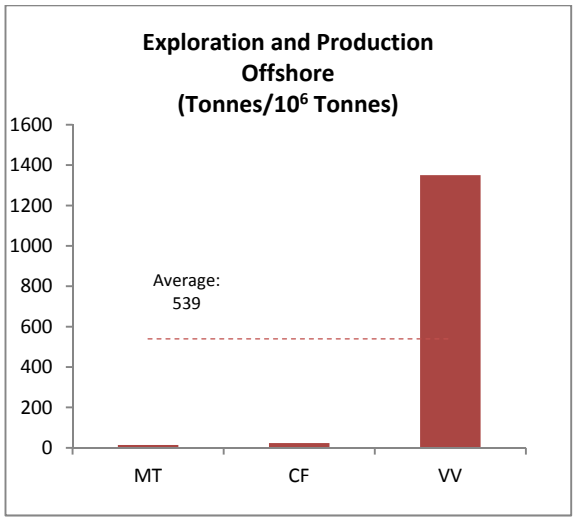
Table 6 details the number of "companies-country" and the consolidated magnitude of the activities reported for each Function in the "Disposal of hazardous wastes" and "Disposal of non-hazardous wastes" indicators.

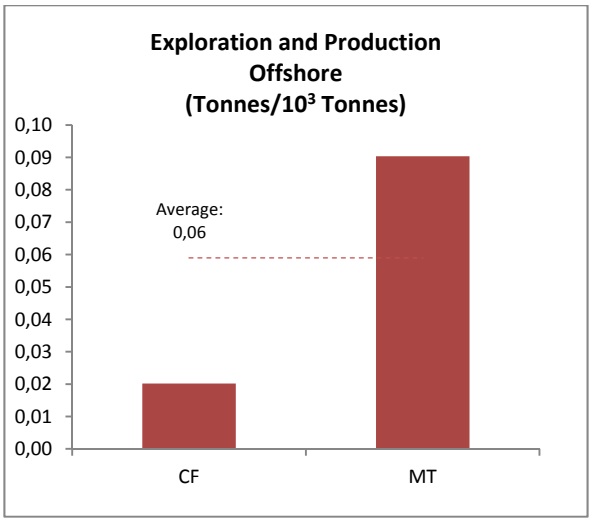
Table 6: "Companies-country" that reported 2010 data for "Disposal of hazardous wastes" and "Disposal of non-hazardous wastes" indicators

Consolidation of data (in 10^3 Tonnes) - Total reported data							
				DISPOSAL OF HAZARDOUS WASTES		DISPOSAL OF NON-HAZARDOUS WASTES	
		Number of "companies-country" that reported data	Total of operations (in 10^3 Tonnes)	Number of "companies-country" that reported data	Total of operations (in 10^3 Tonnes)	Number of "companies-country" that reported data	Total of operations (in 10^3 Tonnes)
Gross Hydrocarbon Production	Offshore	7	227.204	3	2.840	2	1.729
	Onshore	17	148.472	15	132.599	13	130.763
	Undefined	0	0	0	0	0	0
	Total	**19**	**375.676**	**18**	**375.641**	**16**	**255.970**
Pipelines' Transportation		**11**	**15.925.084**	**8**	**15.921.269**	**7**	**15.840.760**
Terminals' Movement		**9**	**895.606**	**7**	**884.449**	**6**	**562.097**
Distribution / Transport		**9**	**1.016.020**	**6**	**1.011.360**	**5**	**945.261**
Refining Activity		**14**	**220.334**	**12**	**219.361**	**11**	**121.662**
Petrochemicals' Activitiy		**2**	**9.523**	**2**	**9.523**	**2**	**9.523**

3.4.1 Hazardous and non-hazardous wastes – Offshore Exploration and Production

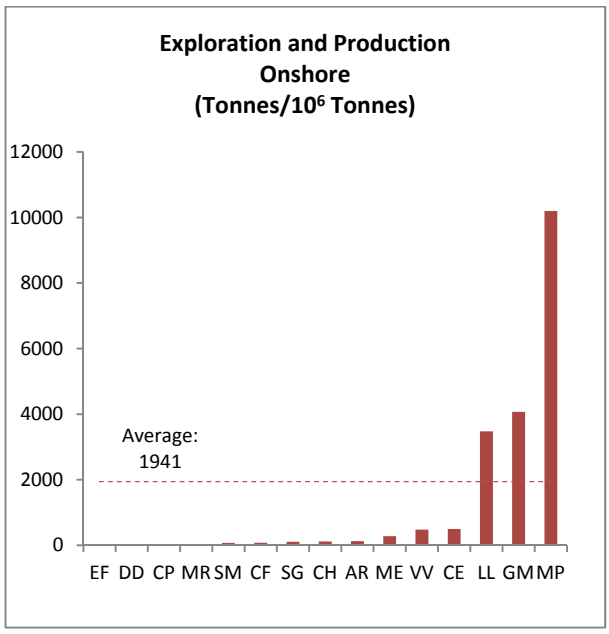
The tables in this sub-chapter show the quantity of hazardous wastes (in metric tonnes) per million tonnes (on the left) and the quantity of non-hazardous wastes (in metric tonnes) per thousand tonnes (on the right) of hydrocarbons produced offshore in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

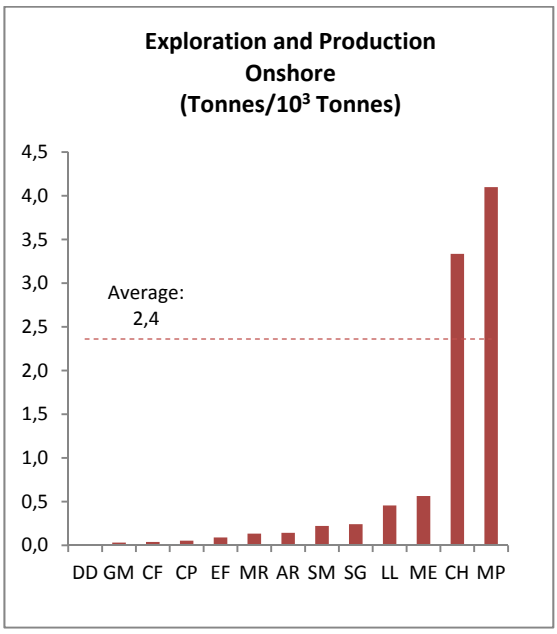




3.4.2 Hazardous and non-hazardous wastes – Onshore Exploration and Production

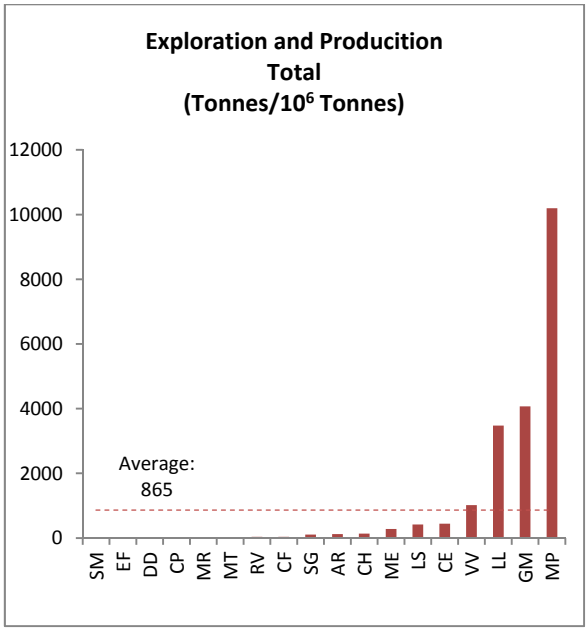
The tables in this sub-chapter show the quantity of hazardous wastes (in metric tonnes) per million tonnes (on the left) and the quantity of non-hazardous wastes (in metric tonnes) per thousand tonnes (on the right) of hydrocarbons produced onshore in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

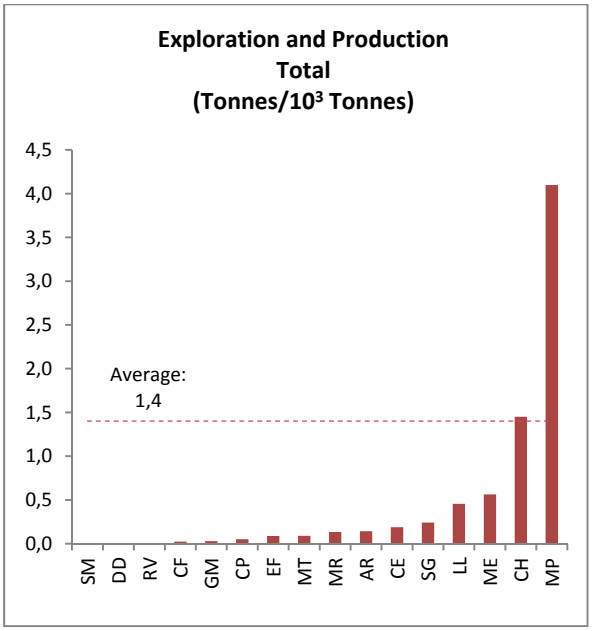




3.4.3 Hazardous and non-hazardous wastes – Total Exploration and Production

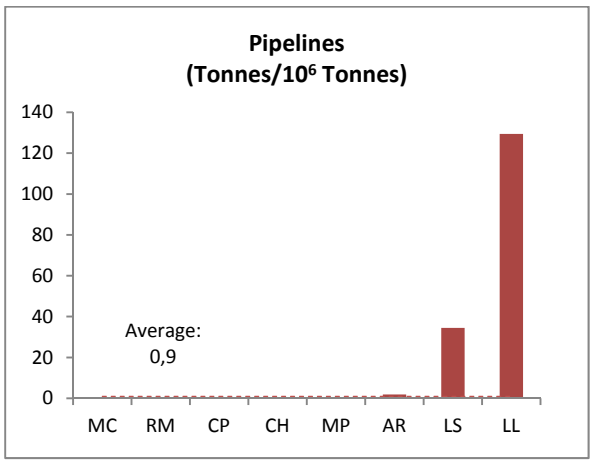
The tables in this sub-chapter show the quantity of hazardous wastes (in metric tonnes) per million tonnes (on the left) and the quantity of non-hazardous wastes (in metric tonnes) per thousand tonnes (on the right) of total hydrocarbons produced in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

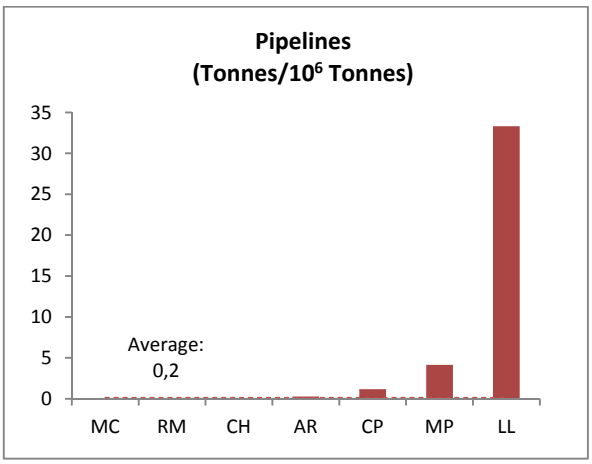




3.4.4 Hazardous and non-hazardous wastes - Pipelines

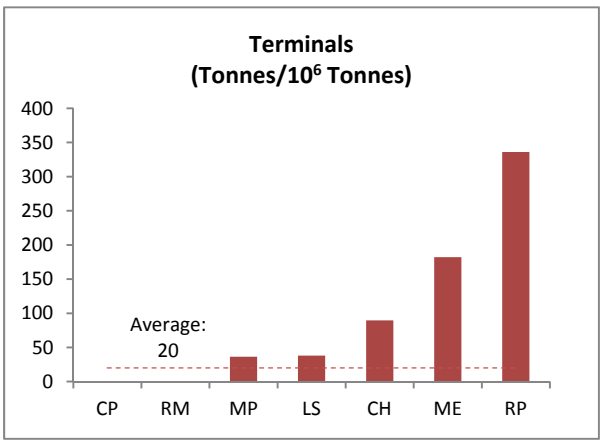
The tables in this sub-chapter show the quantity of hazardous wastes (in metric tonnes) per million tonnes (on the left) and the quantity of non-hazardous wastes (in metric tonnes) per million tonnes (on the right) of product transported by pipelines among the different Functions in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

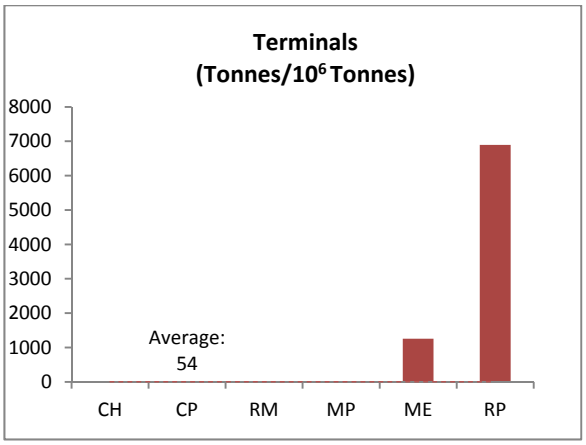




3.4.5 Hazardous and non-hazardous wastes - Terminals

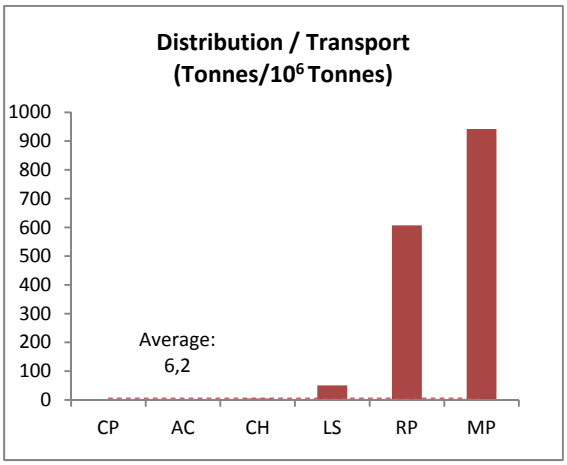
The tables in this sub-chapter show the quantity of hazardous wastes (in metric tonnes) per million tonnes (on the left) and the quantity of non-hazardous wastes (in metric tonnes) per million tonnes (on the right) of products transferred from the Terminals to other Functions in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

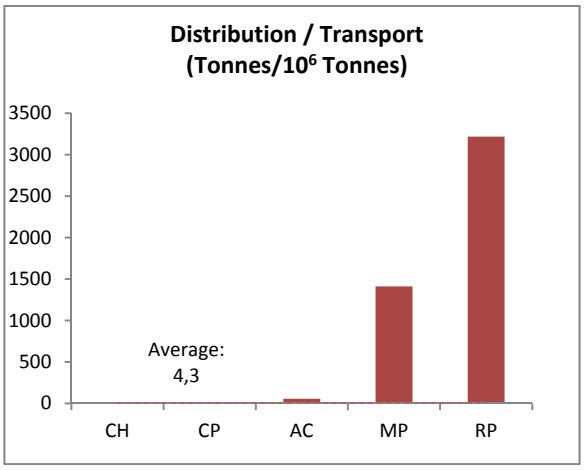




3.4.6 Hazardous and non-hazardous wastes – Distribution/Transport

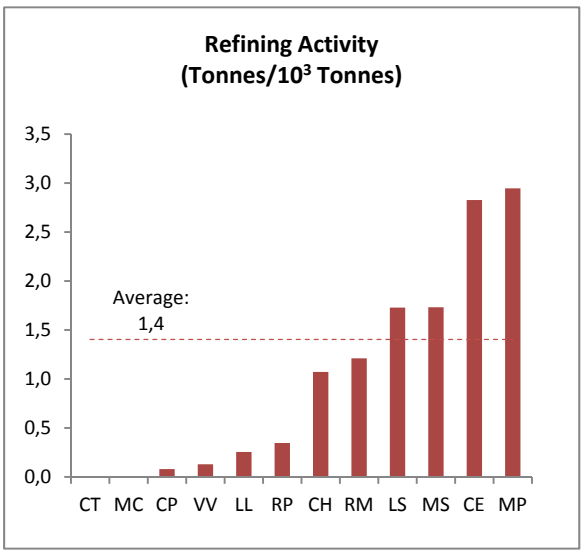
The tables in this sub-chapter show the quantity of hazardous wastes (in metric tonnes) per million tonnes (on the left) and the quantity of non-hazardous wastes (in metric tonnes) per million tonnes (on the right) of products transferred to, from of within the company´s facilities, excluding pipelines, but including tankers, barges, trucks, trains and retail service stations in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.

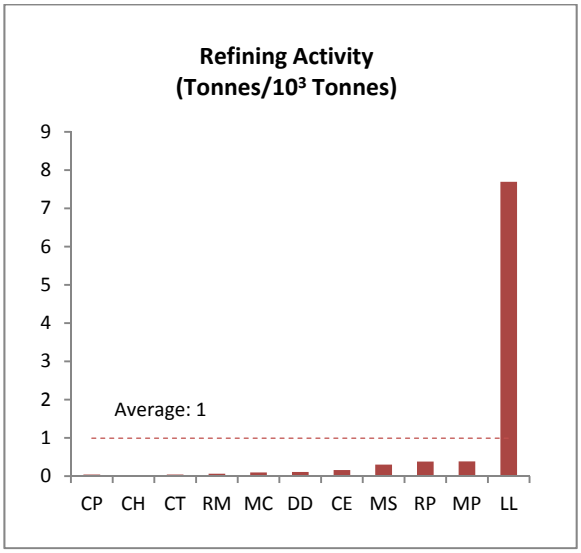




3.4.7 Hazardous and non-hazardous wastes - Refining

The tables in this sub-chapter show the quantity of hazardous wastes (in metric tonnes) per thousand tonnes (on the left) and the quantity of non-hazardous wastes (in metric tonnes) per thousand tonnes fed to produce LPG, gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, and other products in 2010. In the horizontal axis are the codes of each "company-country" reporting data of this indicator.





3.4.8 Hazardous and non-hazardous wastes - Petrochemical

As an average, 1.4 metric tonnes of hazardous wastes and 1.4 metric tonnes of non-hazardous wastes were disposed per thousand tonnes of petrochemicals produced or manufactured where the chemicals are derived from petroleum or petroleum products in 2010.

SUGGESTIONS FOR COMPANIES IN RELATION TO HAZARDOUS AND NON-HAZARDOUS WASTES INDICATORS:

- When analyzing the benchmarking information on solid wastes in operations, aspects that are not analyzed in this report should be taken into account. For example: a more complex refinery may generate fewer wastes than one that is less complex.
- A larger data-recording of wastes from E&P and Refining functions is noted, compared to other functions. It is recommended to measure/discriminate this information -in the environmental information management system- for all the Functions.
- Do not report the "exceptional" generation of solid wastes (see chapter 5.3 of the 1st edition of the User´s Manual – ARPEL Database "Benchmarking on Environmental Performance in the Oil and Gas Industry in Latin America and the Caribbean", 2010)

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

ARPEL is a non-profit association gathering companies and institutions of the oil, gas and biofuels sector in Latin America and the Caribbean. It was founded in 1965 with the primary purpose of promoting industry integration and growth as well as seeking ways to maximize its contribution to sustainable energy development in the region. Its membership represents over 90% of the upstream and downstream activities in the region and includes national and international oil companies, companies providing technology, goods and services to the industry value chain, and oil, natural gas and biofuels sector institutions. Since 1976 ARPEL holds Special Consultative Status with United Nations Economic and Social Council (ECOSOC). In 2006, the association declared its adherence to UN Global Compact principles.

Mission

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

- developing, sharing and disseminating best practices;
- carrying out studies that translate in information of value;
- broadening knowledge and helping build required competencies;
- networking and engaging members and stakeholders in constructive dialogue.

Vision

A growing, competitive and integrated oil, gas and biofuels industry that achieves operational and management excellence, and effectively contributes to the sustainable energy development in Latin America and the Caribbean.

Value proposition

ARPEL is a well established industry association in Latin America and the Caribbean, offering members a unique means for networking, sharing knowledge, joining efforts and building synergies in favor of the industry's competitive and sustainable development. As a recognized regional body of representation, the association also seeks to advocate in favor of the common interests of its membership and to enhance the industry's public image and reputation. A significant part of ARPEL´s value is reflected in its condition of cost-effective vehicle for the development of regional publications on best practices, emerging issues and sectoral studies, of value-added service center, and of means of access to non-reimbursable financial resources for projects related to the social and environmental management improvement of its member companies.

Socio-environmental sustainability
Operational excellence
Sectoral development

Empresas Asociadas / Member Companies

Instituciones Asociadas / Member Institutions

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