Weathering Collapse:

An Assessment of the Financial and Operational Situation of the Venezuelan Oil Industry

Igor Hernández and Francisco Monaldi

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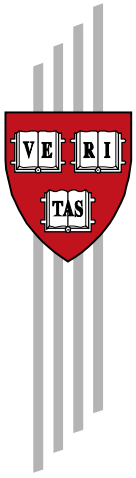

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Center for International Development
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WEATHERING COLLAPSE:

AN ASSESSMENT OF THE FINANCIAL AND OPERATIONAL SITUATION OF THE VENEZUELAN OIL INDUSTRY

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November, 2016

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I. Introduction

Venezuela has one of the most abundant geological endowments in the world. Oil proven reserves are among the largest globally, even if a more conservative criterion than the one used by the current government is applied. However, these resources are qualitatively different than those of other abundant regions such as the Middle East. The large majority constitutes extra-heavy oil, which generally requires higher oil prices to be extracted profitably.

During the last decade, the Venezuelan oil industry wasted a unique opportunity to increase investment and production. At the high oil prices that prevailed, the massive oil reserves could have been monetized by rapidly increasing production with a large margin of profitability. Quite to the contrary, production steadily dropped due either to lack of investment in the new unconventional oil projects or for failing to compensate the decline of the older conventional fields. It is a tragic story of great potential with dismal performance.

A series of trends were negatively impacting the Venezuelan oil industry even before the oil price collapse in 2014. From the revenue side, although oil prices showed an increase in real terms of 120% between 2000 and 2014, the barrels that effectively generate cash for Venezuela have shown a continuous decline. This is not just because production has been declining for the most part during the last eighteen years (a trend that has gotten significantly worse during the last year), but also because of a number of developments. First, during that period, total exports have declined more rapidly than production, and recently, net exports have declined more than total exports. Consumption in the massively subsidized domestic market increased until 2013 (when it started to decline likely because of the recession in the local economy), while imports of oil products for the domestic market have increased since 2012. The domestic market not only generates negative cash-flow for the national oil company (NOC), PDVSA, but also its expansion reduced the barrels available to export. More recently, there has also been an increase in imports of light oil and naphtha as diluents for the extra-heavy oil. Second, the Venezuelan production basket has become heavier and the share of unconventional production, generally less profitable, has increased. Third, the production wholly operated by PDVSA has been falling much more rapidly, while the production share of joint-ventures increased. Fourth, a significant share of the exports to Latin America and the Caribbean is subsidized (although these exports have declined recently). Fifth, some oil exports are committed to repay debts of PDVSA and specially the Venezuelan government, limiting the actual cash flow received by the company. In particular, the government's debt agreements with China involve a significant and increasing amount of production, although recently those agreements were restructured, allowing for a grace period with no capital amortization. From the expenditure side, PDVSA was increasingly responsible of carrying social expenditures and activities not related to the oil industry, which limited the resources for highly profitable investments. That is in addition to the increased fiscal take due to changes in the tax legislation. Also, higher investment requirements due to an increase in the equity share of PDVSA in joint venture projects, has had an impact on its cash flow.

The explanations for the underperformance of the Venezuelan oil industry basically fall into two connected categories: the multiple problems facing PDVSA; and the increase in above-ground risks for foreign investors operating in the country. The deterioration of the institutional framework, led to radical fiscal and regulatory changes, and to the nationalization of the majority of the industry. In

addition, the substantial over-extraction of resources from the NOC, the significant macroeconomic distortions affecting the cost structure of oil companies, and the constraints imposed by the energy infrastructure and human capital availability; have combined to produce dismal results. The massive firing of the majority of the management and technical experts from PDVSA in 2003 following the political conflict that led to a strike, has left the company with limited capabilities to operate effectively.

The recent decline in oil prices, and the changes in the international market structure, have exposed more dramatically the difficulties facing the Venezuelan oil sector, and call into question its ability to prevent a continuation of the declining trend in oil extraction. This situation becomes particularly severe if we take into account the cash flow constraints facing PDVSA, as well as its multiple operational problems, power cuts, and conflicts with oilfield services providers. These challenges are proportional to the enormous investments required to finance the projects in the Orinoco Oil Belt, where most of the reserves in Venezuela are located, and where the quality of the crude and the lack of development of the region, are just two of the many issues that need to be addressed.

Since this paper is part of a wider project to understand the macroeconomic challenges facing the country in 2016-17, it focuses narrowly on the financial problems of the oil industry in the short-term and the operational challenges that could impede its recovery in the next couple of years. Within this context, it largely analyzes the upstream operations, i.e. oil extraction, rather than the downstream, given that in the former is where the oil rents are generated and constitutes the main source of foreign exchange and fiscal revenues of Venezuela. Other areas for further research are mentioned at the end of the document.[2]

Official figures are used to the extent that they are publicly available. An important aspect that prevents an exhaustive evaluation of the oil sector in Venezuela is the lack of available information regarding key performance indicators affecting the cost structure of oil projects, the cash flow of PDVSA, and the fiscal contributions of the oil sector to the government, among other important variables. Thus, on occasion, estimations for variables of interest and explanations for their divergence from official figures are provided.

The paper has two main sections. The first one analyzes the issues affecting the cash flow of PDVSA, the effects of macroeconomic and fiscal variables on both revenues and costs, as well as other financial issues affecting the performance of the company. The second section discusses some of the operational challenges facing the industry and mentions areas for further research.

[2] For a more general overview of the recent developments of the oil sector in Venezuela see Monaldi (2015).

II. Some considerations on PDVSA's Financial Situation

Because of the changes in the Hydrocarbons Law in 2001, the nationalization process, and the current equity structure of the joint-ventures (the so called Mixed Enterprises); PDVSA has majority ownership in every oil venture. According to the latest estimate available, the NOC is responsible for at least 81% of the total investment.[3] Given the importance of oil, which generates more than 90% of the country's total exports, PDVSA is of crucial importance for the analysis of the balance of payments and the fiscal situation of Venezuela. This section of the report offers an analysis of PDVSA's cash flow and the transfers made to the government.

II.1 Revenue considerations

This sub-section discusses the revenues of the company. It begins with the operational side and concludes with the impact of current trends on the revenue generation of PDVSA.

Oil prices reflect an entirely different market

Although the focus of this report is placed on operational and financial considerations within PDVSA, the fact that current oil prices have shown a dramatic fall over the last two years is an element that ultimately cannot be neglected to understand the magnitude of the constraints facing the industry, and is the main factor behind the shift in production targets for PDVSA, as inferred from recent financial statements of the company.

As shown in Figure 1, after an increase of almost 500% in real terms between 1998 and 2014, the price of the Venezuelan oil basket has seen a decrease of more than 60% between 2014 and 2016. This is due to changed market fundamentals that could imply substantial uncertainty in the coming years. Current market expectations indicate that global benchmarks could rise to levels near US$ 60 per barrel for 2017, which reflect markedly different perspectives for the industry in Venezuela compared to previous years, as resources for investment have been reduced locally and globally.[4]

Fluctuations in oil prices become critical when describing the fluctuations in the cash flow for PDVSA, which is why we evaluate different scenarios in the cash flow exercise of section II.5. Understanding future market scenarios will be important for any planning exercise, but are beyond the scope of this report. The analysis that follows will be primarily focused on variables that are affected by current institutional and macroeconomic context in Venezuela.

[3] Per the Hydrocarbons Law of 2006, the State reserves the right to participate in upstream activities for the oil sector whether by itself or in the form of Mixed Enterprises, in which the State has the majority ownership (at least 51% of the equity of the company)

[4] A survey of market analysts in August 2016 revealed that the median of estimates for oil prices in 2017 was US$ 57/barrel, revealing a very slow process of rebalancing of oil markets http://www.bloomberg.com/news/articles/2016-08-01/looking-beyond-a-bear-market-analysts-see-57-crude-next-year

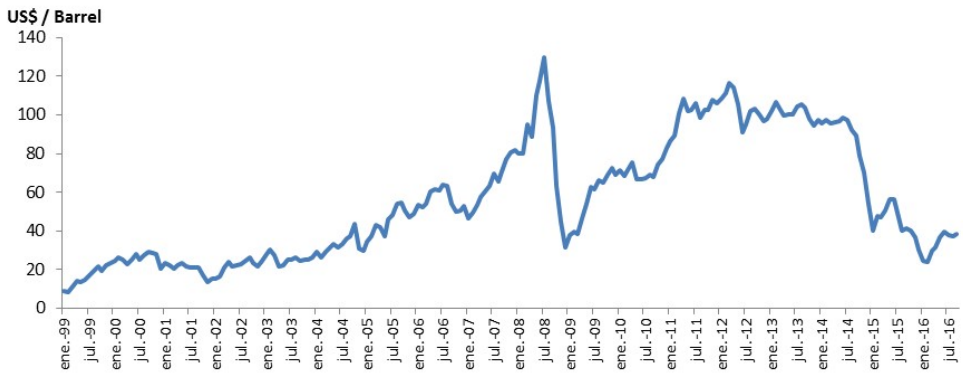


Figure 1: Evolution of the Venezuelan Basket Price

Source: Ministry of Oil and Mining

Production declining and getting heavier

Between 2010 and 2015, oil production in Venezuela registered a cumulative decline of 253 thousand barrels per day (kbd),[5] reaching 2.86 million barrels per day (mbd) by the end of 2015. Out of this, 2.75 mbd are crude production (including condensates) and 117 kbd are from NGL.

Figure 2 is based the monthly data provided by the Ministry of Oil and Mining to OPEC (available since 2012) and shows that the decline in oil production has accelerated during 2016. Just from December 2015 to September 2016, cumulative decline has been approximately 235 kbd. Meanwhile, the number of active rigs has declined from 70 in December of 2015 to 51 in September of 2016.[6] It is worth mentioning that since 2002, there have been significant discrepancies in the figures reported by sources such as PDVSA and Ministry of Oil and Mining, and estimates from secondary sources such as OPEC's own calculations or companies like BP.[7]

As shown in Figure 3, even when investments in Exploration and Production (E&P) were increasing (period 2010-2012) the output showed a consistent decline. This could reflect the effect of limited investment in previous years or diminished efficiency in the E&P investment. If we consider the evolution of oil production by region (using PDVSA categories reported in their financial statements and annual reports shown in Table 1), the only region that showed an increase in production during the period was the Orinoco Oil Belt, with a cumulative increase of 12.0%, whereas the East and West regions showed cumulative declines of 24.3% and 15.8% respectively. It should be noted that the Orinoco Oil Belt is a region where the reserves are largely comprised of heavy and extra-heavy grades, while the latter are mostly comprised of light and medium grades.

[5] PDVSA annual management report.
[6] Baker Hughes rig count.
[7] On average, since January 2012 when monthly data on production is available from official sources, to July 2016, the average difference between production reported by the Ministry and estimated production from OPEC is of 375 kbd.

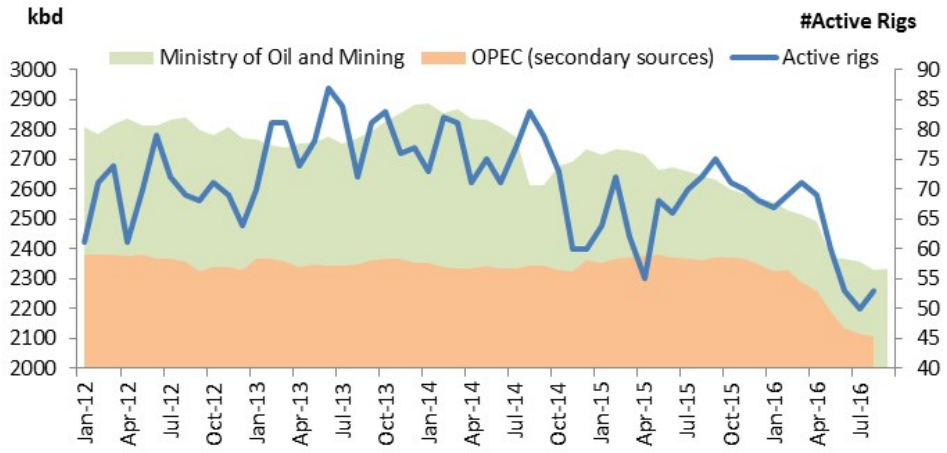


Figure 2: Monthly oil production and active rigs

Source: OPEC Oil Monthly Report and Baker Hughes

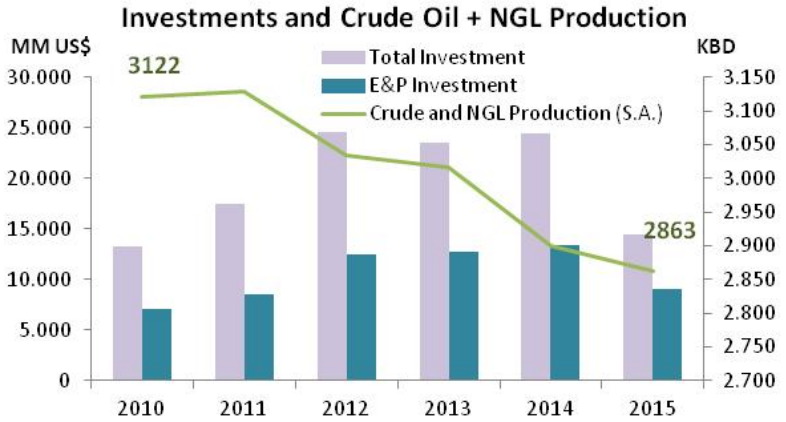


Figure 3: Evolution of oil production and investment in Venezuela

Source: PDVSA Annual Management Report 2010-2015 and Ministry of Oil and Mining Annual Report 2015. Note: Total Investment includes E&P, Refining, Commerce and Supply, Gas and non-oil activities

Crude and NGL Production (kbd)

Region	2010	2011	2012	2013	2014	2015	Change 2015/2010
West	843	810	799	777	750	707	-16.1%
East	1,101	1,106	1,061	964	903	837	-24.0%
Orinoco Oil Belt	1,178	1,213	1,174	1,274	1,246	1,319	12.0%
Total	**3,122**	**3,129**	**3,034**	**3,015**	**2,899**	**2,863**	-8.3%

Table 1: Evolution of oil production by region in Venezuela.

Source: PDVSA Financial Statements 2010-2015.

It is important to consider that the decline in production comes from areas that are entirely operated by PDVSA, which register cumulative decline of 586 kbd (27.5%) between 2010-2015. In areas operated by Joint Ventures, there has been an increase of 357 kbd (42.3%) as reported by Table 2.

Crude Production by type of contract (kbd)							Change
Region	2010	2011	2012	2013	2014	2015	2015/2010
Fields solely operated by PDVSA	2,130	2,080	1,835	1,775	1,639	1,544	-27.5%
Joint Ventures	845	911	1,075	1,124	1,146	1,202	42.3%
Total Crude Production	**2,975**	**2,991**	**2,910**	**2,899**	**2,785**	**2,746**	-7.7%
NGL	147	138	124	116	114	117	-20.4%
Crude + NGL Production	**3,122**	**3,129**	**3,034**	**3,015**	**2,899**	**2,863**	-8.3%

Table 2: Evolution of oil production by type of contract in Venezuela

Source: PDVSA and CIEA calculations

This evolution in in stark contrast with PDVSA ambitions, reflected in the Plan Siembra Petrolera (Oil Sowing Plan), which had a target oil production of 5.8 mbd by 2012. As shown in Table 3, actual production was 50% lower than targeted (2.9 mbd vs. 5.8 mbd planned).

	2005	2012		Change	2019	2025
	Real	Target	Real	2012/2005	Target	Target
Production (KB/D)	3,269	**5,837**	2,910	-11%	**6,000**	**3,150**
Orinoco Oil Belt	600	**1,200**	1,174	96%	**4,000**	**1,929**
East / West	2,669	**4,637**	1,736	-35%	**2,000**	**1,221**

Table 3: PDVSA plans and results.

Source: PDVSA Annual Management Reports, several years. PDVSA bond exchange offer 2017-2020

PDVSA revised its targets in a new Plan Siembra Petrolera, to 6 mbd by 2019, of which 4 mbd would come from the Orinoco Oil Belt, 2.1 mbd from the new projects approved in 2010 operated by Joint Ventures between PDVSA and consortia of foreign investors, including Chinese, Indian, Russian, and U.S. oil companies. The existence of massive deposits of crude oil with low geological risk in this area was the driver for such an ambitious plan.

However, according to local estimations, in 2015 the main projects of the Plan Siembra Petrolera showed an average progress as related to that year's target. The deficits range from more than 60% in production projects in Eastern areas, to less than 5% in some of the new developments in the Orinoco Oil Belt. As shown in Table 4, using the original targets and comparing them with the most recent report of the Ministry of Oil and Mining, production in the new Orinoco projects had reached only an average of 5.8% of the expected output, and one project had not even started production.

Greenfield projects Orinoco Oil Belt

Thousand barrels per day (kbd)

		2015		%	2019
Field	Mixed Enterpise	Projected	Real	Progress	Forecast
Junin 2	Petromacareo	200	0	0.00	200
Junin 4	Petrourica	250	1.1	0.44	400
Junin 5	Petrojunin	200	8.3	4.15	240
Junin 6	Petromiranda	100	8.8	8.80	450
Carabobo 1	Petrocarabobo	100	16.2	16.20	400
Carabobo 3	Petroindependencia	100	20.7	20.70	400
Total		950	55.1	5.80	2090

Table 4: Development of new projects in the Orinoco Oil Belt.
Source: Ministry of Oil and Mining and CIEA calculations

This severe underperformance led PDVSA to revise their production targets again. As per the new business plans, the expectation is to increase oil production capacity to 3.18 mbd by 2025, including existing production and the expansion of the Orinoco Oil Belt (offshore), NGL, and the mature areas. The revised target reduces almost by half the goal proposed by PDVSA in the last Plan Siembra Petrolera. This could be interpreted as a consequence of the decline in oil prices, but ultimately reflects the challenges in reversing the declining production trend over the last decade.

Internal consumption and non-cash exports

Beyond declining production, PDVSA's cash balances are also impacted by highly subsidized domestic consumption which is equivalent to 21% of total production. Compounding this issue further, PDVSA does not charge market prices for some of its exports.

Prices for fossil fuels in the domestic market have been almost negligible in recent years. For example, the price of gasoline, at the official exchange rate, was US$ 0.015 per liter in 2014, the lowest in the world (compared to a world average of US$1.38 per liter)[8]. Given these extremely low prices, the implicit subsidies for local consumption are very large. For the period 2010–2015, gasoline and diesel subsidies, which accounted for 92% of domestic consumption, represented a yearly average of US$ 14.7 billion. That figure alone is equivalent to 12.5% of the total revenues in PDVSA's financial statements (see Table 5). In addition, since 2012, given the technical problems and accidents in the local refinery system, an increasing volume of products has been imported, mostly from the US, to sustain the high levels of consumption. Oil product imports from the US were on average 62 kbd between 2010 and 2015, which represented an explicit subsidy of US$ 2.2 billion per year, on average[9]. However, per the Ministry of Oil and Mining, consumption decreased

[8] http://data.worldbank.org/indicator/EP.PMP.SGAS.CD (data collected from the German Agency for International Cooperation, GIZ). In Saudi Arabia, the country with the second lowest gasoline prices worldwide, has pump prices of $0.16/liter, more than 10 times the gasoline price in Venezuela. Even though gasoline and diesel prices were raised in February 2016 (6000%, the first adjustment since 1997), they remain significantly low compared to any standard (gasoline price calculated at the more appreciated exchange rate of VEF 10/US$ is US$ 0.6/liter but at the alternative exchange rate of VEF 600/US$, is only US$ 0.01/liter).

[9] An implicit subsidy reflects the foregone revenue for PDVSA of selling fossil fuels at lower prices in the domestic market, compared to what they could have received if they have sold those fuels at export prices (net of insurance and transportation costs). An explicit subsidy reflects the difference between the acquisition price of gasoline at international prices and the selling price in the domestic market.

in 2015 by 106 kbd to 594 kbd. This decline might be attributed to the recession faced by the country during the last 2 years and to some constraints in the distribution of products, particularly the adoption of quantitative controls in the western border in an attempt to reduce smuggling.

MM US$	2010	2011	2012	2013	2014	2015
Gasoline Subsidy	8,239	11,779	12,692	12,175	11,270	6,151
Diesel Subsidy	3,355	4,275	4,228	4,777	4,336	5,281
PDVSA reported domestic revenues	1,400	1,675	1,743	1,497	2,871	542
PDVSA reported total revenues	95,348	125,519	127,611	134,326	128,439	88,554

Table 5: Fuel subsidies, opportunity cost, as % of PDVSA's revenue.
Source: PDVSA, US Department of Energy and own calculations.

KBD	2010	2011	2012	2013	2014	2015
Local supply of petroleum products	674	646	681	703	663	594
Imports from U.S.	20	31	87	83	76	72
Estimated Value of Imports from U.S. (US$ MM)	682	1,360	3,760	3,237	3,015	1,672

Table 6: Evolution of oil product consumption in Venezuela and product imports from the U.S.
Source: PDVSA, US Department of Energy and CIEA calculations

Developments in the domestic market have also influenced the exports composition. According to PDVSA reports, there has been an increasing share of crude exports and a decline in product exports (see Table 7). This is partly explained by the increase in the share of heavy, extra-heavy and upgraded crudes (coming from the Orinoco Oil Belt) and the recurring problems facing the refinery system. Furthermore, exports of distillates have shown a sustained decline over the years, particularly since 2009, when a significant portion was shifted to the internal market for thermoelectric generation, to alleviate disruptions in electric supply and hydroelectric generation.

It is important to emphasize that the problems in the refinery system, the increase in the production and export of heavy and extra-heavy crudes, and the decline in the production of light crudes; have increased the requirements of oil imports. To meet the requirements of refinery clients, crude oil obtained from the Orinoco Oil Belt must be blended with components such as naphtha, or with light crudes, to be later exported. Given the reduced availability of light crude, because of the decline in production in Eastern areas of the country, there is an increasing reliance on oil imports to sustain production levels in the Orinoco Oil Belt.

Another consequence of the strategy of prioritizing the extraction in the Orinoco Oil Belt is the higher share of exports of low quality crudes. That shift generally implies lower revenues per barrel, given that export prices for heavy and extra-heavy crude oil are lower than for light and medium grades. On average, between 2013 and 2015, prices for heavy crude oil were US$ 12.61 per barrel lower than those for light grades (see Table 8). Light crudes had the highest decline in exports between 2010 and 2015 (274 kbd cumulative decline) (see Table 7)

KBD	2008	2009	2010	2011	2012	2013	2014	2015
Crude Oil and Products	**2,876**	**2,682**	**2,465**	**2,469**	**2,568**	**2,425**	**2,357**	**2,425**
Crude Oil	**2,213**	**2,019**	**1,911**	**1,917**	**2,060**	**1,935**	**1,897**	**1,950**
Light	548	551	388	400	358	287	228	114
Medium	320	198	151	138	202	110	85	119
Heavy, Extra-Heavy and Upgraded	1345	1270	1372	1379	1500	1538	1584	1717
Products	**663**	**663**	**554**	**552**	**508**	**490**	**460**	**475**
Residual Fuel Oil	230	301	217	271	262	284	254	279
Distillates	104	108	63	64	43	6	13	15
Gasoline and Naphta	69	48	49	46	30	36	44	48
Coke and Sulphur	54	50	31	32	37	35	37	37
NGL and Natural Gasoline	52	50	33	30	25	22	15	6
Others	154	106	161	109	111	107	97	90

Table 7: Evolution of crude and oil product exports from Venezuela.

Source: PDVSA

US$/Barrel	2013	2014	2015
Average Export Price	**99.08**	**85.75**	**39.98**
Light crude oil	106.04	95.49	52.90
Medium crude oil	99.94	85.31	47.75
Heavy crude oil	95.80	81.86	38.94
Extra-Heavy crude oil	99.99	87.98	42.52
Refiined products	97.49	90.47	36.25

Table 8: Export prices for crude oil and refined products.

Source: PDVSA

When considering the destination of oil exports (Table 9), the main recipients are the U.S., India, and China. Some of these exports do not generate cash-flow for PDVSA. It is important to point out that shipments to China are largely used for the amortization of different financing agreements made by the Republic of Venezuela within the context of the Joint Venezuelan-Chinese Fund and Great Volume Fund.[10] In addition to that, a portion of the exports is heavily subsidized, because of regional cooperation agreements with countries in Central America and the Caribbean (e.g. Petrocaribe), as well as bilateral agreements, the most important one with Cuba.[11]

[10] This is to be explained in the following section on Receivables

[11] The implications of these energy cooperation agreements are to be discussed in the following section on Receivables

KDB	2010	2011	2012	2013	2014	2015	Change 2015/2010
North America (includes St. Lacroix)	1,262	1,166	1,002	845	837	804	-36.3%
Central America & Caribbean	319	414	379	369	358	296	-7.2%
Asia	541	644	924	1,015	954	1084	100.4%
Europe	200	140	156	107	131	183	-8.5%
South America	82	83	73	67	60	37	-54.9%
Africa	3	10	21	10	8	13	333.3%
Others	10	12	13	12	9	8	-20.0%

Table 9: Crude and oil products exports from Venezuela per continent.

Source: PDVSA Annual Management Report 2010-2015

Receivables

When evaluating PDVSA's cash flow, one important issue to consider is the significant accumulation of PDVSA's receivables with government entities, which include both those owed by the Treasury (the Republic of Venezuela) and by other public institutions. The former began to accumulate in 2010. Previously most of PDVSA's loans were destined to other government entities. Receivables from the Treasury rose to US$ 22 billion in 2012, an increase of 152% since 2010. This growth appears to be related with changes in the Energy Agreements and the Chinese Funds accounting. Until 2011 the revenues from production assigned to Energy Agreements were considered as in-kind royalty payments from PDVSA to the government, thus not significantly affecting the cash flow. Starting in 2012, the financed portion of the shipments to Petrocaribe was explicitly considered as in-kind royalty, but not Chinese Fund payments. From 2013 onwards these agreements are not considered royalties, but accumulate as receivables from the Treasury. No official information or notes are available for further analysis of these accounting practices and their impact on the cash flow of PDVSA.

Energy cooperation agreements and the payments of the Chinese Fund have locked an increasing volume of barrels over recent years. Per PDVSA's Audited Financial Statements, shipments for payments of the Chinese Fund accounted for 579 kbd in 2015. As in the case of social program expenditures, there are relevant discrepancies in the reported amount of oil shipments for the energy agreements and for the Chinese Funds repayment between PDVSA's Management Report and PDVSA's Financial Statements.

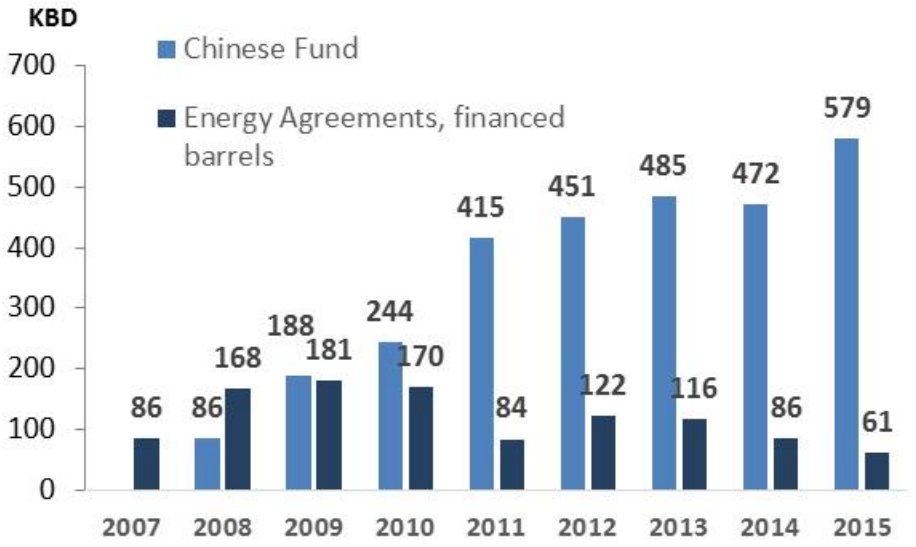


Figure 4: Energy Agreements and Chinese Fund: oil shipments, kbd

Source: PDVSA Financial Statements.

The oil shipments included in these agreements are thus mechanisms by which PDVSA transfers revenues to the Republic (Treasury). The Treasury "pays them back" by discounting royalties owed by PDVSA or by generating receivables from the Treasury in PDVSA's books. The Republic's accumulated debt in turn should be paid by the National Bank for Economic and Social Development (Bandes). Since 2011, it is noticeable that at least a portion of these agreements has ended up as receivables from the Republic, since the increase in this item is similar in size to the value of the financing to the energy agreements (See Table 10). Receivables from other public institutions are summarized in Table 11. The largest share is represented by receivables from the National Electric Corporation (CORPOELEC) and the National Petrochemical Company PEQUIVEN. Changes in the balance of these accounts are significantly affected by the exchange rate used in the report, given that a high component of these receivables is in local currency[12].

US$ MM	2010	2011	2012	2013	2014	2015
Chinese Fund	6,302	14,637	16,213	16,559	14,371	8,371
Petrocaribe	4,968	4,764	2,728	3,214	2,251	108

Table 10: Energy Agreements: Value of Financed Oil Shipping, USD MM.

Note: the value on Petrocaribe is the 50% of the share of shipments that is financed to long term

Source: PDVSA Financial Statements 2010-2015.

[12] The amount of "Others" in Table 11 as does not include receivables with Hovensa, Nynas and Mt. Vernon.

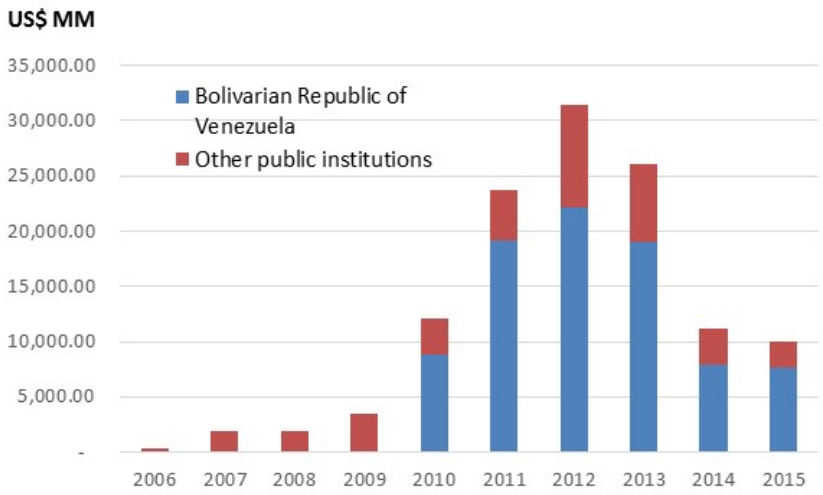


Figure 5: Accounts receivable, USD MM

Source: PDVSA Financial Statements.

US$ MM	2010	2011	2012	2013	2014	2015
CORPOELEC	2,357	2,093	2,676	2,857	1,032	304
Fondo Simón Bolívar para la Reconstrucción	305	-	2,612	-	47	64
PEQUIVEN	-	1,138	1,722	2,055	801	777
CVG	-	628	1,220	901	291	102
BANDES	-	90	89	90	90	90
PDVSA's RETIREE PENSION FUND	50	138	279	913	225	7
OTHERS	540	490	595	236	691	1,042

Table 11: Accounts receivable by other public institutions, USD MM.

Source: PDVSA Financial Statements.

Low oil prices are not the only reason behind lower revenues

Beyond the dramatic effect of the fall in oil prices, other elements are also impairing PDVSA revenues. After subtracting the domestic market, the subsidized portion of exports, the shipments for debt repayment, and the imports used for blending with extra heavy oil; out of total production of 2.86 mbd in 2015, net exports generating cash flow to PDVSA represented only about 1.9 mbd. In the first semester of 2016, they represented 1.5 mbd from a total production of 2.5 mbd (see Table 12). The decline in production during 2016 had an effect on lost revenue, which we estimate at US$ 1,776 MM. Adding the lost revenue from the domestic market to the existence of non-cash generating exports results in total "missing" cash flow of US$ 21 billion in 2015. If we add the cost of oil imports from the U.S., the combined negative effect on PDVSA's cash flow is of US$ 25.7 billion (see Table 13).

kbd	2015	2016
Venezuelan Oil Basket (US$/bbl)	**44.65**	**31.96**
Output (Crude + NGLs)	**2.86**	**2.50**
Crude + NGL available for exports	**1.96**	**1.59**
Petroleum products available for exports	**0.52**	**0.45**
Total exports	**2.47**	**2.04**
Non Cash exports	0.59	0.55
Net total exports	**1.89**	**1.49**

Table 12: Composition of crude and product exports.

Source: CIEA calculations

US$ MM	2015
Non cash exports value	9,547
Gasoline and Diesel subsidy	11,432
Oil imports from the U.S	4,784
Total	**25,764**

Table 13: Lost revenue and cost of imports for 2015.

Source: CIEA calculations

Therefore, even though the decline in oil prices is the main factor behind the collapse in PDVSA's revenues, it is also important to consider that there were also significant revenues not collected, as a result of government policy and the strategy and performance of the company.

However, the revenue side is not the only element affecting the availability of resources in the Venezuelan oil industry. On the expenditure side, there are also worrisome trends to be considered.

II.2. Expenditures and cost considerations

PDVSA´s cash flow has not only been harmed from a revenue standpoint but also on its cost structure. This has been driven by a variety of factors including:

- Real appreciation of the official exchange rate.
- Changes in the type of crude being extracted.
- High government-take on the profits of oil projects.
- Large expenditures and transfers for social development and extra-budgetary funds.
- An increasing share of resources devoted to non-oil subsidiaries (newly created and expropriated).
- Increase in expenditures due to a larger payroll (in part resulting from the expropriation of oil service companies).

Operational Expenditures

In order to analyze the cost structure of the Venezuelan upstream oil projects we can classify the types of project and areas in terms of different characteristics (before taxes): the stage of development of the project, the type of crude extracted, the composition of costs in local or foreign currency, whether it is operated by PDVSA or through a joint-venture, among other elements. The basic types of projects are:[13]

- *Projects for increasing production in mature fields*: these are projects in conventional crude areas operated by Joint-Ventures (JV) with foreign partners, with whom PDVSA has (or is negotiating) a financing deal to fund investment in secondary recovery. The crude is of light or medium grades and infrastructure is already in place.
- *Brownfield Extra-Heavy Joint Ventures (JV)*: these include the former strategic association projects for the development of the Orinoco Oil Belt, four of which have existing extra-heavy crude upgraders (Petropiar, Petrocedeño, Petromonagas and PetroSanFelix, formerly PetroAnzoategui), and one existing project for blending extra-heavy oil (Sinovensa). These projects also have financing agreements and access to higher official foreign exchange rates.
- *Mature field projects operated solely by PDVSA*: these are mostly comprised of areas of conventional oil (light and medium grades) with infrastructure already developed, with a lower cost component in foreign currency. This category includes the most productive fields of conventional oil (El Furrial, Santa Barbara and Tia Juana, among others).
- *New Greenfield projects in the Orinoco Oil Belt:* these projects, assigned in 2010 to several consortiums that include American, Chinese, European, Russian, and Indian foreign companies, were expected to produce 2 mbd of extra-heavy crude oil by 2019 (as mentioned in the section on *Revenues)*. In general, these projects have two planned stages: the blending of heavy and extra-heavy oil with light crude or naphtha, to obtain medium grades to be exported; and the construction of upgrading facilities for the processing of extra-heavy oil to upgrade the 8-9 grade API extra-heavy crude to 32 API grade. The second stage is unlikely to materialize soon under the current price and policy scenario.

One of the most significant problems for the operation of oil fields in the country during recent years has been the sustained appreciation of the exchange rate applicable to oil exports.[14] To illustrate how this affects the cost structure of projects, we use the following example: suppose that the cost of labor per worker in local currency is VEF 1, in year 1. Then if the exchange rate is VEF 1 per US$, oil companies need to sell US$ 1 to pay 1 worker. Suppose now that year inflation is 50%, then at year 2, if the exchange rate is not adjusted, oil companies would have to sell US$ 1.5 to pay the same worker. Therefore, in the absence of an adjustment in the exchange rate, local inflation levels would imply increasing costs for oil companies. This increase in costs from the real appreciation of the exchange rate becomes more relevant as the share of costs to be covered in local currency increases.

[13] To see the evolution of production in these four types of projects, see Appendix 3.
[14] Venezuela introduced a currency exchange in February 2003, by which the VEF/US$ exchange rate is fixed by the Central Bank of Venezuela.

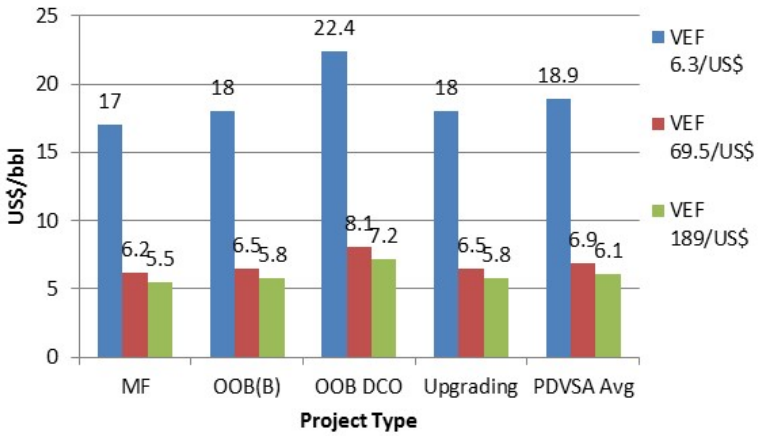


Figure 6: Estimated OPEX by type of project at different exchange rates.

Source: IPD.

Note: MF=Mature Fields, OOB(B)= Orinoco Oil Belt projects with upgrader, OOB(DCO) = Orinoco Oil Belt new projects with Diluted Crude Oil, Upgrading = Orinoco Oil Belt new projects with upgrader.

In Venezuela, this problem is severely enhanced for two reasons. On the one hand, inflation levels in recent years have been the highest worldwide: just between 2010 and 2015 cumulative inflation was of 1340%, with some forecasts pointing to an estimate of 720% for 2016.[15] On the other, there exist multiple rate foreign exchanges that severely distorts the cost of production estimates, augmenting the uncertainty around the exchange rate at which oil companies would be allowed to sell their proceeds from exports. With the introduction of the Exchange Agreement No. 35 in March 2016 by the Central Bank of Venezuela, the possibility opens for PDVSA and the Joint-Ventures to sell the proceedings from their exports at two different official exchange rates: the DICOM rate (VEF 600 per USD by July 2016), and the DIPRO rate (VEF 10 per USD, and was the only rate previously used to sell foreign currency). Therefore, depending on the exchange rate used, the cost per-barrel changes significantly as can be seen in Figure 6. Considering the different characteristics of the projects, there exists a significant decline in operational costs at different exchange rates depending on the level of devaluation. If, for instance, we assume that PDVSA can sell the proceedings from their exports in 2016 at an average of VEF 189/US$ (using an average estimate from local analysts, that assumes, US$ 6 billion sold at VEF 10/US$ and US$ 5.1 billion sold at VEF 400/US$)[16], then operational costs go from US$ 20 per barrel to US$ 6-8 per barrel, depending of the stage of the project and the fields considered for extraction.

In terms of the type of projects, mature field expansion projects and Joint Ventures in already developed areas of the Orinoco Oil Belt are the most affected by the exchange rate that is used. This

[15]"IMF Sees Venezuela Inflation Rocketing to 720 Percent in 2016". Bloomberg News. January 22, 2016 http://www.bloomberg.com/news/articles/2016-01-22/imf-sees-venezuela-inflation-rocketing-to-720-percent-in-2016

[16] The choice of VEF 10/US$ and VEF 400/US$ is related to the expected average rate for the DIPRO and DICOM system for 2016, respectively

is because these projects are in advanced operational stages and the local currency component in the total cost becomes more significant.

On the other hand, the foreign currency component of the new projects in the Orinoco Oil Belt (Diluted Crude Oil projects) is significantly higher compared to the other types of projects, which makes these projects initially less sensitive to the exchange rate in place. However, given that these new developments are in areas where there are significant infrastructure constraints (e.g. for transporting and storing extracted oil) the cost structure can be significantly impacted. For instance, in the absence of pipelines, extracted oil for some of these projects must be transported by truck, increasing the operational costs in domestic currency. Another relevant characteristic of the new Orinoco Oil Belt projects is that there has been an increasing need for importing diluents (light crude or naphtha) to be blended with the extra-heavy crudes. This is due to the limited local refining capacity, constraining the availability of naphtha, and the decline in production of lighter crudes (e.g. Santa Barbara), limiting their use for blending. Thus, the imported diluent strategy implies a significant additional cost of production in these new areas.

As for the entire PDVSA operation, official reports indicate that in 2014 the average production cost was US$ 15.1 per barrel, excluding the fields operated by Joint-Ventures, and US$ 18.1 per barrel, including those projects, which represents a dramatic increase from the values in 2010 (the average exchange rate in 2014 was VEF 20.82/US$). According to a PDVSA declaration from October 2015, [17] operational costs of PDVSA would be between US$ 7-8 per barrel if a higher exchange rate (SIMADI rate of VEF 200 / US$) was used. However, in the latest financial release of PDVSA published in July 2016, which uses an average exchange rate of VEF 68.76 per US$, the reported cost of production in 2015 declined to US$ 3.93 per barrel excluding the fields operated by Joint-Ventures, and was US$ 10.68 per barrel including the JVs. The dramatic changes in costs are largely attributable to exchange rate variations and how they are accounted in financial statements.

	US$ per barrel					
PDVSA Average Production Costs *	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Including Joint Ventures	5.53	7.53	11.09	11.40	18.05	10.68
Excluding Joint Ventures	5.23	7.23	10.86	10.63	15.10	3.93

* Including direct and indirect production costs, and excluding depreciation and depleting

Table 14: Average production cost of crude, natural gas and natural gas liquids, 2010-2015.
Source: PDVSA Financial Reports 2010-2015

[17] "Pdvsa: Costos de producción de crudo en Venezuela están entre 7 y 8 dólares por barril". Panorama. October 7th, 2015. http://www.panorama.com.ve/politicayeconomia/Pdvsa-Costos-de-produccion-de-crudo-en-Venezuela-estan-entre-7-y-8-dolares-por-barril-20151007-0012.html

PDVSA's fiscal regime and social expenditures

PDVSA's "direct contributions" to the government, as are officially known all PDVSA transfers to governmental entities or social programs, are made through both budget and off-budget mechanisms. These contributions can be classified in three main categories:

i. Taxes, royalties, and dividends.
ii. Social development programs
iii. Transfers to the National Development Fund (Fonden).

Taxes, royalties, and dividends are PDVSA's main contributions to the state. These are channeled through the National Budget. Social development programs and Fonden contributions became relevant after a reform on the Central Bank Law in 2005, which allowed PDVSA to manage oil windfall revenues in off-Budget funds. Revenues are transferred to the Central Bank which might return to PDVSA a portion of the revenue when the Central Bank's International FX Reserves are declared "in surplus." Such surplus is managed by PDVSA for investment, social expenditures, and transfers to Fonden. According to PDVSA reports, total direct contributions are the sum of these mechanisms. From 2006 to 2014, these mechanisms transferred a total of US$ 334 billion. This figure is slightly different from the US$ 321 billion reported as BCV's income from PDVSA for the same period (3.8% lower).

Contributions to the National Budget: Taxes, royalties, and dividends (TRD)

Taxes, royalties, and dividends paid by the oil industry are the government's main source of income. Between 2010 and 2015 they sum up more than US$ 110 billion or 52% of total direct contributions (which also include, social programs, and Fonden). Budget contributions include taxes such as: royalties, extractive taxes, export registry taxes, superficial tax, and dividends. Royalties represent over 60% of the total TRD in that period.

Per Venezuela's Hydrocarbons Law,[18] PDVSA accounts oil shipments delivered on behalf of the Republic as part of their royalty payments. These include the value of the barrels financed as part of the Energy Agreements and those sent for repayment of the Chinese Funds. The 2011 PDVSA Financial Statements specify that both arrangements follow this structure. However, in the 2012 statements only Petrocaribe's shipments are listed as discounted from royalties. In the 2013 and 2014 statements these energy agreements are not explicitly accounted as payment of royalties, but given changes reported in other accounts of the Balance Sheet, it appears that these agreements were included as receivables to PDVSA from the government.

When considering the evolution of the government-take in recent years, we observe that generally the main contribution came from royalties, and until 2014 from the *windfall tax*, introduced for so called "extraordinary and exorbitant oil prices," but after that, due to the oil price decline, there has not been any contribution through this mechanism.[19] The government-take is expected to go from 75% in 2014 to 46% in 2016 due to oil price decline.

[18] Article 45 states that the Executive can demand royalty payments as cash or in-kind.
[19] For further explanation on the contributions included in the government take, check Appendix 3

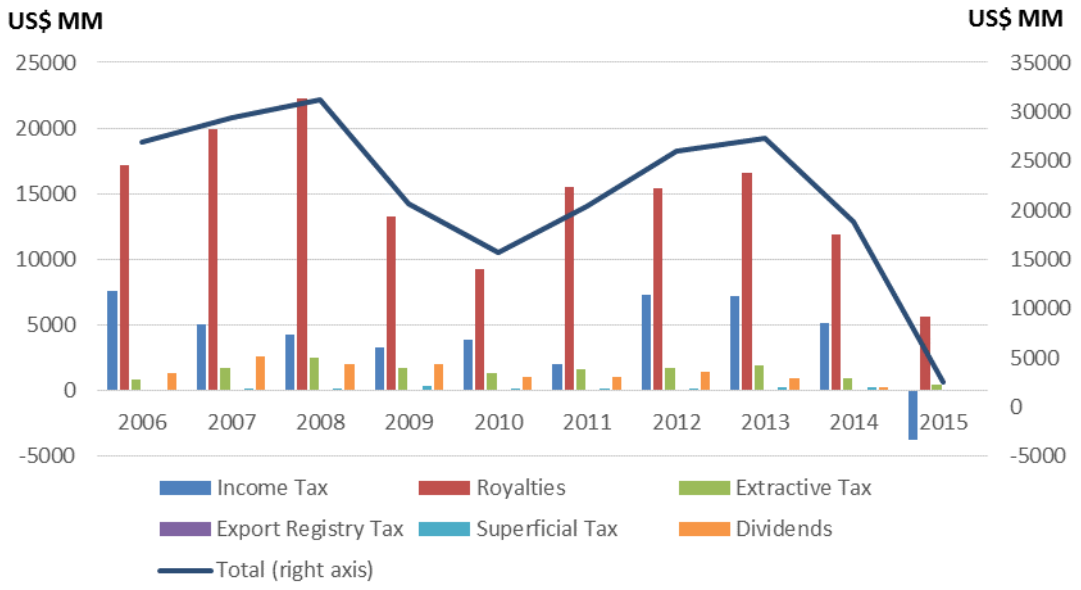


Figure 7: Tax Contributions. US$ MM

Source: PDVSA Financial Statements. Note: the income tax is net of deferred income tax and income tax from discontinued operations, which is why is negative for 2015

Royalties are 30% of total production and the extraction tax is equivalent to an additional royalty of 3.3%. Under the current hydrocarbons law, royalties for projects in the Orinoco Oil Belt can be lowered to 20% to increase profitability in the operation of the fields, and indeed that option has been on the table recently but has not yet been implemented. As can be seen in Table 16, due to higher costs the government-take is lower in the Orinoco Projects. Assuming an average price of US$32 per barrel the government would receive an average of US$11 (34.6% of the price) per barrel in the Orinoco Belt and US$16 per barrel (49.9% of price) in conventional production.

Type of Project	Conventional	Orinoco Oil Belt
Royalties	30%	33.3% and 30% in 2016.
Costs	12.43 US$	28.73 US$
2016 Price	32 US$	

Table 15: Assumptions for government-take estimates.

Source: CIEA calculations

Government Take	2014		2015		2016	
	US$ per barrel	(%)	US$ per barrel	(%)	US$ per barrel	(%)
Conventional Oil	66.35	75.04	24.79	55.52	15.95	49.85
Orinoco Oil Belt	56.69	64.00	15.63	35.01	10.99	34.33

Table 16: Government-take for conventional and unconventional oil projects.

Source: CIEA calculations.

Note: This calculation does not include the take in the JVs corresponding to CVP, subsidiary of PDVSA, and does not include dividends distributed to CVP. Including these would result in government take levels between 85% and 90%.

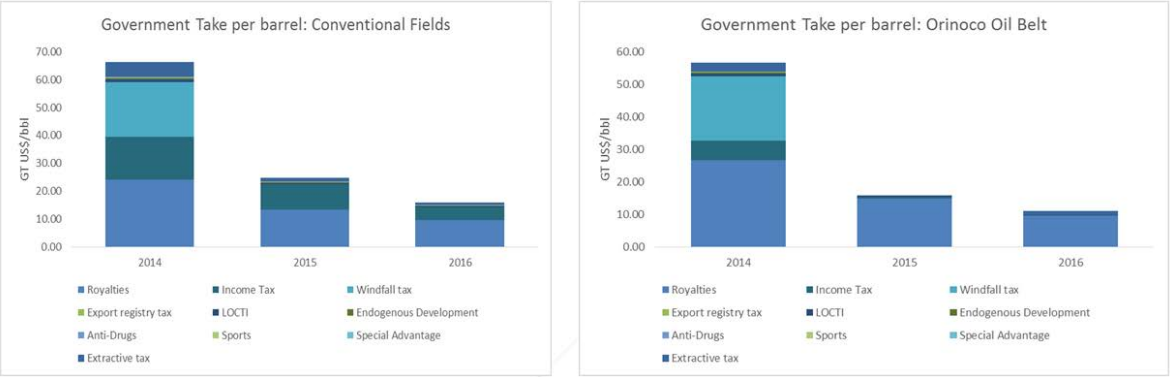


Figure 8: Estimation of government take for conventional and Orinoco Oil Belt projects

Source: CIEA calculations.

The consulting firm Rystad Energy estimates the composition of the cost of extraction of a barrel of oil and gas in selected countries. In the case of Venezuela, their estimate of gross taxes represents 38% of cost, a percentage second only to the estimate for Russia, and the highest in absolute terms in their sample ($10.48 per barrel as of April 2016).

Other estimates of the effect of the fiscal structure on oil projects are provided by Wood Mackenzie. They calculated break-even prices (i.e. the price at which the cash flow of the fields turns negative) for different oil fields in Venezuela (under the assumption of an exchange rate of approximately VEF 25/USD which was the average FX rate of US$ sold by PDVSA and the JVs during 2015). Using this reference and comparing with estimations of oil production by field[20], approximately 1.71 mbd (or 62% of the reported crude production of Venezuela in 2015) has a breakeven price (after taxes) below US$ 35 per barrel for the reference Brent crude.[21] In other words, almost 40% of Venezuela's crude oil production would generate negative after-tax cash flow when Brent prices fall below US$ 35 per barrel, under the current fiscal structure.

[20] Production by oil field can be seen in Appendix 2

[21] Estimates of total oil production in Venezuela by Wood Mackenzie are significantly lower than official estimates obtained through the Ministry of Oil and Mining. As of 2015, this difference was more than 300 kbd.

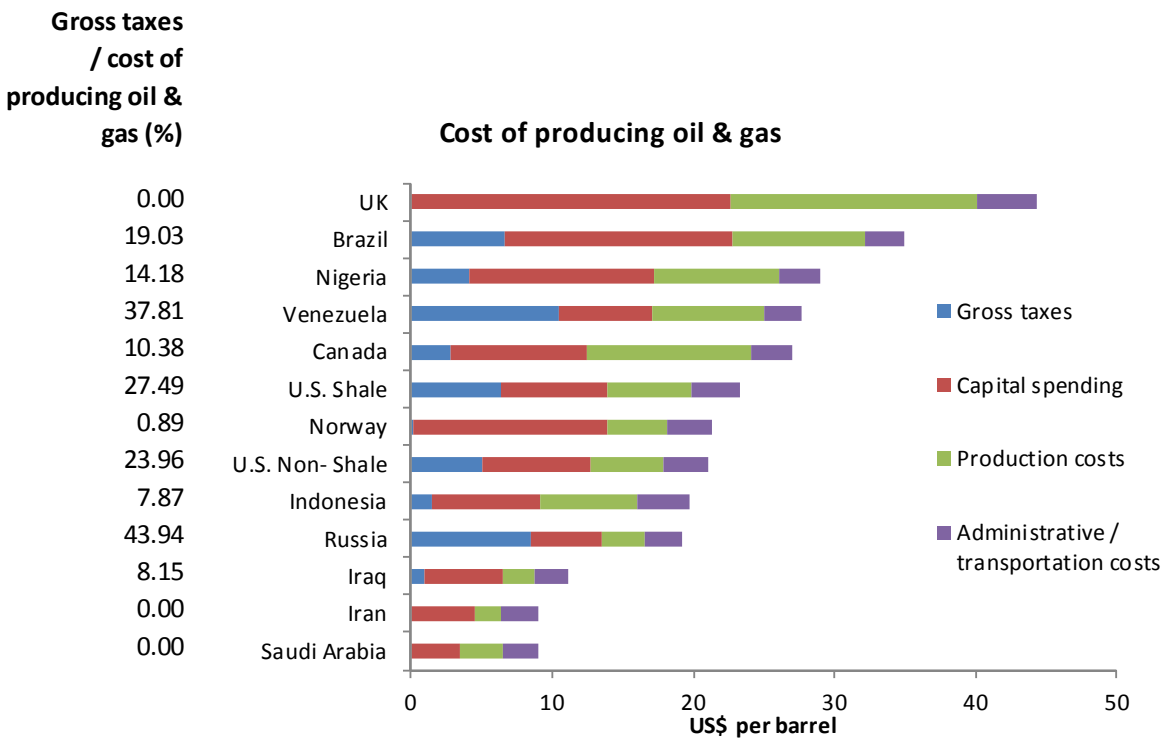


Figure 9: Cost of extraction oil & gas in selected countries.

Source: Rystad Energy and Wall Street Journal. Latest update: April 15th, 2016 (http://graphics.wsj.com/oil-barrel-breakdown/?mod=e2tw)

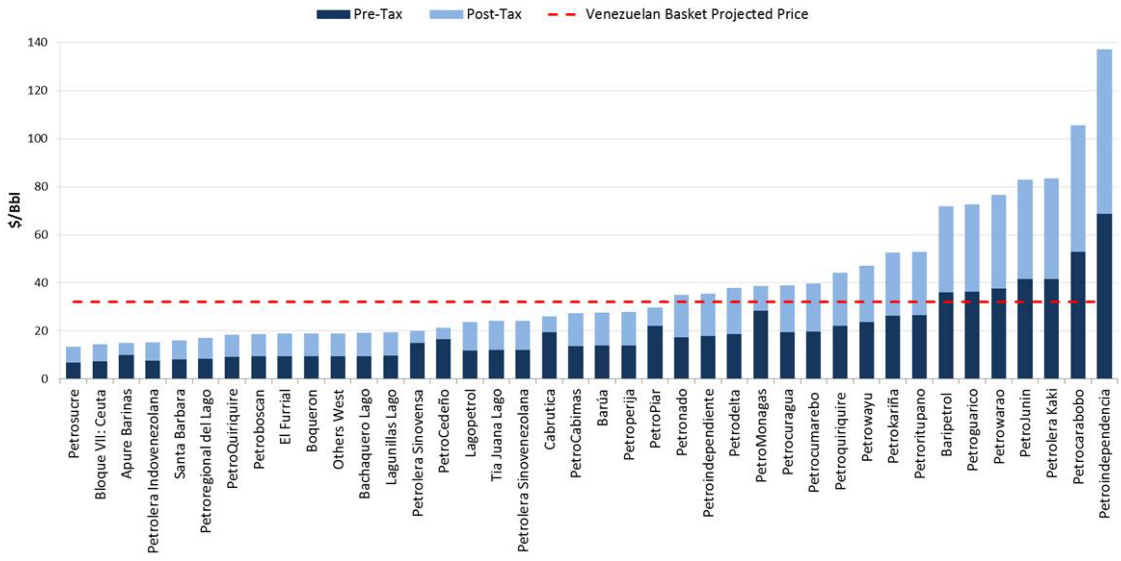


Figure 10: Break even Brent Price Estimates.

Source: Wood Mackenzie

Social Development Programs

Social development programs are an off-budget mechanism to finance social policy. Per PDVSA's Financial Statements, expenditure in social development programs totaled US$ 48 billion from 2010 to 2015 (22.8% of the total direct contributions). It is important to notice that there are significant differences in the published figures for transfers related to social programs, depending on the official source. Table 17 summarizes the discrepancies between the expenditures reported in PDVSA's Audited Financial Statements and in the Management Reports for Social Development Programs, showing that for the period 2010-2015 the cumulative transfers reported in the Management Reports are US$ 89.4 billion higher than those reflected in the Audited Financial Statements of PDVSA. The company warns that Management Reports ignore accounting rules regarding fiscal periods and assets valuation, as a way to explain the enormous difference between both official figures.

US$ MM	2010	2011	2012	2013	2014	2015	Total
Social development programs							
Financial Statements	5,326	15,604	9,025	7,829	2,015	8,215	**48,014**
Management Report	22,223	28,657	28,293	23,341	15,681	19,242	**137,437**

Table 17: Social development contributions according to PDVSA reports, USD MM
Source: PDVSA Financial Statements and PDVSA Annual Management Report 2010-2015.

PDVSA's Annual Management Reports offer figures on expenditures directed to each program.[22] Per this source, around half of disbursements to "social programs" are destined to the Chinese Fund, while the two largest social programs the *Barrio Adentro* Mission and the Miranda Fund get 18% and 17% respectively. The inclusion of payments made for the amortization of the Chinese Fund as a social program, suggests that a key source of the discrepancy between the two official sources is precisely the write-off on receivables owed to PDVSA by the government. This reflects the fact that Management Reports do not expect the government to pay PDVSA back, nor does it offset the receivables from royalty payments. In order words, the Management Reports are classifying as a "social programs" unpaid debts to PDVSA by the government.

National Development Fund (Fonden)

Fonden is a government entity created in 2005 with the reform of the BCV Law. Its objective is to finance "production, education, health, *special circumstances*, and public debt". Fonden is funded by PDVSA's oil revenue and the "surplus" international reserves from the BCV. Since the creation of the oil *windfall tax*, the receipts that it generates also go to FONDEN. The members of the Board of Directors include the Minister of Finance, the Minister of Planning and the Vice-President. According to the law, the Executive sets the international reserves level above which a "reserve surplus" must be recorded. PDVSA can retain the funds above this level. These funds are then allocated to PDVSA investments, social development programs, and Fonden. Net contributions to Fonden discount government subventions, i.e. compensations of expenditures already done in both currency and non-currency assets.

[22] The description and purpose for each program is described in Appendix 1

Table 18 summarizes accounting disparities in Fonden contributions between the Audited Financial Statements and the Management Reports. In this case, for the period 2010-2015, cumulative transfers from PDVSA to Fonden shown in the Management Report are US$ 2.7 billion higher than those reported in the Audited Statements. Between 2010 and 2015 transfers from PDVSA to FONDEN totaled over US$ 50 billion, 24% of PDVSA's total contributions to the government during that period. The amount presented here from the Financial Statements is the gross amount (PDVSA to Fonden), but in these years, there have been also sizable transfers from Fonden to PDVSA in the form of government subventions.

US$ MM	2010	2011	2012	2013	2014	2015	Total
Fonden							
Financial Statements	1,334	14,475	14,994	10,435	8,507	974	**50,719**
Management Report	1,334	14,728	15,572	10,418	10,400	976	**53,428**

Table 18: Social development contributions according to PDVSA reports, USD MM

Source: PDVSA Financial Statements and PDVSA Annual Management Report 2010-2015.

Debt, debt service, and other liabilities

To assess the impact of financial expenditures on the available cash flow for PDVSA, this section analyzes the evolution of the stock of financial debt, arrears, and other liabilities of PDVSA. In general, it is highly noticeable that the increase in the perception of risk among bondholders and suppliers has put pressure on the financial costs associated with debt instruments. Additionally, given the lack of institutional constraints restricting the direct financing from the Central Bank of Venezuela to PDVSA, there has been a concerning increase in the amount of liabilities in PDVSA because of the distortions arising from the current exchange rate system.

Financial Debt

PDVSA's financial liabilities are a significant concern given their rapid upward trajectory and service costs. As shown in Figure 11, the total financial debt grew by 75% between 2010 and 2015 At the same time, financing costs, closely related to market risk perception, have been on the rise.

As shown in Figure 11, the debt composition has remained unchanged in 2010-2015. Between 66 and 75% of the total debt are bonds, around 5-13% credit facilities, and 10%-22% loans. The amount in loans and credit lines increased in 2015 after the announcement of new "financing agreements," amounting to US$ 1.6 billion, including deals with two service companies to reclassify accounts payable into financial debt. Continued use of this type of financing agreements will probably represent a higher proportion of financial debt in the coming years, given the constraints imposed by bond markets (discussed below), and PDVSA's push to develop mature fields with service contractors.

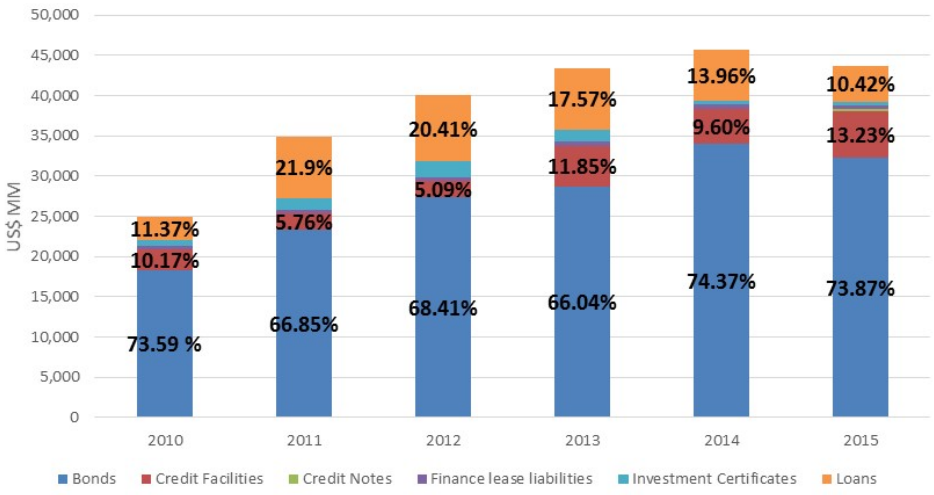


Figure 11: PDVSA's Financial Debt by Instrument, 2010-2015, US$ MM.
Source: PDVSA Financial Statements

Also, it is important to consider that according to PDVSA reports, between May and September of 2016 the company entered transactions to partially convert the outstanding commercial debt of various PDVSA affiliates with certain suppliers into financial debt. These agreements mostly consist of three-year notes with an annual interest rate of 6.5%. By September 2016, the amount of commercial debt that has been so far converted in that period is reported at US$ 1.15 billion.

As it tends to happen, the increase in debt levels has been accompanied by an increase in financial costs. Before 2009, with an average financial debt level of around US$15 billion, debt service per year was less than 1 billion. Later, the increase in market risk perception as measured by bond spreads, forced higher costs of financing even during periods of high oil prices. This led to an increase in the interest rate with every new bond offering, reaching annual interest rates of over 10% for most recent issuances.

Consequently, debt service between 2010 and 2015 increased almost tenfold while financial debt only had an 80% increase in the same period. More recently, heavy discounts on fixed income instruments implied *de-facto* shut-out of the market for PDVSA. That situation has forced the company to rely on other –also expensive- financing mechanisms such as commercial credit lines and loans, mostly to subsidiaries. Table 19 shows evolution of total PDVSA debt service from US $1.12 billion in 2010 to US$10.2 billion by 2015 (12% of the company's reported revenues).

	2010	2011	2012	2013	2014	2015
Capital Payments		2,461			4,099	6,634
Interest Payments	1,117	1,097	2,318	2,925	3,053	3,580
Total	**1,117**	**3,558**	**2,318**	**2,925**	**7,152**	**10,214**

Table 19: Financial Debt Service per Year, 2010-2015, US$ MM.
Source: PDVSA Financial Statements and CIEA calculations

Given the significant constraints imposed by debt service on the cash flow available to PDVSA, in September 2016 the company decided to offer the bondholders with maturity in 2017 a bond swap. They offered bondholders for every dollar of maturities 2017, 1.17 dollars (bonds maturing in April 2017) and 1.22 dollars (bonds maturing in November 2017) of a new 2020 bond with an 8.5% coupon and yearly amortizations. It also offered a majority (50.1%) of the shares of CITGO, PDVSA's US subsidiary, as collateral. All accounted, it was the equivalent of issuing new debt at a 21.7% return.[23] The outstanding amount in 2017 bonds involved in the operation is US$ 7.1 billion and according to the results published in late October (after two extensions on the proposed deadline) holders exchanged US$2.8 billion in bonds (around 39.4 percent of the outstanding amount in bonds involved in the operation). Turnout was lower than expected by analysts[24] and the government proposed target of 50%.[25] In any case, it reduced PDVSA's debt service by US$ 930 MM in 2016 and US$850 MM in 2017, at the expense of roughly US$ 1 billion in debt service per year from 2018 to 2020. Given the previously mentioned trends in production and the volatility in oil markets, there are still major concerns on the ability of the company to increase the availability of resources in the medium term, particularly if oil prices fail to recover in following years.

Because of these financing constraints, alternative arrangements have been structured to expand production and prevent a significant decline in investment.

Alternative financing mechanisms: The conventional Oil JV financial agreements

As part of the efforts to obtain resources for investment, mainly to reduce the decline in production of conventional fields, the Ministry of Oil initiated in 2010 a round of negotiations with JV partners. The objective was to agree on financing structures for the expansion of production in mature fields operated by Joint Ventures. In this regard, a pioneer contract with the Chevron Boscan JV was signed in 2013. As shown in Figure 12, in the typical arrangement, to finance projects with specific targets for incremental production, the minority partner covers the operational and capital expenditures for the entire Joint Venture, including the share belonging to Corporacion Venezolana de Petroleo (CVP), the subsidiary of PDVSA that holds the majority equity in the JVs. The revenues from the sales of crude of these JVs to designated customers go to an Offshore Trust Fund (managed by a reputable financial institution), and after transferring the royalties to the Venezuelan government, the cash flow is used for the amortization of the debt with the minority partner. In this way minority partners limit the credit risk associated with PDVSA and are also able to reduce the arrears owed by PDVSA to the JV. Originally, commercialization of the oil was done by PDVSA, which later transferred the revenues to the JV. In many cases, delays in these payments seriously affected the operations.

Under these arrangements, minority partners gain more control over procurement and contracting, which can also reduce risk for suppliers. At the same time, they took back control over the marketing of oil and the cash flow of the projects, facilitating the distribution of dividends and strengthening their operational control over the projects.[26] Until June of 2016, four agreements of

[23] See Santos and Muci (2016).
[24] Ecoanalítica. "PDVSA's Swap: the game did not change". October 2016.
[25] Barclays Emerging Markets Research. "Venezuela/PDVSA: Partial Relief". October 25th, 2016
[26] Lazzaro and Pulgar (2011) estimate that the value of a project for the development of Orinoco Oil Belt could increase in net present value by 60% if the contracting of services and the commercialization of exports

this type had been approved and executed, representing 13% of current production, and others were being negotiated. However, a general expansion of these structures is unlikely given the financial constraints that some of the partners face especially in the current environment of low oil prices.

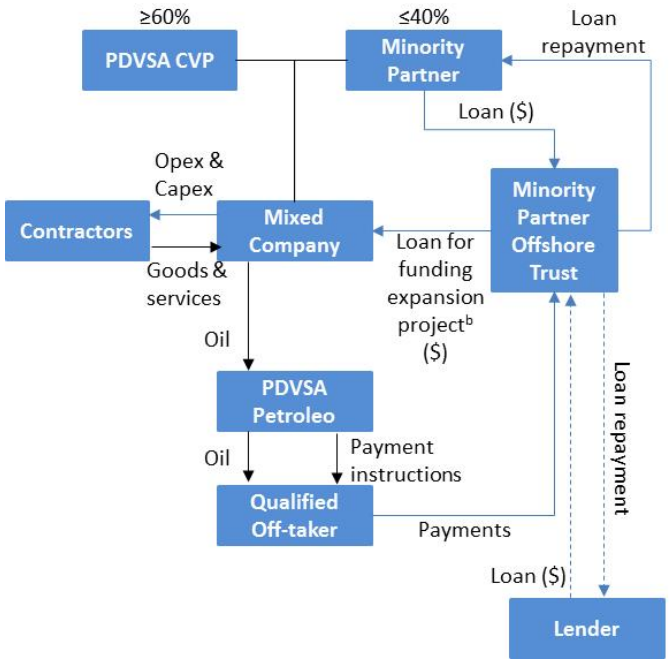


Figure 12: Typical structure of financing agreements with minority partners.
Source: IPD

is shared between CVP and the minority partners, given the reduction in credit risk that the suppliers face and the improved control over cash flow.

Mixed Company	Minority Partner	Financing Amount	Plan	Current Production (kb/d)	Production Target (kb/d)	Debt as of (US$ MM) 2015	2014
PetroBoscan	**Chevron**	**US$ 2B Corporate Loan**	**In effect**	**109**	**127**	**461**	**297**
PetroSinovensa	**CNPC**	**US$ 4B CDB**	**In effect**	**164**	**330**	**699**	**291**
PetroZamora	**Gazprom Bank**	**US$ 1B Corporate Loan**	**In effect**	**70**	**104**	**73**	**8**
PetroWarao	**Perenco**	**US$ 420M Corporate Loan**	**In effect**	**12**	**32**	**17**	**-**
PetroCabimas	Suelopetrol	US$ 625M	Term sheet signed/Closing	32	55		
PetroQuiriquire	Repsol	US$ 1.2B	Term sheet signed	48	64		
PetroRegional del Lago	Shell	US$ 1.7	Under negotiation	33	70		
Petro Indovenezolana	ONGC	TBD	Under negotiation	27	TBD		
PetroDelta	HNR**	TBD	Under negotiation	40	TBD		
Total		**10.9**		**535**	**782**	**1250**	**596**

Table 20: Financial Agreements Summary.
Source: IPD and PDVSA Financial Debt Report 2015.

From Table 20 it can be observed that in 2015, US$ 1.25 billion were executed under these agreements. This number does not include the agreements signed with Orinoco Belt JVs, such as Petropiar and Petrocedeño, which represented US$ 73 million as of December 2015. It also does not include a US$1 billion credit line from Schlumberger for the operation of some of the fields, which most likely is just a reclassification of unpaid arrears.

PDVSA Bonds owned by the government and by PDVSA's Pension Fund.

For PDVSA to cope with the increasing financing costs of its debt, the government and PDVSA have been buying debt in secondary markets at depressed prices as an informal way to conduct debt liability management operations without the need to do open market operations or debt restructuring. Official information on the amount in bonds owned by the pension fund is not disclosed, with the exception of sporadic statements from public officials according to which government institutions hold between 20% and 25% of total outstanding bonds of the Republic and PDVSA.[27] Independent estimations from institutions such as Bank of America suggest that this amount was closer to 14% of total outstanding bond debt, including US$3.5 billion in bonds with maturity in 2017. Calculations from Barclays point that the nominal value of government holdings in these bonds were approximately US$ 7.7 billion as of September 2015, although it is not specified which percentage is from PDVSA bonds. These estimates, however, do not include holdings from PDVSA Pension Fund, which were estimated at US$ 2.1 billion, mostly concentrated in short term maturities (market information suggested that over 60% of PDVSA bonds expiring in October 2016 were in possession of the PDVSA Pension Fund).

[27] "Gobierno se compomete con banca de inversion a publicar cifras". El Nacional. October 1st, 2015 http://www.el-nacional.com/economia/Gobierno-compromete-inversion-publicar-cifras_0_711529034.html

Debt with suppliers and contractors

Although the service of financial debt is the key financial item affecting cash flow, there are other liabilities that could impact the cash flow, such as the commercial debt with suppliers and contractors. As explained above, delays in payments in this area have increased the risk of the providers' partially halting some of their operations (as was the case with Schlumberger and Halliburton) with negative consequences for future oil extraction levels. The increasing pressure on PDVSA led the company to implement two strategies with immediate cash-flow implications:

1) PDVSA is converting part of the outstanding debt with suppliers into notes.
2) To secure payments, some oilfield service providers have entered agreements with PDVSA for which those services are paid in-kind with oil production.

Both strategies in practice increase the seniority of some debt suppliers and restrict the resources available to PDVSA for other activities. Overall, according to the report presented by the Ministry of Oil and Mining to the National Assembly, there was a decline in the account payables to suppliers of US$ 535 MM (3%), for a total debt balance of US$ 20.3 billion as of December 2015. This decrease was attributed to "*the valuation of operations at different exchange rates compared to the previous year*".

	2011	2012	2013	2014	2015
Debt with suppliers (US$ MM)	12,376	16,747	21,404	20,855	19,052
Commercial	12,316	16,725	21,389	20,837	19,042
6 months or less	12,316	16,067	21,389	20,837	19,042
6 to 12 months		658			
Related entities	60	22	15	18	10

Table 21: Debt with suppliers.
Source: PDVSA Financial Statements 2010-2015

No official information is provided on the composition by currency of this debt, although local analysts estimate that as of March 2016 the amount of this debt in US dollars was approximately 40%, with the remaining 60% denominated in bolivars.

To identify the different PDVSA suppliers according to their relative importance for oil operations, official information from PDVSA Contracting System[28] is shown in Table 22. Suppliers are ranked by the total value of signed contracts for the last two years (in VEF million)[29].

[28] http://sicac-ext.pdvsa.com/
[29] Through the website of PDVSA's contracting system, there is only information on the contracts that were open for bidding. Therefore, the information presented in Table 22 does not include contracts that were assigned directly by PDVSA in the form of service orders. In spite of that, Table 22 still allows for identification of some of the major suppliers operating in Venezuela.

FIRM	Contracts Value (VEF MM) 2014	2015	Contract
Schlumberger	3,399	6,729	Oil services
Servicios Halliburtion	2,658	5,271	Oil services
Weatherford Latin America	911	4,984	Oil services
Iker Guarima	5,858		Housing construction
Cementaciones Petroleras	2,362	2,817	Oil services
Data Power	4,824	43	Oil inputs
Cooperativa Mi Aragua Linda	4,600	79	General maintenance operations
Consultora y Constructora Incenter		4,600	Engineering services
Industrias Marítimas Constructores	4,600		Gas pipeline
Bohai Drilling	2,584	1,973	Oil services
Subtotal	**31,796**	**26,496**	
Total	**98,659**	**110,443**	

Table 22: Contract value for the highest recipients in 2014-2015 registered in the Contracting System of PDVSA and Mixed Enterprises.

Source: PDVSA

First, companies with the largest contracts are oilfield service providers such as Schlumberger, Halliburton, and Weatherford. These companies are particularly important because of the extent of their operations in Venezuela. Using the information from the contracting system of PDVSA for the fields in which these companies operate, it is estimated that these service companies are operating in fields with a total production of at least 635 kbd (see Table 23), which represent approximately 23% of the total crude oil production in the country.[30]

	Oil Production 2015 (kdb)
SCHLUMBERGER VENEZUELA, SA	1064
WEATHERFORD LATIN AMERICA, SA	983.1
SERVICIOS HALLIBURTON DE VENEZUELA, S.A.	635.5

Table 23: Combined Venezuelan oil production of fields operated by service companies.

Source: PDVSA, National Contractors Register and CIEA Calculations.

Note: For some oil fields, there are activities of several of these companies at the same time, so totals do not have to coincide with official production estimates.

However, these companies have been facing significant delays in payments over recent years, increasing the risk of their activities in Venezuela. Using information from SEC filings, as of December 2015, the oilfield service provider Schlumberger reports that Venezuela represented at least a 10% of the total receivables of the Company (the largest amount for any individual country along with Mexico). Combining this information with reports from Halliburton and Weatherford, it is estimated that receivables of these companies from their operations in Venezuela total at least US$ 1.8 billion. It is not known how much has been accumulated in 2016.

[30] The service companies could be simultaneously operating in the same fields.

Account receivables (US$ MM)	2015
Schlumberger (estimated)	878
Halliburton	704
Weatherford	205
Subtotal (estimated)	**1787**

Table 24: Accounts receivable from Venezuela operations of oilfield services companies.
Source: Securities and Exchange Commission 10-K files from Schlumberger, Halliburton and Weatherford (Annual Reports).

Because of this situation, in 2016 there have been market reports indicating that Schlumberger has limited its operations in Venezuela due to payment problems.[31] [32] A similar situation has been reported by Halliburton and Weatherford.[33] Not only are the major service companies taking measures given the delay in payments. According to Barclays,[34] international drilling companies such as San Antonio International and Petrex have also reduced operations in the first half of 2016. This reduction in contractors' activities has implied disruptions that affect significant projects in the short term, especially those in conventional areas with a high decline rate and high technological requirements, such as El Furrial (one of the drivers of the sharp fall in production in 2016).

There are other companies which are also significant providers of oil services, such as the Chinese companies Bohai and CNPC Services. Chinese companies are not necessarily facing the same credit risks as multinational oilfield service providers and local companies, given that there is funding tied to financing schemes such as the Joint-Chinese-Venezuelan Investment Fund. Local companies with the largest contracts provide services not only for oil activities, but also for non-oil projects, given the increased deviation of resources to social development areas (as discussed before in the section *PDVSA's fiscal regime and social expenditures*)[35].

Given the magnitude of the risks associated with a halt in the operations by some of these companies, PDVSA has been structuring payment solutions. In the case of Schlumberger, initially, according to SEC filings, in the last quarter of 2015 the company arranged with PDVSA to receive "certain fixed assets in lieu of payment of approximately US$ 200 million in account receivables" (without specifying the nature of these assets). Then, in September 2016 PDVSA awarded US$ 3.2 billion in drilling contracts for the Orinoco Oil Belt to firms that include Schlumberger. Although the details for the collections assurance mechanism are not publicly available, per press reports

[31] "Schlumberger to limit Venezuela operations on payment problems". Reuters. April 12th, 2016 http://www.reuters.com/article/us-schlumberger-venezuela-idUSKCN0X92P0
[32] "Schlumberger lets go of workers in Venezuela as it scales back". Reuters. September 2nd, 2016 http://www.reuters.com/article/us-venezuela-oil-schlumberger-idUSKCN118288
[33] "Halliburton curtailing business activity in Venezuela". Reuters. April 22nd, 2016. http://www.reuters.com/article/halliburton-venezuela-idUSL2N17P1Z0
[34] "Venezuela: the oil spillover begins". Barclays Research. June 20th, 2016
[35] Cooperatives and other local organizations such as communal councils (Consejos Comunales) account for approximately 30% of the value of the contracts registered under this system (at least VEF 100 billion per year in 2014-2015, according to data in the National Registry of Contractors), which suggests that a great part of this debt is not directly affecting oil production and could be considered in some case as a government program or subvention

citing PDVSA documents, the company "asked bidders to provide financing themselves and be repaid in future oil production".[36]

This suggests that in order to lower the risk for suppliers, there could be a scenario in which payments for some specific companies could be made with oil production. Although this strategy may not reduce the present cash flow available for PDVSA, it would certainly compromise future cash flow, in the same fashion as the JV loans did.

PDVSA has also transformed part of the debt with some of these suppliers into notes for US$ 1.4 billion as of September 2016 (See Table 25). [37] This implies an additional financial cost arising from the interest payments associated with this notes, which further constraints the availability of cash flow. According to market reports, the objective of PDVSA is to issue up to US$ 4.7 billion in these instruments, to be offered to 63 companies, and the estimation from these reports suggests that if this amount is reached, debt service could increase by as much as US$ 1.8 billion in 2018[38].

Recipient firm	Annual interest rate (%)	Face value of notes (US$ MM)	Maturity
General Electric Capital Corporation	6.5	257	2018
	6.5	194	2019
Cementaciones Petroleras Venezolanas	6.5	100	2019
Petroalianza	6.5	100	2019
Maritime Contractors de Venezuela	6.5	118	2019
Weatherford Latin America	6.5	120	2019
Servicios Halliburtion	6.5	200	2019
Environmental Solutions de Venezuela	6.5	30	2019
	6.5	36	2019
Proambiente	6.5	14	2019
	6.5	14	2019
Elecnor	6.5	50	2019
	6.5	50	2019
	6.5	45	2019
	6.5	45	2019
Servicios Picardi	6.5	37	2019
Total		**1,408**	

Table 25: Face value of issued notes for suppliers.

Source: PDVSA

[36] Venezuela PDVSA awards $3.2 billion oil service contracts, protest brews http://www.reuters.com/article/us-venezuela-pdvsa-contract-idUSKCN11R1NY

[37] This includes a previous note issued in favor of General Electric Capital Corporation in March 2015.

[38] "PDVSA eyes $4.7 billion debt issue to pay service companies". Reuters. October 6th, 2016. http://www.reuters.com/article/us-venezuela-pdvsa-debt-exclusive-idUSKCN12610X

Accrual and other liabilities (Central Bank of Venezuela)

The item "Accruals and other liabilities," as presented in PDVSA's Annual Financial Statements, accounts for other significant debts. Since 2009 changes in the regulatory framework allow the company to borrow from public financial institutions, in particular, the Central Bank. In turn PDVSA has been securitizing its fiscal obligations with the government (Treasury) into "promissory notes", which have been transferred back to the Central Bank (BCV). Considering that local currency debt accounts for most of "accruals and other liabilities," mainly owed to BCV, an exchange rate depreciation reduces significantly their value. Promissory notes pay interest rates ranging from 2.64% to 4% and have a maturity from 3 to 5 years. Although this debt signals serious financial imbalances in local currency costs, a VEF depreciation could relax any real restriction.

Capital Expenditures

As mentioned in the section *Revenue considerations*, during the last decade there had been ambitious initiatives for the development of the oil sector's potential in Venezuela within the framework of the "Plan Siembra Petrolera" (Oil Sowing Plan). This expansion program was originally formulated in 2005 with targets for 2012. Given that most targets were not only not achieved, but actually target variables fell from the 2005 levels, the plan was reformulated for 2013-2019, essentially replicating the main targets included in the first plan but allowing for more time.

Beginning in 2006, the first Oil Sowing Plan established a set of goals for the oil and gas industry development until 2012, with a total investment of over US$ 77 billion. The business plan was supposed to double, oil and gas production, local and abroad refining capacity, and hydrocarbon exports. The Orinoco Belt potential in heavy and extra-heavy crude was the backbone of the strategy. A quarter of total capital expenditures were initially planned to be allocated to this reservoir with joint ventures taking the leading role. Despite that, PDVSA was responsible for more than 70% of total investments, setting severe constraints on private participation and limiting the development of these projects to PDVSA's availability of investment funds. However, the grandiose investment plans barely materialized. The oil industry has dramatically underperformed. Oil output and exports have had a declining trend. Refining capacity remained virtually unchanged, and gas production did not reach half of the target level. In 2012, the second version of the plan more than tripled the amounts in the first plan's investment projections, setting total disbursements at USD 257 billion, 81% of which was expected to be made by PDVSA. This program established a new series of goals until 2019 for the areas of production (6 mbd of crude production for 2019, including 4 mbd from the Orinoco Oil Belt).

From the information in PDVSA's Management Reports (see Figure 13), since 2010 PDVSA's total investments have been 20% to 30% lower than the projected investment (with exception of the years 2011 and 2012). For example, total investment during 2015 was of US$ 24.5 billion, about US$ 6.5 billion lower than the investment projected for that year in the annual report of 2014. As shown before, even in a context when investments have grown in nominal terms, production has been falling. This not only shows the low efficiency of investments to increase production (given technical and operational constraints to be discussed later), but also a significant mismatch between projections and the real capacity to fund the investments.

An example of the lack of alignment between projected and real investments is provided by the changes in investment projections for 2016-2019. A common practice by PDVSA has been to reduce the expected investment in the short term, while increasing the projections for investments in later years. For instance, investments for the year 2015 were originally projected at US$ 47 billion in the annual report of 2009, but then reduced to a projected investment of US$ 31 billion in the annual report of 2014. Meanwhile investments for 2016 to 2019, which were estimated at US$ 40 billion per year on average in the annual report of 2012, were projected to be over US$ 65 billion per year in the latest annual report, almost twice the projected revenues from oil exports in 2016[39].

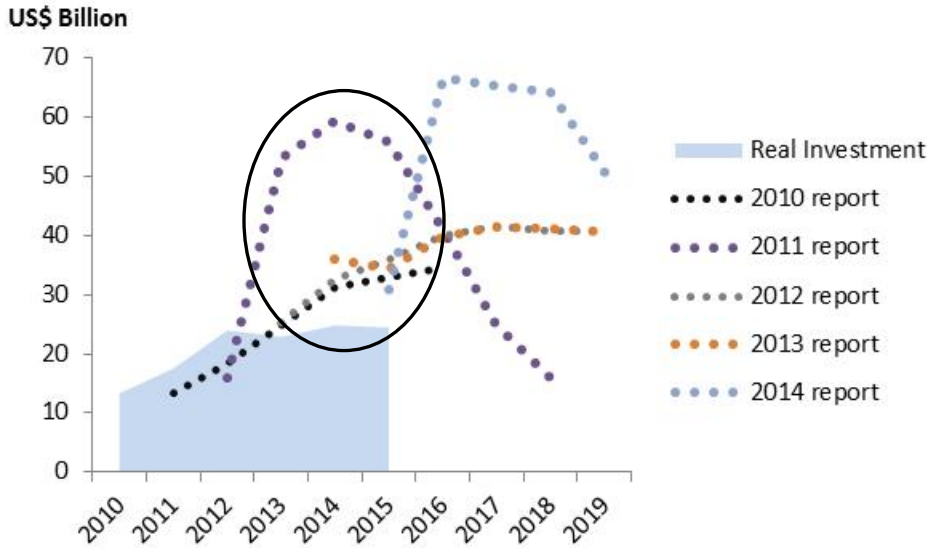


Figure 13: PDVSA Projected and Real Investments, 2010-2019, 2010-2014.
Source: PDVSA Annual Management Reports, Ministry of Oil and Mining and CIEA-IESA

Not only did PDVSA significantly underinvest with respect to its plan, but the composition of investments also was diverted to non-core investments, as shown in Figure 14. While total investment grew by approximately US$ 19 billion, from US$ 6 billion in 2003 to US$ 25 billion in 2014, the composition shifted to non-oil projects. Exploration and production, refining, gas and other oil-related expenses did increase during these years, especially the CAPEX going to gas production and the Orinoco projects, adding to about US$ 130 billion for the whole period. Nevertheless, another US$ 30 billion were assigned to recently created non-oil subsidiaries and other non-oil expenditures. Agriculture and food supply, electric plants, construction, and other sectors were included, in addition to "corporate contingencies" and expenses not-specified.

[39] These differences in estimations are probably reflecting the distortions associated with the exchange rate used for oil exports and the local currency component of the investment, which imply that the higher appreciation of the local currency, more dollars required to cover local currency expenses. For instance, the construction of upgraders, which are required to process the crude oil extracted from the Orinoco Oil Belt, had total investment requirements of US$ 3.7-4 billion in the 90's. Now, projects of similar characteristics are estimated to require investments close to US$ 15 billion

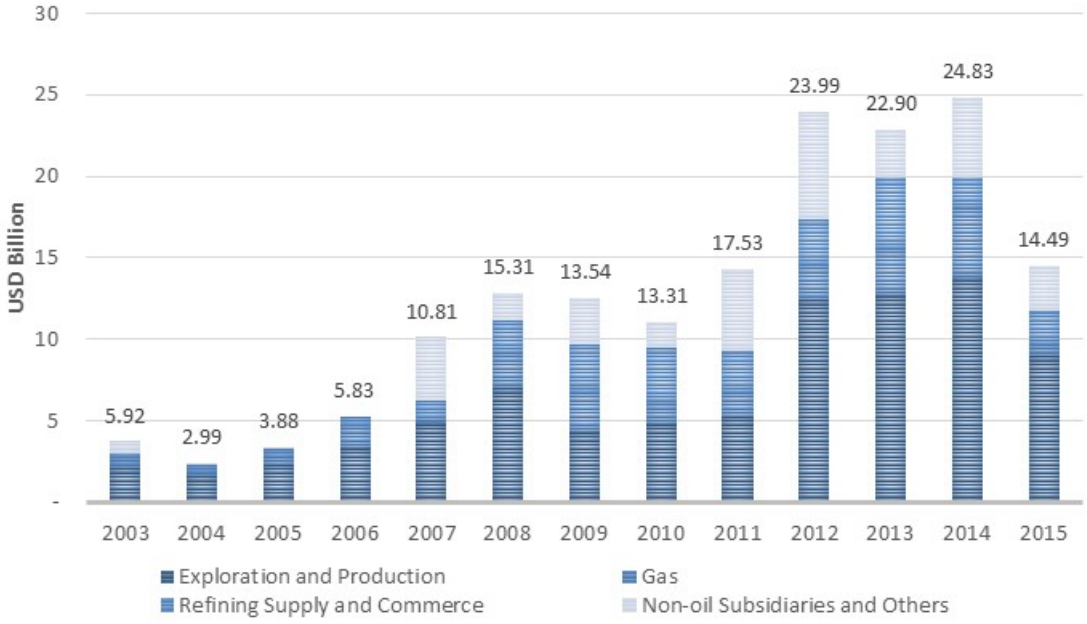


Figure 14: Oil Sector Investment Disbursements Composition, 2003-2015.
Source: PDVSA Management Reports and CIEA-IESA.

Recently, PDVSA announced a new business strategy. According to PDVSA it was in response to "*the impact of the global economic conditions on the demand for oil and the expectations for global economic growth, as well as the projected supply of oil worldwide, the capabilities and challenges related to oil and gas production in Venezuela, and the consolidation of PDVSA's non-oil businesses*". The main targets in this new business plan are increasing oil production capacity for 2025 to 3.18 mbd (including 1.9 mbd from the Orinoco Oil Belt), development of Major Projects in Refineries to increase refining capacity in 200 kbd by 2025, as well as the expansion of the gas sector and increasing the maritime transporting capacity. The expected investment for the period 2016-2025 is US$ 71.6 billion.

Alternative projects have been proposed to overcome some of the production bottlenecks in existing projects in the Orinoco Oil Belt. A summary of these projects is presented in Table 26, for the expansion of brownfield areas with lower investment requirements than the greenfield projects.

Company	Project	Cost (US$ MM)	Start Date / Projected End Date
Petroanzoategui	Debottleneck:	449	Aug 13 / Dec 17
	Phase I: From 160 to 205 KBD (120 to 153 KBD XHO)		
	Phase II: From 205 to 230 KBD (153 to 172 KBD XHO)		
Petrocedeño	Debottleneck: From 270 to 300 KBD DCO (202 to 225 KBD XHO)	To be defined	Jul 14 / Dec 19
Petromonagas	Debottleneck: From 158 to 187 KBD (120 to 145 KBD XHO)	259	May 11 / Jun 16
	Expansion Plan: From 187 to 271 KBD (145 to 210 KBD XHO)	To be defined	Jul 13 / Dec 19
Petrolera Sinovensa	Debottleneck: From 140 to 280 KBD of DCO (105 to 210 KBD XHO)	268	Jan 12 / Sep 16
	Expansion Plan: From 280 to 440 KBD (210 to 330 KBD XHO)	261	Jan 12 / Sep 17
Petropiar	Debottleneck:		
	Phase I: To 260 KBD	135	Jan 12 / Dec 16
	Phase II: To 282 KBD	825	Jan 12 / Dec 17

Table 26: Debottleneck projects for Orinoco Oil Belt.
Source: PDVSA Upgrading Division.
Note: DCO (Diluted Crude Oil), XHO (Extra-Heavy Oil)

The new business plan recognizes the many obstacles that the oil industry faces today, not only from financial constraints for investment, but from operational problems. The new production target is lower than the one contemplated in 2005, when the first Plan Siembra Petrolera was developed.

It should be noted that our cash-flow exercise, instead of the never met projections made by PDVSA, conservatively assumes capital expenditures for US$ 7.2 billion in 2016, with around 80% of those expenditures in dollar terms. Our smaller CAPEX estimate is a result of the current context of lower oil prices and lower cash-flow available for investment, which is further constrained by the lack of access to financing mechanisms, given the high risk perception and cost of debt for PDVSA.

II.3 2016 Cash flow exercise

Combining the information provided in the previous sections, we can analyze the key factors affecting the free cash flow of PDVSA, offering a general understanding of the investment constraints facing the oil industry in Venezuela in the short term. Some key aspects that generate uncertainty on this cash flow estimation include:

- The energy agreements signed by the Bolivarian Republic of Venezuela introduce a wedge between the shipments of oil and products and the collected revenues from exports, creating initially an increase in the level of receivables by PDVSA. Current accounting practices and

the opacity on the details of the energy agreements with Caribbean and South American countries, China and others, prevent the identification of the actual amount of cash available to PDVSA and create significant differences between the value of oil exports reported by the Central Bank of Venezuela and revenues from oil exports reported by PDVSA.[40]

- As a result of changes in the Central Bank Law, there is a high degree of uncertainty regarding the amount in dollars that PDVSA anticipates that it will sell to the Central Bank. PDVSA's FX requirements in a given year are not disclosed, and the forecasts available, as in the case of investments, are generally quite far from the actual investments executed. Moreover, PDVSA has a high degree of discretion on how it allocates its cash revenues. The company is not committed to sell any specific percentage of its FX inflows to the Central Bank, as used to be the rule.
- The domestic sale of oil products does not generate relevant revenues in domestic currency, due to negligible local prices and high inflation levels. As a result, PDVSA can only cover local expenses using the export revenue sold to the Central Bank, which is highly sensitive to the exchange rate at which these transactions are made.[41] On the other hand, in recent years, the accounting earnings from variations in the exchange rate, along with other transactions with the Central Bank (such as the sale of the National Gold Company or receivables from the Petrocaribe agreement, among others), have generated "accounting profits" reportedly equivalent to about US$20 billion per year, but it is not clear how much of this generated cash, and how much of it was used to service the debt with the Central Bank.
- PDVSA's share in total production, including its equity share in JVs, is approximately 85%. However, further calculations need to account for the existence of financing agreements, constraining the cash flow availability of PDVSA in at least an additional 13% of oil output.
- As with the case of revenues, the existence of energy agreements signed by the Republic and honored by PDVSA, as well as the different non-oil activities in which PDVSA is involved; introduce a high degree of uncertainty on the amount of cash involved in the fiscal contributions and other transactions between PDVSA and the Republic of Venezuela. Some were accounted initially as payment of royalties, but recently it appears that in some cases, the write-off of receivables from the government is accounted as transfers to social programs.

The complexities associated with the availability of cash flow for PDVSA are illustrated by the assumptions that we had to make for this exercise:

- In the first 9 months of 2016, the Venezuelan oil basket averaged US$ 33.33 per barrel, which implies that for our scenario of US$ 40 per barrel for the Venezuelan basket in 2016, the average price would have to be at least US$ 60 per barrel in the last quarter. On the other hand, according to the Ministry of Oil and Mining, average crude oil production for the first 9 months of 2016 has been 2.42 mbd, which would imply that including NGL production, the

[40] As described in the reports from PDVSA external auditors, given that according to its social purpose and particular responsibilities, performs multiple transactions with the main stockholder, governmental institutions and other related enterprises, which has important effects on the consolidated financial statements. Moreover, auditors also estimate that because of an investigation related to a process of international procurement of goods and services, to be extended for the foreseeable future, there are effects on the operational results that cannot be determined accurately at this moment.

[41] PDVSA could finance local expenses with the continued emission of VEF from the Central Bank of Venezuela, but this would only accelerate local prices.

average liquids production for 2016 would be approximately 2.5 mbd; a decrease of 360 kbd with respect to 2015.

- When considering the quantity of dollars sold to the Central Bank, in line with official statements, PDVSA is assumed to retain 80% of the estimated export revenues. Given the existence of preferential FX rates, it is assumed that 7% exports will be sold to the Central Bank at VEF 10/US$, 3% will be sold at VEF 50/US$ (revenues sold at the old CENCOEX/DIPRO system), and 10% will be sold at an estimated average rate of VEF 515 per US$ for 2016 (revenues sold at the SIMADI/DICOM system). Then, the weighted average FX rate including all the systems would approximate VEF 270 per US$ for 2016.
- Although more information is necessary to understand the structure of the operational expenditures (OPEX), the local currency component was estimated to be approximately 85% (at an exchange rate of VEF 25/ USD) in 2015, which makes the overvaluation of the local currency a very important component affecting the EBITDA and cash flow from operations, and making the estimates very sensitive to the assumption of the average exchange rate. The biggest component of OPEX is labor (more than 40%), followed by services. It will be important for further analysis to obtain information on the wage structure and the necessary adjustments to retain human capital, which can affect local costs.
- Regarding the capital expenditures (CAPEX) for PDVSA in 2015, it was estimated that 45% of it was in local currency (at an exchange rate of VEF 25/ USD), with the services component representing more than 50% of the CAPEX. For a baseline case scenario, inflation forecasts considered for Venezuela are of 500%, based on local estimates and year on year results for inflation during the first semester of 2016.
- In the case of debt service, the results from the PDVSA bond swap mentioned in the section on financial debt are included in the calculations, as well as the effect of notes issued to pay for debt with suppliers.

Venezuelan Basket Price (USD/bbl)	2016					
	25		32		40	
	USD mm	VEF mm	USD mm	VEF mm	USD mm	VEF mm
REVENUES						
Oil Exports	9,250	620,913	11,840	794,769	14,800	993,461
Other revenues		68,495		71,103		74,084
Total revenues	9,250	689,409	11,840	865,872	14,800	1,067,545
COSTS						
Oil imports	2,026		2,443		2,919	
OPEX	1,950	936,942	1,950	936,942	1,950	936,942
Net Royalties		1,108,951		1,419,457		1,774,321
Depreciation & Amortization	8,189		8,189		8,189	
Other costs	850		850		850	
Total costs	13,015	2,045,893	13,432	2,356,399	13,909	2,711,263
EBITDA excluding royalties	4,424	-247,533	6,597	-71,070	9,081	130,603
EBIT	-3,765	-247,533	-1,592	-71,070	892	130,603
Interest	3,483	2,532	3,483	2,532	3,483	2,532
FONDEN + Social Programs	0		0		0	
EBT	-7,248	-250,065	-5,075	-73,602	-2,592	128,071
Taxes	0		0		0	
Net Income	-7,248	-250,065	-5,075	-73,602	-2,592	128,071
+ Depreciation & Amortization	8,189		8,189		8,189	
+/- Working capital changes	-4,750	-773,438	-4,750	-773,438	-4,750	-773,438
Operating Cash Flow	-3,809	-1,023,503	-1,636	-847,040	847	-645,367
Debt Amortization	2,526	155,309	2,526	155,309	2,526	155,309
CAPEX	5,850	368,084	5,850	368,084	5,850	368,084
Cash Flow Before Financing Act	-12,185	-1,546,896	-10,012	-1,370,433	-7,529	-1,168,760

Table 27: Cash flow scenarios for PDVSA in 2016.

Source: authors' estimates.

- As shown in Table 27, even though export revenues are sold at a much higher FX rate, the existence of high domestic inflation increases the local component of the OPEX and CAPEX, which together with the fiscal contributions, imply that in local currency (VEF) the Earnings Before Interest, Depreciation and Amortization (EBITDA) becomes negative, even though for dollars this is not the case (given the high retention rate from PDVSA).
- This estimate is very conservative, as dollars sold to the Central Bank are in the range of US$ 2.3-4.0 billion, and per official statements just non-oil imports for 2016 would be US$ 20 billion.[42] Moreover, if the debt service and capital expenditures are included, the cash flow before financing operations is negative between US$ 5.6 – 10.2 billion for the three scenarios

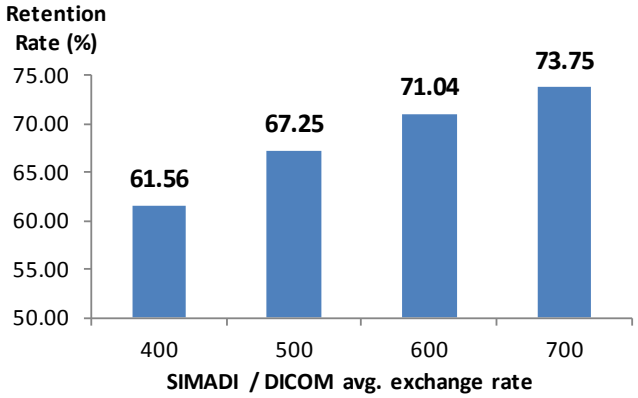
[42] "Venezuelan economy czar says more import cuts coming to pay debt". Bloomberg. May 13th, 2016. http://www.bloomberg.com/news/articles/2016-05-13/venezuelan-economy-czar-says-more-import-cuts-coming-to-pay-debt

of average oil price considered, and in local currency between VEF 1.1 and VEF 1.5 trillion. As a comparison, the reported amount of debt from PDVSA with the Central Bank is over VEF 2 trillion as of September 2016 (a cumulative increase of VEF 1.1 trillion in 2016).

- Although there are limitations in the use of CAPEX figures provided by PDVSA given the distortions in the exchange rate that were explained previously, the CAPEX amount for 2016 is significantly lower than what is recorded as CAPEX for PDVSA (US$ 7.2 billion for 2016 vs US$ 14.4 billion in 2015). This implies further delays in current projects, which implies constraints in the production potential for coming years, in the absence of other sources of financing.

The historically high levels of inflation, combined with the important distortions in relative prices and the uncertainty about the economic policy in general, cautions against concentrating in just a reference case, especially given the implications in terms of the financing activities for the large and negative results in the cash flow from operations. However, this analysis can be further extended to illustrate several tradeoffs that PDVSA faces, which affect the cash flow available to the company and provide further dilemmas for policymakers.

- Consider first the effect of different exchange rates on the amount in dollars PDVSA retains for operations. For this case, it is assumed that in 2016 the average price of the Venezuelan Oil Basket is US$ 40 per barrel and the inflation rate is 500%. In this case, for each exchange rate, a maximum retention rate (i.e. the proportion of the FX that PDVSA keeps) is calculated for which the remaining dollars are sold at that exchange rate and PDVSA breaks even in local currency. For instance, if PDVSA sells (100%-61.56%) = 38.44% of the revenues at a DICOM rate of 400 VEF /US$, the resulting weighted average for 2016 is such that PDVSA breaks even in VEF.



Cash flow before financing activities (US$ MM)	-10,939	-9,887	-9,186	-8,685

Figure 15: Maximum revenue retained by PDVSA to cover local expenses.
Source: authors' estimates.

- From Figure 15 it can be seen, that a higher devaluation of the currency implies that PDVSA requires a lower quantity of dollars to cover their local expenses, which implies a higher retention rate, and a less negative cash flow before financing activities. Nevertheless, given the same dollar requirements coming from oil imports, as well as the same foreign currency share of OPEX and CAPEX as in the reference scenario; in every case the cash flow from financing activities is negative by an amount between US$ 8.7 and 10.9 billion. This suggests there is a significant cash constraint in dollars to cover the requirements from daily operations and investments.
- Another possibility is to maintain a high retention rate for dollars in PDVSA (in this case, 80%), and sell the remaining dollars at the exchange rate necessary to cover local currency expenses. As can be seen from Figure 16, higher inflation rates imply that it is necessary to sell these remaining dollars at a higher exchange rate. This illustrates the problem in recent years when PDVSA and foreign partners were selling at a highly appreciated currency while costs in local currency were accelerating, a circumstance that was one of the drivers behind the rapid increase in costs for oil projects in Venezuela. It also shows that one-time adjustments in the exchange rate will only provide temporary relief for the cost problems faced by the oil companies operating in the country, if there are persistently high inflation levels. In this case, even with a high retention rate from PDVSA (and the implications that this could have on the rest of the economy), cash flow before financing activities remains negative, using an average price of US$ 40 per barrel for the Venezuelan Oil Basket.

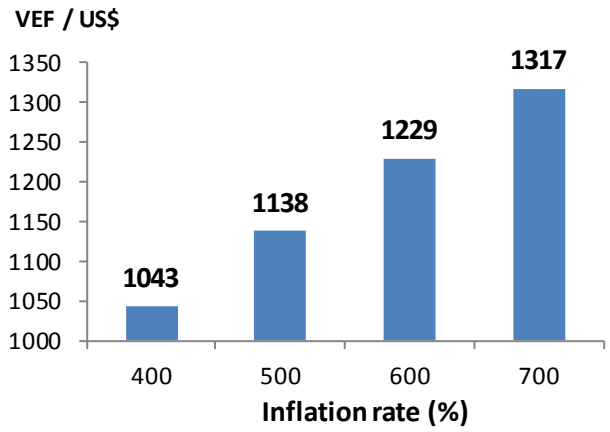


Figure 16: SIMADI/DICOM rate required to cover local expenses under different inflation scenarios given an 80% FOREX retention rate by PDVSA.

Source: authors' estimates.

- Consider a scenario in which PDVSA retains 80% of the revenues and the weighted average exchange rate at which the company sells its FOREX revenues is VEF 270/US$ (consistent with our base scenario), then the average oil price for 2016 would have to be higher than US$ 60 per barrel (US$64.25 per barrel) for PDVSA to have a positive cash flow in FOREX.

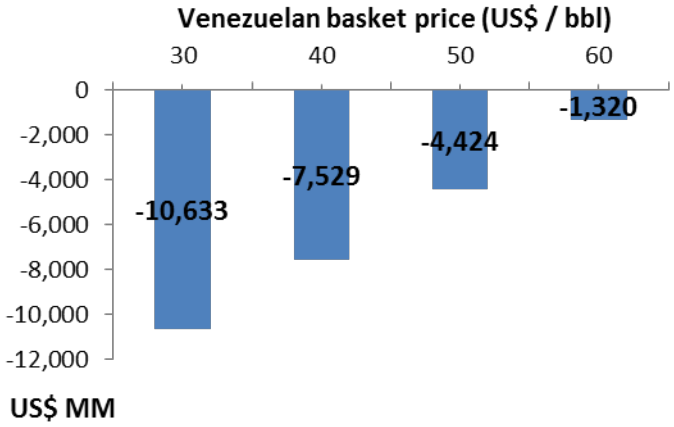


Figure 17: Cash flow before financing operations in FOREX for PDVSA for different oil prices under the assumption that PDVSA retains 80% of FOREX revenues.

Source: authors' estimates.

- Finally, suppose a scenario for which PDVSA retains 80% of the revenues and the weighted average exchange rate at which the company sells its FOREX revenues is VEF 270/US$ (consistent with our base scenario). Then the oil price required for PDVSA to break even in local currency depends on the inflation rate for the period, given that a higher inflation rate implies higher local costs and a higher oil price to cover those increases. From this, it can be shown that it would take prices between US$ 79 and US$ 99 per barrel to cover local expenses, and furthermore, these prices would generate positive cash flow before financing activities. Still in these favorable circumstances, the resulting range between US$ 6.5 and 13 billion is significantly lower than the projected non-oil imports for Venezuela in 2016.

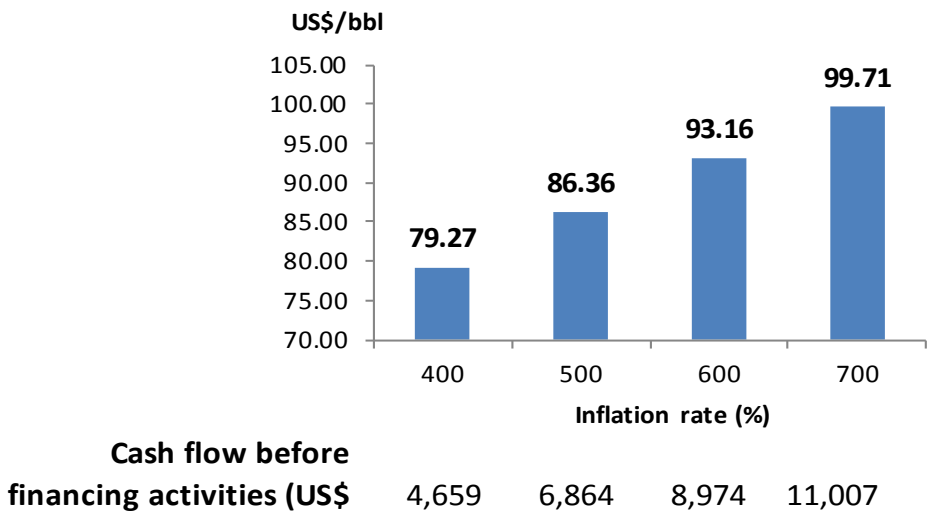


Figure 18: Break even oil price to cover local expenses.
Source: authors' estimates.

Considering the effect of the exchange rate, the foreign currency requirements from the non-oil sector, and the fiscal dependence on oil revenues, some of the trade-offs that PDVSA faces include:

- Higher retention rate of revenues in PDVSA implies that the currency must be devalued further to cover local expenses for the oil industry (or else continue with the financing of PDVSA by the Central Bank).
- Maintaining a target exchange rate implies that with high inflation levels, more revenues must be retained within the oil industry to cover local expenses from operations.
- The absence of export diversification implies a significant trade-off between investment in the oil industry and allocation of resources to non-oil purposes (including social programs, debt service for the Republic, resources for non-oil imports, and many others).
- It could be argued that a devaluation of the currency and the associated decrease in local costs for oil operations could be an element that encourages the local supply of goods and services for the industry and reduces the component of OPEX and CAPEX in foreign currency, therefore helping the cash flow of PDVSA. However, given the significant decline in the activities of many local suppliers of goods and services to the oil industry there is a limited availability of local suppliers' capacity, which prevents a higher level of local procurement of goods and services. The expropriation of many service companies and delays in payments to local suppliers, are some of the factors that have affected the availability of local capabilities.

As shown in Figure 19 PDVSA's net foreign currency (USD) sales to the Central Bank from 1999 to 2015 add up to US$ 456.8 billion, which represented approximately 53.9% of total oil exports from public companies reported by the Central Bank. However, in 2015 the Ministry of Oil report sales from PDVSA to the Central Bank of just US$12.5 billion, only 37% of the estimated oil

exports for the year. This suggests a higher retention rate of FOREX revenues from PDVSA, in particular when considered that FONDEN transfers were also reduced during the period[43].

Figure 19: PDVSA US$ sales to the Central Bank of Venezuela, and reported oil exports from PDVSA.
Source: Central Bank of Venezuela and Ministry of Oil and Mining.

Recently, according to statements by President Maduro[44], the foreign exchange sold by PDVSA to the Central Bank in January of 2016 amounted to just US$ 77 million, a 91% decrease with respect to January of 2015 (US$ 815 million). If true, that would trigger a massive foreign currency shartage for the rest of the economy, given that 94% of the total exports come from oil (in 2015 figures). This implies that in the absence of adjustments to the FOREX regime and with a higher retention rate of FOREX revenues by PDVSA; the NOC has continued their financing of local expenses through loans in local currency directly from the Central Bank.

[43] According to the Ministry of Oil and Mining report of 2015, the estimated total transfers of US$ from PDVSA to the government were US$ 19.9 billion. In addition to the US$12.5 billion sold directly by PDVSA to the BCV, PDVSA sold US$ 988 million to the Public Banking System through the SIMADI foreign exchange mechanism, transferred US$ 671 million to the National Development Fund (FONDEN), receivables for US$ 4.2 billion from Petrocaribe and other supply agreements, and finally US$ 1.51 billion were classified as "other" contributions to the government

[44] "Venta de Divisas al BCV cayó 90,7% en el último año". El Mundo Economía y Negocios. February 17th, 2016. http://www.elmundo.com.ve/noticias/petroleo/pdvsa/venta-de-divisas-de-pdvsa-al-bcv-cayo-90-7--en-el-.aspx

II.4 PDVSA assets and risk of asset seizures

The precarious cash flow of PDVSA has motivated questions on the exposure of the assets of the company to seizures by creditors, in case there is a credit event on the instruments issued by the company, or by companies that win arbitration awards against the company or the Republic. This section analyzes the asset base that could be at risk.

Tankers

The last official report on facilities owned by PDVSA gives an account of 21 active tankers for crude, asphalt, L.P.G, and product transportation. Even though some of the biggest cargo vessels were recently acquired, most of the fleet is over 15 years old, with an average over 20 years old. All vessels are small and medium sized; with load capacities below 160 thousand dead weight tons (tdwt) with total fleet capacity reaching 1,475 twdt. The total value of tanker fleet is estimated at $US 1.35 billion, considering a base case in which small-sized (with less than 80 tdwt capacity) tankers could be sold at US$50 million and medium-sized (over 80 tdwt and less than 160 tdwt capacity) would be worth US$75 million (Johnston & Johnston, 2006). PDVSA officially has plans to build 26 additional tankers with projected costs up to US$ 2.0 billion, four of them being Very Large Crude Carriers (VLCC) with 180 tdwt capacity each.

Name	Type	Capacity (thousands of dead weight tons)	Age in 2015
Yare	Crude Oil	104.3	4
Terepaima	Crude Oil	104.3	4
Paramaconi	Crude Oil	104.3	4
Tamanaco	Crude Oil	104.3	4
Negra Matea	Oil Products	47	18
Negra Hipólita	Oil Products	47	19
Manuela Sáenz	Oil Products	47	18
Luisa Cáceres	Oil Products	47	19
Caura	Oil Products	19.9	33
Guanoco	Asphalt	15.9	32
Inciarte	Asphalt	15.9	32
Eos	Crude Oil	99.4	23
Ícaro	Crude Oil	99.4	23
Hero	Crude Oil	99.4	22
Nereo	Crude Oil	99.4	23
Párnaso	Crude Oil	99.4	23
Proteo	Crude Oil	99.4	23
Teseo	Crude Oil	99.4	23
Zeus	Crude Oil	99.4	24
Paramacay	L.P.G	11.8	31
Yavire	L.P.G	11.8	31
	Total Capacity	1475.7	

Table 28: Tanker fleet summary.

Source: PDVSA, Ministry of Oil and Mining, CIEA calculations

Refining Assets Overseas

PDVSA's total refining capacity abroad amounts to 1.3 million barrels per day, including facilities in North America, Europe, and the Caribbean. The sale of the company's participation in Ruhr Oël GmbH (in 2010) and its 50% share in the Chalmette Refinery (in 2015) decreased its processing capacity by more than 1 million bpd. Despite that, its affiliate CITGO in United States, the Nesté Oil alliance in Europe and the operation of important terminals in different Caribbean islands still constitute significant downstream facilities for crude oil refining and marketing. The three CITGO refineries, Lake Charles, Corpus Christi, and Lemont in the United States concentrate a total crude oil capacity of approximately 749 kbd which is supported by an extensive distribution network of 37 product terminals located across 17 states, a total storage capacity of 18.4 million barrels, and 11 additional joint ownership terminals with over 2 million barrels of capacity. Besides, CITGO has

access to over 150 third-party terminals. Finally, there are approximately 6,500 independently owned and operated CITGO-branded retail outlets in the U.S. that have had presence in the market for around a hundred years.

Refinery	Location	Share	Partner	Refining Capacity (thousand bpd)	Nelson Complexity Index
Lake Charles	Louisiana	100%	-	425	11.8
Corpus Christi	Texas	100%	-	157	14.8
Lemont	Illinois	100%	-	167	11.6
Camilo Cienfuegos	Cuba	49%	Cupet, S.A.	65	1.9
Kingston	Jamaica	49%	PCJ	35	3.0
Haina	Dominican R.	49%	Refidomsa	34	3.4
Dundee	Scotland	50%	Neste Oil Co.	9	1.7
Eastham	England	25%	Neste Oil Co.	18	2.5
Nandnashamn	Sweden	50%	Neste Oil Co.	29	3.1
Gothenburg	Sweden	50%	Neste Oil Co.	11	2.8
		Total		**1,285**	

Table 29: Refining assets overseas.

Source: PDVSA and CITGO Management Reports.

Note: The Nelson Complexity Index "measures the complexity and cost of each major type of refinery equipment…the larger the Nelson index of a refinery, the more complex it is" (DOE, 2012).

PDVSA's U.S. refineries account for 58% of total refining capacity overseas, all of which include above-average complexity levels.[45] There are different estimates for the valuation of the refinery system. Barclays Equity Research (2014), using different assumptions for the ratio between Enterprise Value (EV) and EBITDA for a comparable company (Valero Energy), the value of their logistic assets, and the partnership structure, estimated a Refining Asset Enterprise Value between $4.8 and $6.6 billion and an equity value for all the company (including logistic assets) between $7.1 and $8.9 billion. In September 2016, PDVSA announced that the new notes issued in exchange for the PDVSA bonds with maturity in 2017 would be secured by a first-priority lien on 50.1% of the capital stock of CITGO Holding. Per this announcement,[46] PDVSA conducted an estimation of the market value of the equity of CITGO and CITGO Holding, which was US$ 9.3 billion and US$ 8.3 billion, respectively, net of debt, as of December 31, 2015. Other estimates from the same

[45]Based on an average of 10.11 in the US and a world average of 7 (Johnston & Johnston, 2006). Petroleum refineries vary by levels of complexity, and NCI serves as a single comparable indicator for different technical processes and capabilities across refining industry.

[46] "Offering circular for exchange offer of PDVSA bonds" https://es.scribd.com/document/324333858/PDVSA-2017-into-2020-Exchange-Offer-OC-16-August-2016

period placed the potential market value of CITGO at approximately US$4.8 billion.[47] The range for different valuations suggest that these estimations are subject to a variety of conditions and assumptions that can change with market developments and new information about the company and the legal constraints facing the sale of some of these assets.

The rest of refining assets are partially operated under joint-ventures. Shares on these seven refineries account only for 1% of total value of refining assets overseas. Beyond the limited participation of PDVSA on refining JVs, the very low complexity levels of refineries outside the U.S. scale down value prospects for these assets.[48]

Considerations on the risk of asset seizure in case of default

Default concerns over PDVSA's and the sovereign debt are long-dated and observed clearly in bond and CDS pricing since 2013, with interest rates above even some defaulted sovereign bonds. As interest rates on CDS imply a high probability of default, discussions have turned over recovery values and overseas assets and flows worth seizing by creditors in case that this event occurs. Besides, the debt buildup adds exposure of PDVSA's international assets to the long list of arbitration cases held by PDVSA in the International Center for Settlement of Investment Disputes (ICSID) and the International Commerce Chamber (ICC). Though the company has made payments in the 2013-2016 period even under financial stress, the limited cash flow due to lower prices and the operational issues discussed in this paper, generate uncertainty over future payments.

A default event would occur if PDVSA fails to pay, or refuses to pay, the principal and/or interests on its bonds, loans, or credit facilities. 25% of creditors could declare the defaulted debt, immediately due and payable, in the courts. Judgments over US$100 million for arbitration cases or invalidation of related contracts can also be legally considered default events. Insolvency, liquidation, or bankruptcy of PDVSA, or its subsidiaries would be also considered as automatic default. PDVSA is a separate legal entity from the Republic, with a separate credit rating and yield curve. PDVSA debt is not guaranteed by the Republic, thus if PDVSA fails to pay investors, they do not have any legal recourse against the Republic. Furthermore, this implies that a default by PDVSA would not legally trigger a sovereign default nor vice-versa.

According to market analysts and legal experts, since most of PDVSA's obligations are classified as financial debt, bonds, and loans; contracts and the creditors behavior would ultimately determine the likelihood of embargo in case of default. Although most of PDVSA bonds are subject to the New York jurisdiction as governing law, their contracts have different implications in term of asset seizure. PDVSA's debt has no Collective Action Clauses (CACs) because it is issued as usual corporate debt, which makes the event of default costlier and riskier than the sovereign notes, making possible the hold-up strategy by so called "vulture funds". Other clauses, such as cross-

[47] "PDVSA Debt Swap Plan Gets Early Thumbs Down From Investors" http://www.bloomberg.com/news/articles/2016-09-19/pdvsa-debt-swap-proposal-gets-early-thumbs-down-from-investors

[48] The Isla refinery value may be near US$ 691 million, though it is not a property of PDVSA, but of the Government of Curacao. More recently, the Government of Curacao signed a preliminary agreement with China's Guangdong Zhenrong Energy to operate the aging Isla refinery, given that this government failed to reach a new contract with PDVSA to operate the refinery (http://www.reuters.com/article/us-refinery-investment-curacao-idUSKCN11P2GM) .

default, are also fundamental, allowing the intervention of multiple instruments' creditors, in case of default of one. Finally, PDVSA's bonds include a standard negative pledge provision whereby PDVSA will not create a lien, other than permitted, over its property or assets unless the bonds are equally secured.

For various reasons, PDVSA's foreign assets are particularly at risk and their attachment could add operational challenges to the current situation. The location of assets is a major issue when considering the risk of embargo. The relevant jurisdiction's legal framework and the historical or political environment can be decisive in the execution of a seizure. Some jurisdictions have pro-creditors laws and others have pro-debtor laws, which influence the degree and timing of a possible attachment. Furthermore, politically friendly jurisdictions could be more favorable to PDVSA in case of a default than non-friendly ones, which might be a central matter regarding the current strategy of asset protection. For instance, PDVSA indirectly through its subsidiaries, owns assets that could be worth seizing in foreign – enforcement friendly – jurisdictions. These assets include liquid, hard currency assets, refining subsidiaries, oil in transit, ships in transit, accounts receivables, inventories, and overseas accounts. It should be noted that asset attachment would be a major challenge for creditors since most PDVSA assets are held by subsidiaries removed from the corporate parent. However, sovereign immunity does not apply to PDVSA's assets, but only to those which are direct property of the Republic and the Central Bank. Thus, most of the external assets related to financial debt contracts ultimately belong to the enterprise and are potentially at risk.

Oil and currency reserves are not subject to asset seizure. Venezuela owns all hydrocarbons while they are underground and the title is passed to the holder of a concession (PDVSA, PDVSA Petróleo S.A., CVP or the JV) at the wellhead. Venezuela's foreign exchange reserves are held and managed by the Central Bank, which is a separate legal entity from the Republic and generally protected by the same set of immunities. Oil in transit shipped as Free on Board (FOB) is not available for enforcement given that property transfer to the purchaser occurs at port and is typically delivered in shipments of third-party tankers. Meanwhile oil shipped through Cost, Insurance, and Freight (CIF), could be attachable and is generally shipped in the PDVSA owned fleet. Most of PDVSA petroleum exports are shipped FOB and PDVSA owned-fleet is held indirectly through subsidiaries.

Additionally, the company has moved some liquid assets to countries where enforcement is not practical, mainly to China. As part of recent oil-backed loans, many accounts denominated in U.S. dollars have been moved to Hong Kong and Shanghai, with multiple Chinese and Venezuelan entities involved in custody and management. Reduced sales and exports to the U.S. market have also diminished the total assets at risk, with expanded footprint in friendly jurisdictions.

It appears then that the refining assets in the Caribbean, Europe, and the U.S. could be the more vulnerable, given that they are property of indebted subsidiaries, these jurisdictions are not friendly to sovereign debtors and these remain the main overseas assets. According to local analysts, PDVSA has been assessing its risk mitigation strategy for potential asset attachment from ICSID arbitrations, even when attachments would be against the sovereign and not PDVSA. However, this strategy could also be associated to the protection of assets in case of a default event. Given that PDVSA US dollar denominated bonds does not have CACs, a default event could be very difficult

to manage. This has been suggested as one rationale behind the recent creation of a military-owned oil company Compañía Anónima Militar de Industrias Mineras Petrolíferas y de Gas (CAMIMPEG), interpreted by some analysts as a strategy to mitigate asset risk. Nonetheless we believe it is unlikely to be activated as such, and the negative pledge clauses present in PDVSA's bonds may prevent compensation not occurring in case of default.

PDVSA may further its asset protection strategy by: moving additional cash flows to greater protection jurisdictions, increasing FOB sales, decreasing exports to the U.S., introducing of anti-embargo clauses into its contracts, and making sure that property transfers take place in Venezuela. Additionally, CITGO debt has been increased and may be increased further, reducing the remaining equity value of seizing the assets. Lastly, accounts receivable could remain vulnerable. The newly issued bonds in 2016 have lien on 51% of CITGO equity, thus they would have a higher likelihood of recovering value in case of default.

II.5 Some concluding remarks on the financial situation

From the financial standpoint, there are several elements that hinder the capacity of PDVSA to meet its targets and increase the risk of falling or stagnated production in the medium term, under the current context:

- Reduced cash-generation capacity coming from the existence of massive subsidies to domestic consumption, the increase in non-cash exports, and the decline in production of crude types with larger profit margins.
- A substantial extraction of resources from PDVSA, given the current tax structure and the existence of numerous non-oil activities financed by the company.
- The increase in financial costs associated with a larger outstanding debt and increased risk perception from bondholders, partners in joint-ventures, and suppliers.
- The severe macroeconomic distortions, particularly the overvaluation of the local currency, which increases operational costs and investment requirements for companies.

The financial constraints imposed by these factors constitute a persistent obstacle for the progress of projects. However, these are not the only risk factors that affect the performance of the oil industry in Venezuela, because from the operational standpoint, there are also elements for concern.

III. Operational considerations, evaluation of constraints

In general, from the previous analysis we can conclude that the cash and credit limitations of PDVSA would imply a significant decrease in investment, and as a result the development of projects in the country will require other sources of financing. However, besides cash-flow issues, there are other constraints that might pose problems in the near future. We will deal with some of them in this section.

III.1 Availability of inputs

Official production targets not only would put an enormous pressure on PDVSA financials, but also on the local suppliers in the industrial sector, which has faced important capacity restrictions in recent years. According to PDVSA, in 2013, in order to accomplish the targets in the Oil Sowing Plan there were deficits of equipment parts, ranging from 40% in parts for pumps, to 70% in the case of valves and other components, as well as an estimated 35-40% in engineering hours.

Local goods and services demand		
Estimated figures to July 2013	Demand	Deficit (% of Demand)
Engineering hours	60,000,000	35-40
Bomb parts and supplies	700,000	40
Well service materials and supplies	9,500,000	50
Bomb, valves parts and accessories	7,800,000	70

Table 30: Shortage of inputs for Oil Sowing Plan.
Source: PDVSA

One source of these difficulties is the expropriation of input suppliers, such as pipe manufacturer TAVSA. Rangel (2013), reported that by August 2013, after being expropriated, TAVSA produced 120 pipes per day, only 40% of what it was producing in 2007, and it had capacity to provide only 10% of the requirements of casing tubes for PDVSA. Similarly, while rig problems have been an issue, diluent availability has been the main headache for the Orinoco extra-heavy oil production, according to local analysts. PDVSA is contractually responsible for diluent supply to all joint venture projects, but cash flow issues and falling production of light oil in the North Monagas fields, have prevented the NOC from honoring supply agreements. In fact, PDVSA is asking partners to finance the acquisition of imported diluent given its own financial constraints.[49]

The development of areas such as the Orinoco Oil Belt poses significant challenges for the acquisition and development of human capital. According to Péné-Annette (2012): "*Direct manpower for the construction and operation stages related to production, upgrading, refining,*

[49]Exclusive: Venezuela's PDVSA asks partners to pick up tab as oil prices sink. Reuters. January 18th, 2016 http://www.reuters.com/article/us-oil-venezuela-naphtha-exclusive-idUSKCN0UW1LE .

transport, and industrial services associated to the functioning of the FPO must achieve a plateau in 2016 of 127,000 workers, before stabilizing between 50,000 and 60,000 workers from 2025. If this "accelerated scenario" could be accomplished, it would mean that for 2016, nearly 20,000 engineers and specialized professionals from universities, and near 30,000 high skills technicians would be required, only for Faja projects… In addition, 76,000 artisans and low-skilled workers with experience will be required. This implies that for the Orinoco Oil Belt will require more than 50,000 people with higher education, which Venezuelan universities are not graduating and do not appear to be in capacity to prepare in coming years, given these timelines". In the case of the development of the Carabobo and Junín Blocks, Baumeister, Da Silva y Giardinella (2010) estimated that 6,600 professionals and more than 3 million hours would be required for the construction of the four upgraders, one refinery and production facilities. In 2010, it was estimated that local capacity to cover such requirements would be 66-72%, thus the deficit would be between 3,500 and 4,200 professionals. Governmental efforts in this area have included programs in the Universidad Bolivariana and Universidad Nacional Experimental de la Fuerza Armada (UNEFA), with the support of the Saber y Trabajo, Ribas, and Sucre Missions, as well as projects of Integral Formation Centers in Pariaguán and Ciudad Bolívar, and the Universidad de los Hidrocarburos. PDVSA reported in 2012 that 51% of participants of the Misión Saber y Trabajo (77 workers) had job offers in PDVSA, while 4,150 students of the Misión Ribas had Jobs in PDVSA Servicios Faja, Producción Faja and Empresas Mixtas. All these efforts seem insufficient and often misguided.

On the other hand, PDVSA created in 2005 the *System of Employment Democratization* (Sistema de Democratización del Empleo, SISDEM), to organize a pool of workers to be hired by contractors of PDVSA in their projects, essentially including students from the Misión Ribas Técnica. However, some contractors have complained that students from this program require significant further training in oil operations, and after acquiring some experience, are recruited by PDVSA, which causes a high rotation of personnel in these companies (Marcano, 2013).

It is also important to mention that after the conflict and oil strike of 2003, which led to the massive dismissal of skilled personnel in PDVSA, an increasing number of non-oil activities began to be carried out by PDVSA, as part of the social programs that were included in the strategic plans of the company. In the following years, the creation of non-oil subsidiaries, as well as the expropriation of oil service companies in 2009, led to a significant increase in the payroll of PDVSA. In 2015, the total number of employees (including non-oil subsidiaries), was of 150,032, more than five times the number of employees reported in 2003, and more than three times the pre-strike levels.[50]

Given the observed decline in oil production in the same period, the average production per employee in 2015 was 18.3 barrels/day, the lowest in the eighty years for which production and oil worker data is available (see Figure 20). Even if a more conservative estimate is considered (which includes only employees in Exploration, Production, CVP, Joint Ventures and the Orinoco Oil Belt) observed values are lower than those attained for the whole company in the period between 1990-2005.[51] This aggregate ratio, although an imperfect measure of productivity, does illustrate the magnitude of the changes occurred in recent years and the increased demand for resources destined to non-oil activities.

[50] Of this total number for 2015, PDVSA reported that 30,794 employees were in non-oil subsidiaries
[51] Reported number of employees in PDVSA by subsidiaries are included in the Appendix 4.

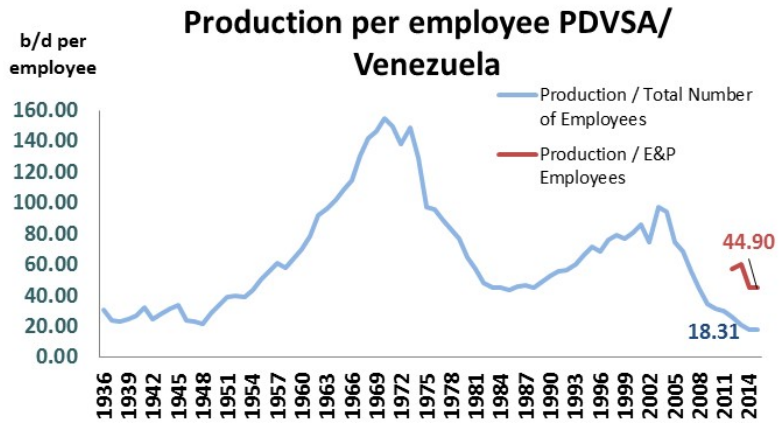


Figure 20: Evolution of Production per employee in Venezuela.

Note: estimates after 1975 correspond to PDVSA and not the total number of oil employees in Venezuela. Source: Statistical Review of the Ministry of Oil and Mining and PDVSA Annual Management Report.

III.2 Technical and operational inefficiencies

In addition to the previous constrains, there have been issues in all areas of operation that affect short-term production and long term potential for some of the fields, including:

- **Drilling operations.** Recent estimates suggest that in 2015, drills were non-operative approximately 40% of the time, compared to less than 30% in 2011. The world standard for this indicator is between 10% and 15%. This number is largely the result of operations in the Orinoco Belt, where in the past two years the inefficiency rate has been more than 50%, significantly increasing well-completion time. There are several factors contributing to this outcome, including the acquisition of drilling equipment not compatible with existing facilities, lack of experienced personnel to operate the equipment, and severe logistical issues.
- **Gas compression and connecting facilities**. Severe problems in the management of gas compression plants have resulted in lack of pressure for the wells, limiting the production potential and leading to massive flaring, which generates losses in natural gas commercialization and has hazardous environmental effects. For example, in the field of El Furrial, in the Eastern part of the country, technological requirements are significantly higher in comparison to other fields of the same type of crude, and thus the compression plant is necessary for the process of enhanced oil recovery. After the government cancelled (expropriated) the operation contract of Williams Energy (Wilpro) for the compression plant, and PDVSA assumed the operation in 2009, production has shown a dramatic decrease.[52] Similarly, in western areas of the country, the lack of connecting facilities for gas and water injection, along with problems in well-maintenance, are elements affecting crude extraction, and gas firms do not have the infrastructure to take advantage of the associated gas produced.

[52] Individually, El Furrial is the largest producing field in Venezuela. Since 2008, production in this field has fallen from 408 kbd to an estimated 259 kbd in 2015.

- **Power facilities**. There is evidence in recent years that the problems in the electric sector can be an important constraint in the expansion of oil operations, particularly in downstream activities, given that those facilities are largely connected to the national grid. For instance, El Palito refinery is dependent on the generation from the Planta Centro complex, which has suffered frequent service interruptions. Because of this and other problems related to the operation of the refineries, the availability of products has decreased, which in turn affected export volumes. In the case of the transport infrastructure, power outages can provoke interruptions in loading and unloading operations at the Jose terminal (which is the main gateway for oil exports in the country), given its dependence on hydroelectric generation. As mentioned before, the lack of completion of natural gas projects (including transport infrastructure) has prevented the use of gas, which is currently flared, in thermoelectric plants. Therefore, when problems arise in hydroelectric generation, the natural gas that is used in crude recovery needs to be moved away from oil operations to assist thermoelectric plants. If not, then distillates that were supposed to be exported must be used for these plants.
- **Industrial facilities evidence declining performance**. Upgraders - the units that process heavy and extra-heavy crude oil from the Orinoco Oil Belt - present general depreciation in its physical infrastructure, due to maintenance deficits. Some equipment and machinery is completely inactive, and safety measures for workers have been seriously undermined. Infrastructure depreciation affects crude quality, which does not fulfill the requirements on water and salt content to be commercialized. The Jose Complex upgraders were designed to produce 1 mbd, their current formal capacity is at 909 kbd, but they actually upgrade 700 kbd. Storage and crude handling capacity has diminished by 33-35%, mostly because of out-of-service tanks. Lack of maintenance and several technical failures force ships to over-stay in ports, adding US$120 million in costs during 2014. Even critical infrastructure such as the Paraguaná Refinery Complex (the second largest refinery complex worldwide), has been regularly missing key equipment and parts to enable its full operation. As mentioned before, because of the electricity problems, underperformance in the refinery sector constraints the availability of products, not only for exports, but to be used in upstream operations in the Orinoco Oil Belt. In addition, in 2016 there were press reports about the lack of operation of the loading arms at the Jose Complex Terminal that triggered some delays in loading cargoes.
- **Safety and environmental risks.** The operational difficulties are also reflected in diminished industrial safety practices, affecting upstream operations, but even more severely downstream operations. Serious accidents such as the Guarapiche river spill in Monagas and the tragic accident in the Paraguana Refinery Complex, have had serious implications for the operation of the industry, reducing the availability of products to export and inputs for local operations. Fluid treatment infrastructure has insufficient capacity to manage PDVSA's residual water, inputs, and hazarous waste. Sulfur transportation also presents lack of maintanence in Petrocedeño facilities and coke management facilities are in desrepair, causing massive delays. Hence, both production and upgrading are generating pollution at high rates.
- **Crime.** In recent years, significant problems asociated with crime have affected the operations. According to reports from inspections made by the Ministry of Oil and Mining to the Orinoco Oil Belt projects presented in July 2015, not only workers are regularly exposed to crime, but extorsion of service providers from organized crime is frequent, including to

PDVSA employees.[53] Partly this is a result of the delays in deploying the security infrastructure. Theft, mainly of electricity cables, continues to run rampant, and has resulted in the restriction of electricity supply to many wells. Parts used for upstream facilities have also been stolen. Incredibly, even pirate activity in the Maracaibo Lake has taken a toll on the operations of the industry.[54]

III.3 Corporate governance and industrial practices

There are a lot of problems derived by the lack of coordination and effective corporate governance in the sector. PDVSA appears to be poorly coordinated with the ministries and other government agencies. Contracts by different government entities have no common database to share insights on projects. Hence, resources have been misallocated. According to reports from Ministry inspectors, 100% of the Engineering, Procurement and Construction contracts faced delays.[55] Early production in the Orinoco Belt and operations elsewhere, are delayed due to inadequate contractual practices. For example, local committee review periods extend from 150 to 280 days and direct contracts by Service Orders limit the enforcement of Public Procurement Laws. Furthermore, technical specifications of contracts are faulty, extending execution time due to changes and amendments in prices and inputs; and some of these show higher prices in dollars. Amendments delay and stop projects as management is located away from execution areas. Services and work programs are also delayed due to contractors' poor performance and the appalling delivery from Bariven (PDVSA's procurement affiliate)[56]. In many cases, managerial procedures have been highly irregular. Recently, charges of corruption in PDVSA's procurement deals led to indictments and convictions in US courts, and according to PDVSA's Audited Financial Statements for 2015, the company confirmed it was a "*victim of fraud in its process of international procurement*"[57].

The suspension of operations in projects and plants due to inefficient management and practices has been very costly to PDVSA. For example, Petrocedeño's waste management project had serious delays and an interruption in solid waste management is estimated to cost US$26 million per-day. Further, Petrocedeño's upgrader had a 15-day non-planned stoppage in 2015 that implied losses for approximately US$16.8 million.

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[53] "Informe General Faja Petrolífera del Orinoco 'Hugo Chávez Frías'" https://es.scribd.com/doc/298847999/INSPECCION-a-LA-FPO-Inspectores-Socialistas. According to this report, firms in the Orinoco Oil Belt are asked to pay fees ("vacunas") in order to perform transport activities around the area. Also, firms are forced to open employment positions for locals under the umbrella of "communal participation" if they wish to continue their activities in the area.

[54] "Pirates and hold-ups: crime strikes Venezuela's oil industry". Reuters. June 30th, 2015 http://www.reuters.com/article/us-venezuela-oil-crime-insight-idUSKBN0P51G020150630

[55] "Informe General Faja Petrolífera del Orinoco 'Hugo Chávez Frías'" https://es.scribd.com/doc/298847999/INSPECCION-a-LA-FPO-Inspectores-Socialistas

[56] Examples of this mismanagement are, the dinning and housing facilities for workers, the refining storage and shipment enhancement project at the Anzoátegui Terminal, Petrocedeño's main station construction, and Petroanzoategui and Petrocedeño's solid waste management facility

[57] "Venezuela's PDVSA finds procurement fraud in U.S. case". Reuters. July 13th, 2016 http://uk.reuters.com/article/uk-venezuela-usa-corruption-idUKKCN0ZT2HT

One of the main observations regarding the management of the oil JVs operations is the high centralization of decisionmaking in PDVSA, which reduces the financial and operational autonomy of these companies and increases the operational risks, given PDVSA's discretional use of the resources and the inability of the JV management to finance the expansion of projects with their own operative cash flow. As a result, final investment decisions by JVs partners have been deferred, severely stretching the financial capacity required for infrastructure development.

III.4 Concluding comments on operational constraints

All these constraints influence the risk perception of Venezuela, which has increased in recent years. The reputational costs of the expropriation of oil firms, changes in the fiscal regime, and the low institutional capacity and transparency, are also factors affecting the operations and investments in the long term. For example, ExxonMobil and ConocoPhillips, two of the largest oil investors in the country, left the country and are still in arbitration proceedings. According to the Fraser Institute, which provides a global ranking of oil jurisdictions based on surveys of risk perception, Venezuela has had the lowest ranking during the last 7 years. This has also been evidenced in the exit in recent years of consortium partners in the Orinoco Oil Belt projects in recent years (e.g.: PetroVietnam, Surgutneftegaz, TNK-BP, Petronas, and Lukoil).

Global Petroleum Survey Ranking							
	2009	2010	2011	2012	2013	2014	2015
Venezuela	141	132	135	146	157	156	125
Total considered Jurisdictions	141	133	135	147	157	156	126

Table 31: Global Petroleum Survey.

Source: Fraser Institute

IV. Areas for further analysis

As mentioned in the introduction, this paper is focused on the financial situation of the oil industry and the operational challenges in the upstream. However, it is important to consider that there are also significant risks regarding the operation and performance of downstream assets, which not only represent significant threats to the financial situation of PDVSA, but imply serious safety and environmental risks and can affect the long-term sustainability of the oil industry in Venezuela. Further research should deal with some of the following issues:

- Refining economics: margins, the effect of local market subsidies, and how to reduce them.
- Industrial security in downstream operations: key performance indicators and their comparison with other NOCs.
- Status of downstream projects: particularly regarding oil and gas pipelines as bottlenecks for upstream projects (e.g. diluent availability and transportation).

The discussion about the oil industry has to consider its relation within the general energy framework, identifying the constraints to the oil sector arising from challenges in the gas and electricity sector. Some of the areas that could be part of further research include:

- This paper did not deal directly with the *natural gas sector*, but the development of the offshore unassociated natural gas fields offers a tremendous opportunity to monetize those resources and to eventually use them for electricity generation, residential uses, and oil production. The strategy of exporting gas to Colombia and especially to Trinidad appears to offer a very attractive opportunity. The study of these topics constitutes an important priority.

- The *relation between refining supply, gas infrastructure, and electricity generation*. There are important linkages between refining assets and electricity availability (e.g. El Palito Refinery and Planta Centro). In addition, the lack of completion of the infrastructure for gas storage and transport, not only limits the supply of natural gas for the domestic market, but prevents the use of gas for electricity generation in dry seasons to complement the hydroelectric generation. This in turn affects the amount of oil products available to export (e.g. diesel used for electric generation).

- As mentioned previously, the *lack of infrastructure for gas capture and storage* has been one of the elements explaining the decline in production in mature fields, but has also become a constraint in the long-term development of the value chain of the gas sector. The use of propane, a valued resource, for domestic use in cooking, at highly subsidized prices has become a constraint for the development of the petrochemical sector, which currently faces a limited supply for manufacturing polypropylene. The development of treatment and transport infrastructure for methane gas for residential use could free highly valued resources to develop forward linkages in the oil and gas sector, but it does imply a review of the pricing of oil and gas domestically and the incentives for investment in infrastructure for the sector.

It is also important to understand from a fiscal point of view, the cost-benefit of developing different oil regions (Eastern, Western, Orinoco Oil Belt), natural gas projects, enhanced oil recovery projects, and the potential recovery of fields that are currently not being exploited. This includes formulation of scenarios that include the following:

- Return on investments for PDVSA for different fields, to establish how financial resources can be optimized.
- Analysis on the current structure of Joint Ventures and the potential impact of increasing participation of foreign investment.
- Evaluation of fiscal changes in the Hydrocarbons Law, particularly for upstream operations.
- Financial implications of the different debt arrangements within JVs and other forms of credit (including oil-backed loans).

Other areas for further study include the following:

- An evaluation on the progress of upstream projects and the main investment constraints faced by joint-venture partners.
- Review of the structure of compensation for PDVSA executives, and mechanisms to attract and retain human capital in the different areas of operations, as well as performance indicators for upstream and downstream activities in the industry.

- Assessment of technological complementarities or mismatch between Chinese operators and contractors and the infrastructure in Venezuelan fields (which have been historically supported by U.S. service companies).
- Environmental impact of the development of the Orinoco Oil Belt and its implications in terms of CO2 emissions.
- Performance review of PDVSA's procurement activities, comparing prices paid for goods and services with international benchmarks, the impact of the exchange rate, and the exercise of market power by local suppliers.
- Financial implications of the accounting practices of PDVSA. For example, the nature of what is reported as financial income, as well as the treatment of the deferred income tax.
- Further information is required on how the local currency component in the CAPEX changes with the stage of development of the projects.

V. Concluding Comments

This report offers a bleak diagnostic of the situation of PDVSA and the Venezuelan oil industry. The country wasted a tremendous opportunity during a decade of high oil prices. A combination of massively dismissing human capital, the nationalization of operators and service companies, and the over-extraction of resources from the National Oil Company; led to investment stagnation and production decline. The problems of the company were accelerated by the oil price decline, but were not caused by it. Even though the government has recently assumed a much more pragmatic stance, trying to attract investors, it has been largely unable to do so. PDVSA's cash flow crunch in 2016 is very severe. The company has accumulated large arrears with contractors and partners, and even had trouble paying diluent suppliers. Our cash-flow exercise under different assumptions of exchange-rates and oil prices, points to a significant deficit of anywhere from US$ 5-11 billion.

In spite of the re-profiling of part of its 2017 debt payments in 2016, the risk of default over the next two years are still significant. The cost of default could be substantial, a combination of possible asset and shipment seizures, lack of commercial credit, and limits to the ability of importing diluent. The costs related to avoiding these effects might be also large.

PDVSA and the industry also face significant operational difficulties that would make it hard to rapidly recover production, even if the cash-flow and institutional environment significantly improves. However, there is no doubt that the outstanding resource base of Venezuela, better macroeconomic policies, and a more pro-investment regulatory framework, could lead to significant increases in production in the medium-term. It is beyond the scope of this paper to offer policy recommendations, but the region offers some successful models on how to structure the oil sector and the NOC to more efficiently develop hydrocarbon resources. This shall be the subject of our forthcoming work.

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Appendix

PROGRAM	GOAL	EXPENDITURE 2001-2014 USD MM	SHARE OF TOTAL OFF-BUDGET	SHARE OF SOCIAL DEV. PROGRAMS
MISIÓN RIBAS	To provide education to adults without high-school diploma.	3,460.00	1.48%	2.32%
MISIÓN ALIMENTACIÓN	To offer access to food through regulation and management of trade, market, distribution, reception, provision, deposit, conservation, quality and consumption of food. Includes entities such as: PRODUCTOS CASA, MERCAL, PDVAL, FUNDAPROAL, SADA, VENALCASA, LOGICASA.	7,843.00	3.35%	5.26%
MISIÓN BARRIO ADENTRO I, II Y III	To offer health services in low-income neighborhoods through outpatient clinics. Barrio Adentro II: to increase the number of outpatient clinics. Barrio Adentro III: to construct 600 integral diagnosis centers and 600 integral rehabilitation centers. Barrio Adentro IV: consists of a specialized infant-cardiology hospital.	26,740.00	11.43%	17.92%
MISIÓN VUELVAN CARAS	To develop skills in unemployed youngsters and adults in common interest areas. To constitute productive and services cooperatives.	672.00	0.29%	0.45%
MISIÓN MILAGRO	To attend free of charge to low-income population with visual disabilities. This program is designed by cooperation with Cuba.	159.00	0.07%	0.11%
MISIÓN SUCRE	To provide high-level education through the Bolivarian University to form social communicators, historians and lawyers.	966.00	0.41%	0.65%
MISIÓN CIENCIA	To promote and coordinate development and follow-up of initiatives to utilize scientific and technological knowledge, incentivizing its use and articulation with economic, social, academic and political networks, which allow the use and production of knowledge in function of endogenous, scientific and technological development of the country.	319.00	0.14%	0.21%
MISIÓN REVOLUCIÓN ENERGÉTICA	To generate awareness on energy importance. To freely substitute light bulbs by 82 million energy-saving light bulbs, to reduce energy consumption. 15 million were allocated to food supplies (Mercal).	6,175.00	2.64%	4.14%

GRAN MISIÓN VIVIENDA VENEZUELA[58]	To provide credits to construction, acquisition or expansion of housing to low-income families.	8,074.00	3.45%	5.41%
GRAN MISIÓN AGROVENEZUELA	To guarantee food rights through technical assistance, inputs provision and financing agricultural producers.	1,140.00	0.49%	0.76%
GRAN MISIÓN HIJOS DE VENEZUELA	To assist families and mothers with less than 18 years old children or any disabilities, which income is less than minimum salary.	598.00	0.26%	0.40%
GRAN MISIÓN EN AMOR MAYOR VENEZUELA	To offer pensions to third-age workers but cannot earn social security pensions.	1,241.00	0.53%	0.83%
GRAN MISIÓN BARRIO TRICOLOR	To structure and organize "comunas" (community grassroots) and to proportionate worthy living conditions in low income neighborhoods. To guarantee the strategic security and defense of the country with grassroots, with participation of militia. To provide inputs to maintain these communities.	325.00	0.14%	0.22%
PROYECTOS AGRÍCOLAS	N/A Agricultural projects.	4,048.00	1.73%	2.71%
PROYECTOS DE INFRAESTRUCTURA	N/A Infrastructure projects.	2,024.00	0.87%	1.36%
PROYECTOS AUTOGAS	To develop infrastructure for vehicular natural gas use by 1) constructing service stations with vehicular natural gas supplies; and 2) incentivizing changes in vehicles to use biofuels.	733.00	0.31%	0.49%
FONDO ALBA CARIBE	To finance programs and social policies, prioritizing healthcare, education and housing, as well as socio-productive policies that promote economic development through cooperatives, and SMEs.	152.00	0.06%	0.10%
FONDO BICENTENARIO	The Bicentenario Alba-Mercosur Fund is an investment mechanism to strengthen productive capacity destined to exports.	887.00	0.38%	0.59%
FONDO ESPECIAL DE LA JUVENTUD	N/A. Special Youth Fund.	40.00	0.02%	0.03%
FONDO SEGURIDAD	N/A. Security Fund.	558.00	0.24%	0.37%
FONDO MIRANDA	N/A.	19,894.00	8.50%	13.34%
FONDO DEPORTE	N/A Sports Fund.	125.00	0.05%	0.08%
FONDO CHINO	Cooperation Fund with China to finance policies in Venezuela. It is financed by the Chinese Development Bank and Venezuela's National Endogenous Development Fund. Funds are managed through BANDES.	28,889.00	12.35%	19.37%
PLAN DE VIALIDAD	To finance road infrastructure.	3,745.00	1.60%	2.51%

[58] During 2012 and 2011, PDVSA received funds from FONDEN, BANDES and the Joint Chinese-Venezuelan Investment Fund for the acquisition of goods and services for the Gran Mision Vivienda. In 2011, paid US$ 611 and US$ 43 MM in 2012. After that, liabilities were transferred to the Fondo Simón Bolívar para la Reconstrucción.

PLAN CARACAS BICENTENARIO	Too finance policies regarding healthcare, social protection, road maintenance, social infrastructure rehabilitation, socio-environmental formation, and refuge family from 2010 natural disasters.	402.00	0.17%	0.27%
OBRAS HIDRÁULICAS	To construct water treatment plants, potable water infrastructure, water sanitation, and flood control.	1,088.00	0.46%	0.73%
NÚCLEOS DE DESARROLLO ENDÓGENO	To organize communities to use resources for local development.	283.00	0.12%	0.19%
APORTES SECTOR ELÉCTRICO PDVSA	Electric turbogeneration, equipment installment, construction, expansion of electric substations, grid adjustments and electric transformer.	11,001.00	4.70%	7.37%
APOYO A EMERGENCIA POR LLUVIAS	N/A. Emergency support due to rain.	534.00	0.23%	0.36%
APORTES A COMUNIDADES	Works in Nueva Esparta island. Policies of students' preferential passage. Support to train the Army's National Guard troops. Extraordinary plan for environmental sanitation in Maracaibo, Zulia. Debris collection in Tachira. Habilitation and repairmen of infrastructure in Valencia.	8,304.00	3.55%	5.57%
APORTE SOCIAL. PROYECTOS DE INVERSIÓN PDVSA	N/A. Social support investment projects of PDVSA.	4,485.00	1.92%	3.01%
FONDO DE AHORRO DE LOS TRABAJADORES	N/A. PDVSA workers savings fund.	2,446.00	1.05%	1.64%
OTRAS MISIONES Y APORTES	N/A. Others.	1,828.00	0.78%	1.23%
FONDO ESPECIAL PARA LA OFENSIVA ECONÓMICA	N/A. Not active. Special Fund for Economic Offensive.	-	0.00%	0.00%

Appendix 1: Social development programs: disbursements and goals.

Source: PDVSA Annual Management Report.

	2010	2011	2012	2013	2014	2015
Mature field expansion	**188.87**	**213.08**	**225.20**	**214.63**	**208.16**	**209.70**
Petroboscan (Boscan)	95.75	102.52	107.47	101.00	100.00	104.00
PetroQuiriquire (Quiriquire)	10.22	9.86	11.54	11.00	10.00	10.00
Petroregional del Lago (Urd. Oeste	26.20	30.31	32.50	31.00	30.00	30.00
Petrolera Indovenezolana (San Cris	33.25	39.19	37.60	35.00	31.00	28.00
Petrodelta (Monagas Sur, Temblad	23.45	31.21	36.09	36.63	37.16	37.70
XHO JV Brownfield	**927.1**	**953.3**	**1014.0**	**1036.8**	**1062.0**	**1093.4**
PetroCedeño	136.0	141.0	127.0	115.8	121.1	120.1
PetroMonagas	109.0	110.0	130.0	141.0	134.2	129.8
PetroPiar	147.0	158.0	166.0	160.0	154.9	149.5
Cabrutica (PetroAnzoategui)	93.7	88.0	103.4	111.9	110.3	106.2
Petrolera Sinovensa	81.0	98.0	117.0	135.4	153.8	156.0
San Tomé (Dacion/Ayacucho 8)	207.4	199.6	201.2	202.9	211.2	229.1
Morichal	153.0	158.7	169.4	170.0	176.5	202.7
Early Production Stage	**0.0**	**0.0**	**0.0**	**18.2**	**38.9**	**89.6**
Petrocarabobo*				2.056805	7.5	16.2
Petroindependencia*				0.193323	1.7	20.7
PetroUrica*				0.391369	0.9	1.1
PetroJunin				1.465392	3	8.3
Petromiranda*				1.850272	4.3	8.8
Junin 10*				12.28155	21.5	34.5
PDVSA projects	**1674.1**	**1633.3**	**1455.4**	**1392.9**	**1240.2**	**1083.0**
El Furrial	383.4	393.2	352.8	290.0	241.0	258.9
Santa Barbara	173.7	178.2	179.5	212.0	174.0	174.0
Tia Juana Lago	113.0	92.0	102.0	97.0	88.0	88.0
Others West	570.3	533.7	471.9	425.3	393.1	380.4
Others East	433.6	436.4	349.3	368.6	344.1	181.7
Subtotal	**2,790.1**	**2,799.7**	**2,694.6**	**2,662.6**	**2,549.2**	**2,475.8**

* Project includes upgrading

Appendix 2: Oil production estimates by field

Source: PDVSA Annual Management Reports and CIEA calculations

Tax	*Rate*	*Threshold*	*GO*
Royalties	30%-20%	If mature or heavy-oil wells are not profitable. In the Orinoco Oil Belt royalties may be diminished until 20%.	LOH 38.493
Superficial tax	(100 U.T. * x)^y	For each km2 of surface per year. X increases 2% each year for 5 years, later on it increases 5% yearly.	LOH 38.493
Own consumption tax	10%	For each mt3 of derivatives produced and consumed in operations, estimated as price sold to final consumers.	LOH 38.493
General consumption tax	30-50%	For each lt. of hydrocarbon derived-products sold in the national market. The rate is decided each year in the Budget Law. It may be totally or partially exonerated.	LOH 38.493
Extractive tax	1/3	Of liquid hydrocarbons' value, paid monthly alongside royalties. The tax may be reduced by the value of royalties (both cash and in kind) and other special advantages payment.	LOH 38.493
Export Registry tax	0.1%	Of any exported hydrocarbon, estimated at the sell-price.	LOH 38.493
Special contribution Extraordinary prices	20%	If price is bigger than Budget estimates and less or equal than 80 US$/bbl. Tax is estimated as proportion of the difference in both prices. If the tax is bigger than 80 US$/bbl, the tax is estimated from the difference between 80 $ and the budget estimate.	Decree #8.807
Special contribution Exorbitant tax	Trench 1: 80% Trench 2: 90% Trench 3: 95%	Portion of revenues. If price is… Trench 1: bigger than 80US$/bbl and less than 100 US$/bbl. If price is more or equal than 100$/bbl, it is calculated as a percentage of the difference of 100 and 80. Trench 2: more or equal than 100 US$/bbl and less than 110 US$/bbl. If price is more or equal than 110$/bbl, it is estimated as a portion of the difference of 110 and 100. Trench 3: more or equal than 110 US$/bbl.	Decree #8.807
Rent tax	50%	Applies on the difference between revenues minus costs, royalties, special contributions, export registry, LOCTI, and endogenous development taxes. If this difference is 0, no rent tax is applied.	Decree #2.163
LOCTI: Organic	1%	Of revenues.	LOCTI

Law of Science and Technology			6151
Endogenous Development	1%	Of net revenues after royalties.	N/A PDVSA website: "An address by the Minister of Energy and Petroleum and President of PDVSA, Rafael Ramírez Carreño, to the National Assembly Plenary on the Model for Mixed Companies." Link
Anti-Drugs tax	1%	Of revenues after (previous) taxes, unless after tax revenues equals 0.	39.510
Sports tax	1%	Of revenues after (previous) taxes, unless after tax revenues equals 0.	39.741
Special advantage (shadow tax)	50%	If tax take is less than 50% of gross revenue after all taxes and levies, the Joint Venture pays the difference between 50% of revenue after taxes and total tax take.	N/A Uria Menendez and D'Empaire Reyna Abogados. Link
Value Added Tax	12%	On sales, services and imports.	

Appendix 3: Taxes for the Oil Industry.

Source: CIEA Energy in Figures.

	2012	2013	2014	2015
Social and Environmental Management Report				
Total	**129,836**	**137,823**	**147,126**	**145,053**
Oil Subsidiaries	**106,465**	**113,369**	**116,806**	**114,259**
Exploration	1,912	2,056	2,306	2,205
Production	28,185	25,758	32,957	32,221
CVP, Joint Ventures, Orinoco Oil Belt	20,540	20,515	26,728	26,735
Refining	9,745	9,827	9,879	9,391
Supply and Commerce	5,186	5,309	5,738	5,825
Bariven	1,038	1,007	1,030	
Headquarters	5,795	6,125	6,330	7,061
Gas	10,549	10,350	7,317	7,120
Intevep (R&D)	1,764	1,698	1,750	1,713
Sea operations	9,102	9,162		
PDVSA Asphalt (formerly Palmaven)	254	242	234	222
PDV Maritime	1,785	1,807	1,741	1,699
PDVSA Services	10,610	5,427	5,693	5,392
PDVSA Oil Services		14,086	15,004	14,580
PDV America			20	19
PDV Caribe			79	76
Non Oil Subsidiaries	**23,371**	**24,454**	**30,320**	**30,794**
PDVSA Agriculture	1,208	1,324	1,012	1,056
Urban Developments	236	809	255	254
Communal Gas	9,102	9,329	9,500	9,438
PDVSA Industrial	9,122	9,905	17,813	18,296
PDVSA Engineering and Construction	881	965	2	1
PDVSA Navy	1,611	1,793	1,708	1,693
PDVSA TV			30	56
Asphalt	250	329		
Health	961			
Annual Management Report				
PDVSA Own Labor Force	132,086	140,626	152,072	150,032
Outsourced Labor Force	15,603	16,168	25,698	21,284

Appendix 4: PDVSA employees by subsidiary.

Note: Figures for the Social and Environmental Management Report are provided by the Executive Direction of Human Resources of PDVSA, but do not coincide with those reported in the Annual Management Report.

Source: PDVSA Annual Management Report and Social and Environmental Management Report