27. Objectives and policies of financial risk management

The Group is exposed to financial risks, including:

- market risk (risk related to raw material and petroleum product prices, risk related to prices of CO_2 allowances, currency risk, interest rate risk),
- liquidity risk,
- credit risk related to financial and trade transactions.

The Parent has appropriate units (Finance Management Office, Financial Risk Analysis and Control Office together with the Credit Risk and Transaction Documentation Team) reporting to the Chief Financial Officer, who coordinates and exercises ongoing supervision of the LOTOS Group's financial risk management processes.

Furthermore, the Price Risk and Trading Committee, appointed by the Management Board, supervises the work on development of policies and procedures, and monitors the implementation of the Group's strategy in the area of its responsibilities. Specifically, the Committee provides opinions on or initiates key price and trading risk management initiatives, issues recommendations, and submits proposals for actions that require the Management Board's approval.

In addition, to ensure effective management of liquidity, debt structure and external finance raising by companies of the LOTOS Group, the Management Board has appointed the Liquidity Optimisation and Financing Coordination Team.

Financial risk management seeks to achieve the following key objectives:

- increase the probability of budget and strategic objectives being met,
- limit cash flow volatility,
- ensure short-term financial liquidity,
- optimise the expected level of cash flows and risk,
- support operating, investment and financial processes, and create value in the long term.

With a view to implementing the above objectives, the Group has put in place appropriate tools and developed a number of documents, approved at the relevant decision-making levels, defining the framework for ensuring effectiveness and safety of the Group's financial activities, including:

- the methodology for quantifying exposures to particular risks,
- the time horizon for hedging a given risk,
- acceptable financial instruments,
- the method of assessing financial risk management,
- limits within risk management,
- the reporting method,
- credit limits,
- documentation and operating standards,
- separation of responsibilities for execution of transactions, risk analysis and control, documentation of and accounting for transactions, and their allocation to different corporate units.

The Parent monitors and reports all managed market risks on an ongoing basis. The Parent uses liquid derivatives which can be measured by applying commonly used valuation models. The valuation of derivative financial instruments is performed based on market inputs provided by reliable sources. Opening positions with respect to risks which do not arise as part of the Group's core business is prohibited.

In 2018, the Parent continued to apply the hedge accounting policies implemented in 2011 and 2012 with respect to its cash flows (i.e. foreign-currency facilities used to finance the 10+ Programme, designated as hedges of future USD-denominated petroleum product sale transactions).

27.1 Risk related to commodity and petroleum product prices

The Group considers risk related to prices of commodities and petroleum products to be particularly important.

The following risk factors are identified in this area:

- volatility of the refining margin, measured as the difference between liquid indices of a reference petroleum product basket (e.g. aviation fuel, gasoline, diesel oil, fuel oil) and a liquid index of reference commodity (e.g. Urals crude),
- volatility of prices with respect to the commodity and product inventory volumes deviating from the required levels of emergency and operational stocks,
- volatility of differentials between the reference indices and indices used in commercial contracts (e.g. Urals-Brent differential, i.e. the difference between different types of crude oil),
- use of non-standard pricing formulae in trade contracts.

The Parent has in place "Grupa LOTOS S.A.'s commodity and petroleum products price risk management policy", which defines the classification system for transaction portfolios and their business functions, describes how risk is understood and how portfolio exposures are measured, specifies permitted financial instruments and limitations on their use, and transaction execution standards, and also provides guidelines on how to evaluate risk management performance and set relevant limits. Transaction limits falling within the scope of that policy are delegated by the Management Board to lower-level decision-makers.

To support the achievement of the policy objectives, the Company uses a leading Energy Trading and Risk Management system (Allegro).

Under the approved policy, the Company may continue to offer petroleum products at fixed prices. To preserve the original price risk profile, the Group has entered into commodity swaps.

Open commodity swaps as at December 31st 2018:

Type of contract	Underlying index	Valuation period	Amount in tonnes in the valuation period	Fair value measurement	
				Financial assets	Financial liabilities
Commodity swap	FuelOil 3.5 pct Brg FOB Rrdam	Mar 2019–Jun 2021	183,433	0.5	(21.5)
Commodity swap	Gasoil 0.1 pct Crg CIF NWE_ARA	Mar 2019–Jun 2021	(17,010)	3.3	(0.1)
			Total	**3.8**	**(21.6)**

The above swap transactions for a total of 183,433 tonnes based on the FuelOil 3.5 pct Brg FOB Rrdam liquid index in the period from March 2019 to June 2021 and (17,010) tonnes based on the Gasoil 0.1 pct Crg CIF NWE ARA liquid index in the same period were entered into to reverse the risk profile relating to the prices of raw materials and petroleum products and arising in connection with the sale of bitumen components at fixed prices.

Type of contract	Underlying index	Valuation period	Amount in cubic metres in the valuation period	Fair value measurement	
				Financial assets	Financial liabilities
Commodity swap	Ethanol T2 FOB Rdam Barge Eur/cm	Jan 2019–Dec 2019	24,300	10.0	-
			Total	**10.0**	**-**

Furthermore, in connection with the execution of an annual contract for the purchase of ethanol, in 2018 the Parent entered into commodity swaps to hedge the price risk.

Open commodity swaps as at December 31st 2017

Type of contract	Underlying index	Valuation period	Amount in tonnes in the valuation period	Fair value measurement	
				Financial assets	Financial liabilities
Commodity swap	3.5 pct Brg FOB Rrdam	Mar 2018 – Jun 2019	111,877	34.7	-
Commodity swap	Gasoil 0.1 pct Crg CIF NWE_ARA	Mar 2018 – Jun 2019	(10,339)	-	(3.8)
			Total	**34.7**	**(3.8)**

The above swap transactions for a total of 111,877 tonnes based on the 3.5 PCT Barges FOB Rotterdam liquid index in the period from March 2018 to June 2019 and (10,339) tonnes based on the Gasoil 0.1 pct Crg CIF NWE ARA liquid index in the same period were entered into to reverse the risk profile relating to the prices of raw materials and petroleum products and arising in connection with the sale of bitumen components at fixed prices.

27.1.1 Sensitivity analysis: market risk related to commodity and petroleum product price movements

Below is presented an analysis of the sensitivity of the Group's financial transactions to the risk of fluctuations in prices of commodities and petroleum products as at December 31st 2018 and 2017, assuming price increase/decrease corresponding to the implied annual volatility of the underlying index:

	December 31st 2018			December 31st 2017		
	Carrying amount	Change*		Carrying amount	Change**	
		+ implied volatility	- implied volatility		+ imp. vol.	-imp. vol.
Financial assets	13.8	1.5	(1.5)	34.7	37.3	(37.3)
Financial liabilities	21.6	(62.1)	62.1	3.8	4.3	(4.3)
Effect on profit/loss		**63.6**	**(63.6)**		**33.0**	**(33.0)**

* With respect to instruments held as at December 31st 2018, the above deviations of underlying index prices were calculated based on the implied annual volatility of the underlying index for December 31st 2018, as published by *SuperDerivatives*. The volatility was +/- 37.28% for the FuelOil 3.5 pct Brg FOB Rrdam index, +/- 38.11% for Gasoil 0.1 pct Crg CIF NWE_ARA, and +/- 16.42% for Ethanol T2 FOB Rdam Barge Eur/cm.

** With respect to instruments held as at December 31st 2017, the above deviations of underlying index prices were calculated based on the implied annual volatility of the underlying index for December 31st 2017, as published by *SuperDerivatives*. The volatility was +/- 27.39% for the FuelOil 3.5 pct Brg FOB Rrdam index and +/- 21.23% for Gasoil 0.1 pct Crg CIF NWE_ARA.

The effect of the underlying index price changes on the fair value was examined assuming that the currency exchange rates remain unchanged.

27.2 Risk related to prices of carbon dioxide (CO_2) emission allowances

The risk related to prices of carbon dioxide emission allowances is managed within the Parent on an ongoing basis in line with the assumptions set forth in the strategy for managing the risk approved by the Grupa LOTOS Management Board. The Group balances its future CO_2 emission allowance deficits and surpluses depending on the market situation and within defined limits. In line with the approved strategy and limits, the Parent executes the following transactions for emission units:

- EUA (Emission Unit Allowance) – represents an allowance to emit one tonne of CO_2,
- CER (Certified Emission Reduction unit) – represents one tonne of CO_2 equivalent (tCO_2e) effectively reduced. CERs are obtained in connection with investment projects implemented in developing countries where no CO_2 emission limits have been defined.
- ERU (Emission Reduction Unit) – represents one tonne of CO_2 equivalent (tCO_2e) effectively reduced. ERUs are certified emission units, obtained through investment projects implemented in countries where CO_2 reduction costs are lower.

As at December 31st 2018, the Parent's deficit of allowances in the 2013–2020 trading period (Phase III) was 1,142,876 tonnes. However, taking into account derivative transactions for a total of 1,159,000 tonnes, the Parent had surplus emission allowances for 16,124 tonnes, which were purchased in view of the market situation and the strategic nature of the emission allowances deficit expected after 2020.

As at December 31st 2017, the Parent's deficit of allowances in the 2013–2020 trading period (Phase III) was 1,103,796 tonnes. However, taking into account derivative transactions for a total of 1,554,000 tonnes, the Parent had surplus emission allowances for 450,204 tonnes, which were purchased in view of the market situation and the strategic nature of the emission allowances deficit expected after 2020.

To manage risk related to carbon dioxide emission allowances, the Group evaluates the risk of deficit of free emission allowances allocated under the National Allocation Plan on a case-by-case basis.

The CO_2 emission allowances for 2013–2020 presented below include allowances granted pursuant to the Regulations of the Council of Ministers, as well as other free allowances allocated by the European Commission.

Number of free CO_2 emission allowances for 2013–2020 and actual CO_2 emissions:

in million tonnes	2013	2014	2015	2016	2017	2018	2019	2020	Total
Allowances allocated under the National Allocation Plan(1)	1.8	1.7	1.6	1.6	1.6	1.5	1.5	1.5	12.8
Actual CO_2 emissions (2)	1.7	1.9	1.9	2.0	1.8	2.0	-	-	11.3

(1) Number of free CO_2 allowances in 2013–2020 as per the National Allocation Plan (NAP), based on the Regulation of the Polish Council of Ministers of March 31st 2014 (Dz.U. of 2014, item 439) and the Regulation of the Polish Council of Ministers of April 8th 2014 (Dz.U. of 2014, item 472), containing a list of installations covered by the greenhouse gas emission allowance trading scheme along with the number of allowances allocated to them. The figures also account for additional free emission allowances from the European Commission reserve, allocated in connection with the expansion of the refinery's production capacities following from the use of natural gas in hydrogen production.

(2) CO_2 emissions, calculated based on the production data for the installations covered by the emissions trading scheme. The data is verified in accordance with Art. 59 of the Act on Trading in Greenhouse Gas Emission Allowances of April 28th 2011.

As at December 31st 2018, considering the proposed amount of allowances to be allocated under the European Union Emissions Trading Scheme for 2018 and the actual volume of emissions, the Group reported a deficit of allocated CO_2 emission allowances, and therefore recognised a liability PLN 40.7m as at December 31st 2018 (December 31st 2017: PLN 14.4m). The PLN 26.3m effect of the provision on EBIT (see Note 9.4) is presented under other expenses (2017: PLN 4.6m; see Note 9.3).

If required, futures contracts to purchase carbon dioxide (CO_2) allowances open as at the last day of the reporting period are settled by the Group through physical delivery, with the intention to potentially use the allowances to offset actual CO_2 emissions. The valuation of contracts settled through physical delivery is not disclosed under financial assets/liabilities in the financial statements. However, the Group internally monitors and performs the valuation of such contracts as part of an overall assessment of the effectiveness of its CO_2 risk management (off balance sheet).

EUA futures contracts open as at December 31st 2018 which the Group considered likely to be settled through physical delivery and used for the Group's own purposes were not disclosed in the financial statements as at the last day of the reporting period, and their fair value was recorded only as an off-balance sheet item.

Contract position as at December 31st 2018 and 2017:

Open CO_2 allowances contracts as at December 31st 2018:

Type of contract	Contract settlement period	Contract volume (in tonnes)	Phase	Fair value measurement*	
				Financial assets	Financial liabilities
EUA Futures	Dec 2019 – Dec 2020	1,159,000	Phase III	50.1	(0.8)

*Off-balance-sheet value, used exclusively for statistical purposes and as part of monitoring in risk management.

Open CO_2 allowances contracts as at December 31st 2017:

Type of contract	Contract settlement period	Contract volume (in tonnes)	Phase	Fair value measurement*	
				Financial assets	Financial liabilities
EUA Futures	Dec 2018 – Dec 2020	1,554,000	Phase III	8.7	(0.1)

*Off-balance-sheet value, used exclusively for statistical purposes and as part of monitoring in risk management.

27.2.1 Sensitivity analysis: market risk related to movements in prices of carbon dioxide (CO_2) emission allowances

As at December 31st 2018 and 2017, the Group held futures for the purchase of carbon dioxide (CO_2) emission allowances.

The Group does not perform a sensitivity analysis for the fair value of futures contracts to purchase CO_2 emission allowances held by it as at the end of the reporting period if it intends to settle the contracts through physical delivery and use them to cover its allowance deficits under the carbon emission reduction system. Therefore, no sensitivity analysis was performed with reference to the EUA futures held as at December 31st 2018 and 2017.

27.3 Currency risk

In its operations the Group is exposed to currency risks related to:

- trading in raw materials, petroleum products and other commodities,
- investment cash flows,
- cash flows from financing activities, including deposits and borrowings,
- valuation of derivative instruments,

indexed to or denominated in a currency other than the functional currency.

Currency risk is managed by the Company in line with the assumptions of the Grupa LOTOS S.A. Currency Risk Management Policy. Under the policy, exposure is understood as material positions exposed to currency risk, affecting liquidity within the management horizon when the risk arises. The central risk metric is Cash-Flow-at-Risk (CFaR), computed based on the CorporateMetrics™ methodology, with the CFaR value limit and the maximum hedge ratio being the key limits.
The exposure management horizon is linked with the budget forecast horizon, which varies from three to six consecutive quarters depending on the time of the year.

The Group actively manages its currency exposure by optimising the expected values of cash flows and risk within applicable limits, taking into account expected market developments.

As USD is used in market price quotations for crude oil and petroleum products, it was decided that USD is the most appropriate currency for contracting and repaying long-term credit facilities financing the 10+ Programme as this would reduce the structural long position and, consequently, also the strategic currency risk.

The Group has a structural long position in USD (it benefits from a rise in the USD/PLN exchange rate) as its cash inflows dependent on the USD exchange rate (mainly revenue from sale of petroleum products) are higher than the corresponding cash outflows (e.g. on purchase of crude oil, credit facility repayments).

Under the EFRA Project, the Group concluded EUR/USD currency contracts designed to hedge EUR-denominated capital expenditure against USD as the main financing currency.

Open currency contracts as at December 31st 2018:

Type of contract	Purchase/sale	Contract settlement period	Currency pair (base/quote)	Amount in base currency (million)	Fair value measurement	
					Financial assets	Financial liabilities
Currency spot	Sales	Jan 2019	EUR/PLN	(1.6)	-	-
Currency forward	Purchase	Jan 2019	USD/PLN	11.5	-	(0.4)
Currency forward	Purchase	Jan-Dec 2019	EUR/USD	125.0	-	(14.1)
Currency forward	Sales	Jan–Jun 2019	USD/PLN	(110.0)	-	(7.3)
Currency swap	Purchase	May 2019	EUR/USD	19.0	-	(0.6)
Currency swap	Purchase	Jan 2019	EUR/PLN	60.0	0.1	-
Currency swap	Sales	Jan–Jul 2019	USD/PLN	(261.6)	2.7	(3.2)
				Total	**2.8**	**(25.6)**

Open currency contracts as at December 31st 2017:

Type of contract	Purchase/sale	Contract settlement period	Currency pair (base/quote)	Amount in base currency (million)	Fair value measurement	
					Financial assets	Financial liabilities
Currency spot	Purchase	Jan 2018	USD/PLN	54.0	-	(0.6)
Currency spot	Purchase	Jan 2018	EUR/PLN	0.1	-	-
Currency forward	Purchase	Jan 2018	USD/PLN	124.0	-	(8.3)
Currency forward	Purchase	Jan–Mar 2018	EUR/PLN	10.0	-	(0.6)
Currency forward	Purchase	Jan−Jun 2018	EUR/USD	25.8	5.8	-
Currency forward	Sales	Jun–Oct 2018	USD/PLN	(60.0)	6.2	-
Currency forward	Sales	Mar 2018	EUR/PLN	(10.0)	1.1	-
Currency swap	Purchase	Jan–Jun 2018	USD/PLN	162.6	-	(38.3)
Currency swap	Purchase	Jan 2018	EUR/USD	14.3	1.1	-
Currency swap	Sales	Jan–Oct 2018	USD/PLN	(565.7)	106.3	-
				Total	**120.5**	**(47.8)**

27.3.1 Sensitivity analysis: market risk related to currency exchange movements

Currency structure of selected financial instruments as at December 31st 2018

December 31st 2018	Note	(million) USD	USD translated into PLN	(million) EUR	EUR translated into PLN	Carrying amount in foreign currency translated into PLN
Classes of financial instruments						
Financial assets						
Trade receivables		78.0	293.2	6.5	28.4	321.6
Cash and cash equivalents		75.7	284.7	26.7	115.4	400.1
Other financial assets:		75.7	284.5	-	-	284.5
Loans advanced to related entities		64.3	241.4	-	-	241.4
Deposits		9.0	33.9	-	-	33.9
Cash for removal of the MOPU from the YME field	15	0.7	2.8	-	-	2.8
Other		1.7	6.4	-	-	6.4
Total		**229.4**	**862.4**	**33.2**	**143.8**	**1,006.2**
Financial liabilities						
Borrowings		913.4	3,376.6	-	-	3,376.6
Notes		60.4	227.0	-	-	227.0
Finance lease liabilities		-	-	7.8	33.3	33.3
Trade payables		388.8	1,461.9	5.8	25.0	1,486.9
Other financial liabilities		3.2	12.0	11.6	49.9	61.9
Total		**1,365.8**	**5,077.5**	**25.2**	**108.2**	**5,185.7**

Currency structure of selected financial instruments as at December 31st 2017

December 31st 2017	Note	(million) USD	USD translated into PLN	(million) EUR	EUR translated into PLN	Carrying amount in foreign currency translated into PLN
Classes of financial instruments						
Financial assets						
Trade receivables		88.4	307.9	4.3	18.3	326.2
Cash and cash equivalents		271.1	868.4	23.1	102.0	970.4
Other financial assets:		182.4	634.6	4.7	20.0	654.6
Loans advanced to related entities		157.0	546.3	4.7	19.8	566.1
Deposits		8.3	29.0	-	-	29.0
Security deposit (margin)		-	-	-	0.2	0.2
Cash for removal of the MOPU from the YME field	15	15.9	55.1	-	-	55.1
Other		1.2	4.2	-	-	4.2
Total		**541.9**	**1,810.9**	**32.1**	**140.3**	**1,951.2**
Financial liabilities						
Borrowings		1,201.1	4,116.2	-	-	4,116.2
Notes		59.0	205.4	-	-	205.4
Finance lease liabilities		-	-	10.7	44.5	44.5
Trade payables		485.3	1,689.3	5.3	21.9	1,711.2
Other financial liabilities		4.5	15.6	6.4	26.5	42.1
Total		**1,749.9**	**6,026.5**	**22.4**	**92.9**	**6,119.4**

For the purposes of sensitivity analysis, the currency structure presented above also accounts for intercompany foreign currency transactions sensitive to changes in foreign exchange rates, which affect the Group's currency risk in accordance with IAS 21 The Effects of Changes in Foreign Exchange Rates with respect to recognition of relevant foreign exchange gains or losses in the Group's net profit or loss.

Apart from currency spots, forwards and swaps, the Group held foreign-currency derivatives, including commodity swaps, commodity options, interest-rate swaps and futures. Depending on the type of derivative, the Group applies appropriate methods of fair value measurement, which also determine the method of calculating the effect of changes of foreign exchange rates on the value of individual derivatives (for more detailed information on the derivative measurement methods, see Note 7.22). The tables below, presenting sensitivity of financial instruments to currency risk as at December 31st 2018 and December 31st 2017, also present the effect of currency exchange rate movements on the carrying amounts of the derivative financial instruments.

Analysis of the sensitivity to currency risk as at December 31st 2018, showing the effect of a +/- 9.950% change in the USD/PLN exchange rate and a +/- 5.512% change in the EUR/PLN exchange rate on net profit or loss

December 31st 2018	Effect of exchange rate increase/decrease on net profit/loss for the year in 2018			
	+9.950%	+5.512%	-9.950%	-5.512%
	USD	EUR	USD	EUR
Classes of financial instruments				
Financial assets				
Derivative financial instruments	(46.7)	14.4	46.7	(14.4)
Trade receivables	29.2	1.6	(29.2)	(1.6)
Cash and cash equivalents	28.3	6.4	(28.3)	(6.4)
Other financial assets:	28.3	-	(28.3)	-
Loans advanced to related entities	24.0	-	(24.0)	-
Deposits	3.4	-	(3.4)	-
Cash for removal of the MOPU from the YME field	0.3	-	(0.3)	-
Other	0.6	-	(0.6)	-
Total financial assets	**39.1**	**22.4**	**(39.1)**	**(22.4)**
Financial liabilities				
Borrowings	143.7 [1]	-	(143.7) [1]	-
Notes	22.6	-	(22.6)	-
Finance lease liabilities	-	1.8	-	(1.8)
Derivative financial instruments	151.4	(34.0)	(151.4)	34.0
Trade payables	145.5	1.4	(145.5)	(1.4)
Other financial liabilities	0.1	2.8	(0.1)	(2.8)
Total financial liabilities	**463.3**	**(28.0)**	**(463.3)**	**28.0**
Total	**(424.2)**	**50.4**	**424.2**	**(50.4)**

[1] The calculation of the effect of an exchange rate movement on the balance-sheet item takes into account the effect of cash flow hedge accounting. Assuming a +/-9.950% change of the USD/PLN exchange rate, the effect of cash flow hedge accounting would potentially lead to a change of PLN (194.1)m/PLN 194.1m in the fair value of borrowings. Furthermore, the calculation takes into account the effect of paid upfront arrangement fees (measured at the exchange rate effective on the payment date), reducing financial liabilities under borrowings, which would potentially result in a change of PLN 1.9m/PLN (1.9)m in the fair value of borrowings, assuming a +/- 9.950% change of the USD/PLN exchange rate.

The above deviations of carrying amounts in the złoty that are dependent on currency exchange rates were calculated on the basis of the implied annual exchange rate volatility for December 31st 2018, which was 9.950% for USD/PLN and 5.512% for EUR/PLN, as published by Reuters. The sensitivity analysis was performed with reference to the balance of instruments held as at December 31st 2018.

Analysis of the sensitivity to currency risk as at December 31st 2017, showing the effect of a +/- 9.087% change in the USD/PLN exchange rate and a +/- 5.950% change in the EUR/PLN exchange rate on net profit or loss

December 31st 2017	Effect of exchange rate increase/decrease on net profit/loss for the year in 2017			
	+9.087%	+5.950%	-9.087%	-5.950%
	USD	EUR	USD	EUR
Classes of financial instruments				
Financial assets				
Derivative financial instruments	(206.7)	6.7	206.7	(6.7)
Trade receivables	28.0	1.1	(28.0)	(1.1)
Cash and cash equivalents	78.9	6.1	(78.9)	(6.1)
Other financial assets:	57.6	1.2	(57.6)	(1.2)
Loans advanced to related entities	49.6	1.2	(49.6)	(1.2)
Deposits	2.6	-	(2.6)	-
Cash for removal of the MOPU from the YME field	5.0	-	(5.0)	-
Other	0.4	-	(0.4)	-
Total financial assets	**(42.2)**	**15.1**	**42.2**	**(15.1)**
Financial liabilities				
Borrowings	157.2 [1]	-	(157.2) [1]	-
Notes	18.7	-	(18.7)	-
Finance lease liabilities	-	2.6	-	(2.6)
Derivative financial instruments	95.5	2.5	(95.5)	(2.5)
Trade payables	153.5	1.3	(153.5)	(1.3)
Other financial liabilities	1.4	1.6	(1.4)	(1.6)
Total financial liabilities	**426.3**	**8.0**	**(426.3)**	**(8.0)**
Total	**(468.5)**	**7.1**	**468.5**	**(7.1)**

[1] The calculation of the effect of an exchange rate movement on the balance-sheet item takes into account the effect of cash flow hedge accounting. Assuming a +/-9.087% change of the USD/PLN exchange rate, the effect of cash flow hedge accounting would potentially lead to a change of PLN (219.4)m/PLN 219.4m in the fair value of borrowings. Furthermore, the calculation takes into account the effect of paid upfront arrangement fees (measured at the exchange rate effective on the payment date), reducing financial liabilities under borrowings, which would potentially result in a change of PLN 2.6m/PLN (2.6)m in the fair value of borrowings, assuming a +/- 9.087% change of the USD/PLN exchange rate.

The above deviations of carrying amounts in the złoty that are dependent on currency exchange rates were calculated on the basis of the implied annual exchange rate volatility for December 31st 2017, which was 9.087% for USD/PLN and 5.950% for EUR/PLN, as published by Reuters. The sensitivity analysis was performed with reference to the balance of instruments held as at December 31st 2017.

27.4 Interest rate risk

The Parent is exposed to the risk of changes in cash flows caused by interest rate movements as interest income and interest expense related to certain assets and liabilities accrue based on floating interest rates, including in particular investment credit facilities under the 10+ Programme and the EFRA Project, as well as the financing and refinancing credit facility where the amount of interest is computed by reference to the floating LIBOR USD rate. The Parent manages the interest rate risk within the granted limits using interest rate swaps.

In a long-term perspective, a partial risk mitigation effect was achieved through the choice of a fixed interest rate for a tranche of the term facility contracted to finance the 10+ Programme.

Open interest rate contracts as at December 31st 2018:

Type of contract	Period	Notional amount (USD million)	Company receives	Financial assets	Financial liabilities
Interest rate swap (IRS)	Dec 2015–Jun 2019	2.5	6M LIBOR	0.1	-
Interest rate swap (IRS)	Jan 2015–Dec 2021	522.0	3M LIBOR	7.7	(7.1)
			Total	**7.8**	**(7.1)**

In the table above, IRS contracts are aggregated according to the currency of the notional amount and the reference rate. The ‘Period’ column shows the earliest start date and the latest end date of the period for contracts classified in a given group.

Open interest rate contracts as at December 31st 2017:

Type of contract	Period	Notional amount (USD million)	Company receives	Financial assets	Financial liabilities
Interest rate swap (IRS)	Jul 2011–Jun 2019	207.5	6M LIBOR	0.1	(19.8)
Interest rate swap (IRS)	Jan 2015–Dec 2021	494.0	3M LIBOR	9.2	(8.0)
			Total	**9.3**	**(27.8)**

In the table above, IRS contracts are aggregated according to the currency of the notional amount and the reference rate. The ‘Period’ column shows the earliest start date and the latest end date of the period for contracts classified in a given group.

27.4.1 Sensitivity analysis: market risk related to interest rate movements

Analysis of the Group’s sensitivity to interest rate risk as at December 31st 2018, assuming a +/- 0.26% change in interest rates

December 31st 2018	Note	Carrying amount	Change	
			+0.26%	-0.26%
Classes of financial instruments				
Financial assets				
Derivative financial instruments (2)	23	7.8	3.4	(3.4)
Cash and cash equivalents	17	1,941.3	5.0	(5.0)
Other financial assets:		506.0	1.3	(1.3)
Oil and Gas Extraction Facility Decommissioning Fund	15	38.7	0.1	(0.1)
Deposits	15	33.9	0.1	(0.1)
Cash pledged as security for contractual obligations related to future asset decommissioning	15	430.6	1.1	(1.1)
Cash for removal of the MOPU from the YME field	15	2.8	-	-
Total		**2,455.1**	**9.7**	**(9.7)**
Financial liabilities				
Bank borrowings	22.1	3,421.2	7.7 (1)	(7.7) (1)
Non-bank borrowings	22.2	55.8	0.1	(0.1)
Notes	22.3	227.0	0.6	(0.6)
Finance lease liabilities	22.4	180.0	0.5	(0.5)
Derivative financial instruments (2)	23	7.1	(0.7)	0.7
Total		**3,891.1**	**8.2**	**(8.2)**

(1) Net of fixed-rate borrowings and paid arrangement fees reducing liabilities under borrowings.

(2) Interest rate swap (IRS). The difference between the change in the valuation amount, when the interest rate curve moves up or down 0.26%, arises at the time of calculating and discounting future cash flows (relating to the contract settlement) as at the valuation date. The cash flows are discounted at different interest rates (in the first case the interest rate curve movement increases the interest rate by 0.26%, in the second case it reduces the interest rate by 0.26%).

Analysis of the Group's sensitivity to interest rate risk as at December 31st 2017, assuming a +/- 0.30% change in interest rates

December 31st 2017	Note	Carrying amount	Change	
			+0.30%	-0.30%
Classes of financial instruments				
Financial assets				
Derivative financial instruments (2)	23	9.3	7.3	(7.4)
Cash and cash equivalents	17	1,920.7	5.8	(5.8)
Other financial assets:		334.1	1.0	(1.0)
Oil and Gas Extraction Facility Decommissioning Fund	15	34.1	0.1	(0.1)
Deposits	15	37.0	0.1	(0.1)
Cash pledged as security for contractual obligations related to future asset decommissioning	15	207.9	0.6	(0.6)
Cash for removal of the MOPU from the YME field	15	55.1	0.2	(0.2)
Total		**2,264.1**	**14.1**	**(14.2)**
Financial liabilities				
Bank borrowings	22.1	3,903.0	10.0 (1)	(10.0) (1)
Non-bank borrowings	22.2	68.3	0.2	(0.2)
Notes	22.3	313.0	0.9	(0.9)
Finance lease liabilities	22.4	141.6	0.4	(0.4)
Derivative financial instruments (2)	23	27.8	(0.9)	0.9
Total		**4,453.7**	**10.6**	**(10.6)**

(1) Net of fixed-rate borrowings and paid arrangement fees reducing liabilities under borrowings.
(2) Interest rate swap (IRS). The difference between the change in the valuation amount, when the interest rate curve moves up or down 0.30%, arises at the time of calculating and discounting future cash flows (relating to the contract settlement) as at the valuation date. The cash flows are discounted at different interest rates (in the first case the interest rate curve movement increases the interest rate by 0.30%, in the second case it reduces the interest rate by 0.30%).

The sensitivity analysis was performed for the instruments held as at December 31st 2018 and December 31st 2017. The effect of the interest rate changes on the fair value was examined assuming that the currency exchange rates remain unchanged. In the case of derivative instruments held as at December 31st 2018 and December 31st 2017, for the purpose of interest rate sensitivity analysis the interest rate curve was moved up or down by the historical annual volatility for December 31st 2018 and December 31st 2017, calculated based on historical volatility data for interest rates on interest rate swaps expiring in one year, as published by Reuters.

27.5 Liquidity risk

The liquidity risk management process at the Group consists in monitoring projected cash flows and the portfolio of financial assets and liabilities, matching maturities of the assets and liabilities, analysing working capital, and optimising cash flows within the Group. This process requires that units operating in different business areas closely cooperate in activities undertaken in order to ensure safe and effective allocation of the liquidity.

The majority of the Group's Polish subsidiaries participate in a physical cash pooling arrangement, whereby the Parent manages the structure on an on-going basis to optimise liquidity and interest balances.

In the period covered by the budget, liquidity is monitored on an ongoing basis across the Group as part of financial risk management. In the mid- and long term, it is monitored as part of the planning process, which helps to develop a long-term financial strategy.

In the area of financial risk, in addition to active management of market risk, the Group observes the following liquidity management rules:

- no margins in derivative financial instrument trading on the OTC market,
- limited possibility of early termination of financial transactions,
- limits for low-liquidity spot financial instruments,
- credit limits for counterparties in financial and trade transactions,
- ensuring adequate quality and diversification of available financing sources,
- internal control processes and organisational efficiency facilitating prompt contingency response.

Below are presented contractual maturities of financial liabilities as at December 31st 2018 and December 31st 2017:

Contractual maturities of financial liabilities:

December 31st 2018	Note	Carrying amount	Contractual cash flows	Up to 6 months	6 – 12 months	1–2 years	2–5 years	Over 5 years
Bank borrowings (other than overdraft facilities)	22.1	3,418.2	4,340.4	162.4	1,375.7	929.5	1,853.0	19.8
Overdraft facilities	22.1	3.0	3.0	3.0	-	-	-	-
Non-bank borrowings	22.2	55.8	60.2	8.1	7.9	15.7	27.5	1.0
Notes	22.3	227.0	238.0	238.0	-	-	-	-
Finance lease liabilities	22.4	180.0	261.0	26.7	29.9	50.8	110.5	43.1
Trade payables	25	1,913.7	1,913.7	1,913.7	-	-	-	-
Other financial liabilities	25	279.5	279.5	244.5	8.9	7.4	7.0	11.7
Total		**6,077.2**	**7,095.8**	**2,596.4**	**1,422.4**	**1,003.4**	**1,998.0**	**75.6**
December 31st 2017								
Bank borrowings (other than overdraft facilities)	22.1	3,902.9	4,624.0	89.8	1,164.4	906.5	1,968.4	494.9
Overdraft facilities	22.1	0.1	0.1	0.1	-	-	-	-
Non-bank borrowings	22.2	68.3	69.4	6.5	58.1	0.9	2.2	1.7
Notes	22.3	313.0	306.1	306.1	-	-	-	-
Finance lease liabilities	22.4	141.6	179.0	28.7	28.7	53.2	68.4	-
Trade payables	25	2,201.7	2,201.7	2,196.5	5.2	-	-	-
Other financial liabilities	25	222.0	222.0	188.0	7.4	3.3	7.8	15.5
Total		**6,849.6**	**7,602.3**	**2,815.7**	**1,263.8**	**963.9**	**2,046.8**	**512.1**

Contractual maturities of derivative financial instruments:

December 31st 2018	Note	Carrying amount*	Contractual cash flows	Up to 6 months	6 – 12 months	1–2 years	2–5 years	Over 5 years
Commodity swap	23	(7.8)	(8.4)	3.3	(6.9)	(4.7)	(0.1)	-
Currency forward and spot contracts	23	(21.8)	(22.0)	(16.1)	(5.9)	-	-	-
Interest rate swap (IRS)	23	0.7	0.8	(3.6)	3.0	(0.2)	1.6	-
Currency swap	23	(1.0)	(0.9)	(0.9)	-	-	-	-
Total		**(29.9)**	**(30.5)**	**(17.3)**	**(9.8)**	**(4.9)**	**1.5**	**-**
December 31st 2017								
Commodity swap	23	30.9	31.3	10.6	20.1	0.6	-	-
Commodity options	23	-	-	-	-	-	-	-
Currency forward and spot contracts	23	3.6	3.7	(0.4)	4.1	-	-	-
Interest rate swap (IRS)	23	(18.5)	(18.6)	(21.5)	7.1	(5.9)	1.7	-
Currency swap	23	69.1	69.1	62.9	3.2	3.0	-	-
Total		**85.1**	**85.5**	**51.6**	**34.5**	**(2.3)**	**1.7**	**-**

*Carrying amount (fair value gains on derivative financial instruments plus fair value losses on derivative financial instruments) represents the fair value of derivative financial instruments disclosed in the statement of financial position (excluding CO_2 emission allowance futures purchased with the intention of settlement through physical delivery).

27.6 Credit risk

Management of credit risk related to counterparties in financial transactions consists in the verification of creditworthiness of the current and potential counterparties and monitoring of credit exposures against the granted limits.
The credit exposure is attributable to bank deposits and derivatives measurement.

The counterparties must have an appropriate credit rating assigned by leading rating agencies or hold guarantees from institutions meeting the minimum rating requirement. The Group enters into financial transactions with reputable firms with sound credit standing, and diversifies the group of institutions with which it maintains relationships.

As at December 31st 2018 and December 31st 2017, the concentration of credit risk exposure to any single counterparty in the Group's financial transactions did not exceed PLN 542.7m and PLN 845.7m, respectively (5.44% and 9.51% of the Parent's equity, respectively).

As regards management of counterparty risk in non-financial transactions, all customers who request trading on credit terms are subject to credit assessment, whose results determine the level of possible credit limits. In 2017, the Parent completed development of a rating model which supports assigning credit limits to counterparties. The Parent defines guidelines for managing counterparty risk in non-financial transactions to ensure that appropriate standards of credit analysis and operational security are observed across the entire Group.

As at December 31st 2018 and December 31st 2017, the concentration of credit risk exposure to any single counterparty in the Group's trade transactions did not exceed PLN 116.4m and PLN 530.5m, respectively (1.17% and 5.97% of the Parent's equity, respectively).

Credit risk is measured by the maximum exposure to risk of each class of financial assets. Carrying amounts of financial assets represent the maximum credit risk exposure.

Maximum credit risk exposure of financial assets	Note	December 31st 2018	December 31st 2017
Derivative financial instruments	23	24.4	164.5
Trade receivables	15	1,880.4	2,677.0
Cash and cash equivalents	17	1,941.3	1,920.7
Other financial assets	15	710.7	459.6
Total		**4,556.8**	**5,221.8**

In the Management Board's opinion, the risk related to non-performing financial assets is reflected in the recognised impairment losses. For information on impairment of financial assets, see Notes 9.4 and 15.1.

For discussion of credit risk concentrations for trade receivables, see Note 15.1.
For ageing analysis of receivables past due but not impaired, see Note 15.1.

28. Capital management

The objective of the LOTOS Group financial policy is to maintain long-term liquidity, while using an appropriate level of financial leverage to support the achievement of the principal objective of maximising the return on equity for shareholders.

This is achieved through constant effort to develop the desired capital structure at the Group level.

The LOTOS Group uses the debt to equity ratio, calculated as net debt to equity, to monitor its financing structure.

Net debt comprises bank and non-bank borrowings, notes and liabilities under finance leases less cash and cash equivalents. Equity includes equity attributable to owners of the Parent plus non-controlling interests.

	Note	December 31st 2018	December 31st 2017
Non-current liabilities			
Bank borrowings	22.1	2,158.1	2,633.6
Non-bank borrowings	22.2	42.2	4.4
Notes	22.3	-	-
Finance lease liabilities	22.4	145.0	100.3
Total		**2,345.3**	**2,738.3**
Current liabilities			
Bank borrowings	22.1	1,263.1	1,269.4
Non-bank borrowings	22.2	13.6	63.9
Notes	22.3	227.0	313.0
Finance lease liabilities	22.4	35.0	41.3
Total		**1,538.7**	**1,687.6**
Cash and cash equivalents	17	(1,941.3)	(1,920.7)
Net debt		**1,942.7**	**2,505.2**
Equity attributable to owners of the Parent		12,034.7	10,712.4
Non-controlling interests		0.1	0.1
Total equity		12,034.8	10,712.5
Net debt to equity		**0.16**	**0.23**