

LG Chem, Ltd. and Subsidiaries

Consolidated Interim Financial Statements

June 30, 2019 and 2018

LG Chem, Ltd. and Subsidiaries
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June 30, 2019 and 2018

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Report on Review of Interim Financial Statements

(English Translation of a Report Originally Issued in Korean)

To the Shareholders and Board of Directors of
LG Chem, Ltd.

Reviewed Financial Statements

We have reviewed the accompanying consolidated interim financial statements of LG Chem, Ltd. and its subsidiaries (collectively referred to as the “Group”). These financial statements consist of the consolidated interim statement of financial position of the Group as at June 30, 2019, and the related consolidated interim statements of profit or loss and comprehensive income for the three-month and six-month periods ended June 30, 2019 and 2018, and consolidated interim statements of changes in equity and cash flows for the six-month periods ended June 30, 2019 and 2018, and a summary of significant accounting policies and other explanatory notes, expressed in Korean won.

Management’s Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these consolidated interim financial statements in accordance with International Financial Reporting Standards as adopted by the Republic of Korea (Korean IFRS) 1034 *Interim Financial Reporting*, and for such internal control as management determines is necessary to enable the preparation of consolidated interim financial statements that are free from material misstatement, whether due to fraud or error.

Auditor’s Responsibility

Our responsibility is to issue a report on these consolidated interim financial statements based on our review.

We conducted our review in accordance with quarterly or semi-annual review standards established by the Securities and Futures Commission of the Republic of Korea. A review of interim financial information consists of making inquiries, primarily of persons responsible for financial and accounting matters, and applying analytical and other review procedures. A review is substantially less in scope than an audit conducted in accordance with Korean Standards on Auditing and consequently does not enable us to obtain assurance that we would become aware of all significant matters that might be identified in an audit. Accordingly, we do not express an audit opinion.

Conclusion

Based on our review, nothing has come to our attention that causes us to believe the accompanying consolidated interim financial statements are not presented fairly, in all material respects, in accordance with Korean IFRS 1034 *Interim Financial Reporting*.

Other Matters

We have audited the consolidated statement of financial position of the Group as at December 31, 2018, and the related consolidated statements of profit or loss, comprehensive income, changes in equity and cash flows for the year then ended, in accordance with Korean Standards on Auditing. We expressed an unqualified opinion on those financial statements, not presented herein, in our audit report dated February 28, 2019. The consolidated statement of financial position as at December 31, 2018, presented herein for comparative purposes, is consistent, in all material respects, with the above audited statement of financial position as at December 31, 2018.

Review standards and their application in practice vary among countries. The procedures and practices used in the Republic of Korea to review such financial statements may differ from those generally accepted and applied in other countries.

August 14, 2019
Seoul, Korea

This report is effective as of August 14, 2019, the review report date. Certain subsequent events or circumstances, which may occur between the review report date and the time of reading this report, could have a material impact on the accompanying consolidated interim financial statements and notes thereto. Accordingly, the readers of the review report should understand that there is a possibility that the above review report may have to be revised to reflect the impact of such subsequent events or circumstances, if any.

LG Chem, Ltd. and Subsidiaries
Consolidated Interim Statements of Financial Position
June 30, 2019 (Unaudited) and December 31, 2018

(in millions of Korean won)

	Notes	June 30, 2019 (Unaudited)	December 31, 2018
Assets			
Current assets			
Cash and cash equivalents	3, 5, 6	2,631,013	2,513,702
Trade receivables	3, 5, 7, 31	4,738,091	4,381,199
Other receivables	3, 5, 7, 31	301,142	326,093
Other current financial assets	3, 5, 8	418	-
Prepaid income taxes		568	1,831
Other current assets	13	850,830	573,460
Inventories	9	4,770,886	4,289,463
Assets held for sale	35	8,239	2,764
Total current assets		<u>13,301,187</u>	<u>12,088,512</u>
Non-current assets			
Other receivables	3, 5, 7	183,954	129,251
Other non-current financial assets	3, 5, 8	102,283	93,350
Investments in associates and joint ventures	1, 10, 33	295,325	266,122
Deferred tax assets	28	480,609	408,136
Property, plant and equipment	11	15,863,283	13,839,198
Intangible assets	12	2,129,578	2,006,238
Investment properties		941	950
Other non-current assets	13	78,387	112,380
Total non-current assets		<u>19,134,360</u>	<u>16,855,625</u>
Total assets		<u>32,435,547</u>	<u>28,944,137</u>
Liabilities			
Current liabilities			
Trade payables	3, 5, 31	2,548,447	2,165,969
Other payables	3, 5, 31	2,385,162	2,551,476
Borrowings	3, 5, 14	1,431,852	1,613,146
Other current financial liabilities	3, 5, 8	356	18,477
Provisions	15	234,578	119,366
Income tax payables	28	204,133	247,787
Other current liabilities	3, 5, 17	557,701	557,313
Total current liabilities		<u>7,362,229</u>	<u>7,273,534</u>
Non-current liabilities			
Other payables	3, 5	9,793	9,984
Borrowings	3, 5, 14	7,048,585	3,708,001
Other non-current financial liabilities	3, 5, 8	18,138	30,384
Provisions	15	249,450	218,287
Net defined benefit liabilities	16	310,210	227,544
Deferred tax liabilities	28	51,771	57,856
Other non-current liabilities	17	106,516	96,419
Total non-current liabilities		<u>7,794,463</u>	<u>4,348,475</u>
Total liabilities		<u>15,156,692</u>	<u>11,622,009</u>

LG Chem, Ltd. and Subsidiaries
Consolidated Interim Statements of Financial Position
June 30, 2019 (Unaudited) and December 31, 2018

(in millions of Korean won)

	Notes	June 30, 2019 (Unaudited)	December 31, 2018
Equity			
Share capital	1, 19	391,406	391,406
Capital surplus		2,274,623	2,274,623
Other components of equity	21	(374,243)	(374,243)
Accumulated other comprehensive income		(61,559)	(202,994)
Retained earnings	20	14,791,622	14,994,252
Equity attributable to owners of the Parent Company		<u>17,021,849</u>	<u>17,083,044</u>
Non-controlling interest		257,006	239,084
Total equity		<u>17,278,855</u>	<u>17,322,128</u>
Total liabilities and equity		<u>32,435,547</u>	<u>28,944,137</u>

The above consolidated interim statements of financial position should be read in conjunction with the accompanying notes.

LG Chem, Ltd. and Subsidiaries
Consolidated Interim Statements of Profit or Loss
Three-Month and Six-Month Periods Ended June 30, 2019 and 2018 (Unaudited)

		Period Ended June 30			
		2019 (Unaudited)		2018 (Unaudited)	
	Notes	Three months	Six months	Three months	Six months
Revenue	31, 33	7,177,444	13,816,517	7,051,853	13,605,443
Cost of sales	23, 31	(6,029,442)	(11,498,537)	(5,580,273)	(10,792,302)
Gross profit		1,148,002	2,317,980	1,471,580	2,813,141
Selling and administrative expenses	22, 23, 31	(880,487)	(1,775,098)	(768,289)	(1,459,009)
Operating profit	33	267,515	542,882	703,291	1,354,132
Finance income	5, 25	84,538	154,773	70,032	117,859
Finance costs	5, 25	(146,715)	(220,987)	(146,313)	(180,223)
Share of net profit of associates and joint ventures accounted for using the equity method	10	3,710	10,270	(1,200)	(457)
Other non-operating income	5, 26	143,263	229,945	179,852	243,804
Other non-operating expenses	5, 27, 36	(159,366)	(244,356)	(161,410)	(237,667)
Profit before income tax	32	192,945	472,527	644,252	1,297,448
Income tax expense	28	(109,122)	(176,766)	(150,857)	(251,309)
Profit for the period		83,823	295,761	493,395	1,046,139
Profit is attributable to:					
Owners of the Parent Company		68,088	262,575	477,724	1,009,073
Non-controlling interests		15,735	33,186	15,671	37,066
Earnings per share attributable to the equity holders of the Parent Company (in won)	29				
Basic earnings per ordinary share		887	3,425	6,234	13,169
Basic earnings per preferred share		900	3,450	6,247	13,194
Diluted earnings per ordinary share		819	3,320	6,177	13,063
Diluted earnings per preferred share		832	3,345	6,190	13,088

The above consolidated interim statements of profit or loss should be read in conjunction with the accompanying notes.

LG Chem, Ltd. and Subsidiaries
Consolidated Interim Statements of Comprehensive Income
Three-Month and Six-Month Periods Ended June 30, 2019 and 2018 (Unaudited)

(in millions of Korean won)

	Notes	Period Ended June 30			
		2019 (Unaudited)		2018 (Unaudited)	
		Three months	Six months	Three months	Six months
Profit for the period		83,823	295,761	493,395	1,046,139
Other comprehensive income					
<i>Items that will not be reclassified to profit or loss</i>					
Remeasurements of net defined benefit liability	16	(960)	(5,270)	(2,010)	(4,673)
Gain on valuation of financial assets at fair value through other comprehensive income		(8,189)	(1,234)	1,247	3,568
Shares of remeasurements of net defined benefit liabilities of associates		(14)	(132)	(210)	(60)
Income tax relating to these items		2,514	1,784	178	2
<i>Items that may be subsequently reclassified to profit or loss</i>					
Exchange differences on translation of foreign operations		31,653	132,963	5,824	86,920
Cash flow hedge		(3,069)	22,569	233	233
Shares of other comprehensive income of joint ventures and associates		(625)	1,299	135	1,836
Income tax relating to these items		(130)	(5,516)	(358)	(3,689)
Other comprehensive income for the period, net of tax		21,180	146,463	5,039	84,137
Total comprehensive income for the period		105,003	442,224	498,434	1,130,276
Total comprehensive income for the period is attributable to:					
Owners of the Parent Company		90,166	400,053	483,143	1,085,710
Non-controlling interest		14,837	42,171	15,291	44,566

The above consolidated interim statements of comprehensive income should be read in conjunction with the accompanying notes.

LG Chem, Ltd. and Subsidiaries
Consolidated Interim Statements of Changes in Equity
Six-Month Periods Ended June 30, 2019 and 2018 (Unaudited)

(in millions of Korean won)

	Notes	Attributable to owners of the Parent Company					Non-controlling interests	Total equity
		Share capital	Capital surplus	Other components of equity	Accumulated other comprehensive income	Retained earnings		
Balance at January 1, 2018		391,406	2,274,386	(362,676)	(173,839)	14,039,250	170,050	16,338,577
Comprehensive income								
Profit for the period		-	-	-	-	1,009,073	37,066	1,046,139
Remeasurements of net defined benefit liability	16	-	-	-	-	(3,394)	-	(3,394)
Exchange differences on translation of foreign operations		-	-	-	75,795	-	7,500	83,295
Gain on valuation of financial assets at fair value through other comprehensive income		-	-	-	2,291	-	-	2,291
Others		-	-	-	2,005	(60)	-	1,945
Total comprehensive income for the period		-	-	-	80,091	1,005,619	44,566	1,130,276
Transactions with owners:								
Dividends	30	-	-	-	-	(460,058)	-	(460,058)
Others		-	-	-	(164)	43	-	(121)
Total transactions with owners		-	-	-	(164)	(460,015)	-	(460,179)
Balance at June 30, 2018 (Unaudited)		391,406	2,274,386	(362,676)	(93,912)	14,584,854	214,616	17,008,674
Balance at January 1, 2019		391,406	2,274,623	(374,243)	(202,994)	14,994,252	239,084	17,322,128
Comprehensive income								
Profit for the period		-	-	-	-	262,575	33,186	295,761
Remeasurements of net defined benefit liability	16	-	-	-	-	(3,825)	-	(3,825)
Exchange differences on translation of foreign operations		-	-	-	124,669	-	8,985	133,654
Gain on valuation of financial assets at fair value through other comprehensive income		-	-	-	(895)	-	-	(895)
Cash flow hedge		-	-	-	16,362	-	-	16,362
Others		-	-	-	1,299	(132)	-	1,167
Total comprehensive income for the period		-	-	-	141,435	258,618	42,171	442,224
Transactions with owners:								
Dividends	30	-	-	-	-	(460,058)	(23,852)	(483,910)
Others		-	-	-	-	(1,190)	(397)	(1,587)
Total transactions with owners		-	-	-	-	(461,248)	(24,249)	(485,497)
Balance at June 30, 2019 (Unaudited)		391,406	2,274,623	(374,243)	(61,559)	14,791,622	257,006	17,278,855

The above consolidated interim statements of changes in equity should be read in conjunction with the accompanying notes.

LG Chem, Ltd. and Subsidiaries
Consolidated Interim Statements of Cash Flows
Six-Month Periods Ended June 30, 2019 and 2018 (Unaudited)

(in millions of Korean won)

	Notes	2019 (Unaudited)	2018 (Unaudited)
Cash flows from operating activities			
Cash generated from operations	32	1,231,380	592,066
Interest received		27,793	21,314
Interest paid		(83,686)	(53,154)
Dividends received		10,847	9,992
Income taxes paid		(295,898)	(451,897)
Net cash inflow from operating activities		890,436	118,321
Cash flows from investing activities			
Decrease in other receivables		136,858	514,754
Decrease in other non-current receivables		32,481	33,950
Decrease in other current financial assets		-	359
Proceeds from disposal of investments in joint ventures		-	19,499
Proceeds from disposal of financial instruments		1,336	8,465
Proceeds from disposal of property, plant and equipment		65,694	217,071
Proceeds from disposal of intangible assets		2,306	1,137
Government grants received		9,672	-
Increase in other receivables		(124,890)	(465,157)
Increase in other non-current receivables		(82,918)	(16,537)
Acquisition of investments in associates and joint ventures		(27,676)	(2,061)
Acquisition of financial assets		(6,993)	(15,187)
Acquisition of property, plant and equipment		(3,123,116)	(1,804,602)
Acquisition of intangible assets		(140,740)	(49,688)
Business combination		(529)	-
Net cash outflow from investing activities		(3,258,515)	(1,557,997)
Cash flows from financing activities			
Proceeds from borrowings		3,314,060	2,206,602
Repayments of borrowings		(394,006)	(207,199)
Dividends paid		(483,910)	(460,058)
Net cash inflow from financing activities		2,436,144	1,539,345
Net increase in cash and cash equivalents		68,065	99,669
Cash and cash equivalents at the beginning of the period		2,513,702	2,249,341
Effects of exchange rate changes on cash and cash equivalents		49,246	2,711
Cash and cash equivalents at the end of the period in the consolidated interim statement of financial position		2,631,013	2,351,721

The above consolidated interim statements of cash flows should be read in conjunction with the accompanying notes.

LG Chem, Ltd. and Subsidiaries

Notes to the Consolidated Interim Financial Statements

June 30, 2019 and 2018 (Unaudited), and December 31, 2018

1. General Information

1.1 The Parent Company

The Parent Company was spun off on April 1, 2001, from LG Chem Investment Ltd. (now LG Corp., formerly LG Chemical Ltd.).

As at June 30, 2019, the Parent Company has its manufacturing facilities in Yeosu, Daesan, Ochang, Cheongju, Ulsan, Naju, Iksan, Paju, Osong, Onsan and Gimcheon.

The Parent Company is authorized to issue 292 million shares of ordinary shares with par value of ₩5,000 per share. As at June 30, 2019, the Parent Company has issued and outstanding 70,592,343 ordinary shares (₩352,962 million) and 7,688,800 preferred shares (₩38,444 million). The largest shareholder of the Parent Company is LG Corp., which owns 33.34% of the Parent Company's ordinary shares. Preferred shareholders have no voting rights but are entitled to receive dividends at a rate 1% more than those paid to ordinary shareholders.

1.2 Business Overview

The Group is engaged in Petrochemical business, Energy solutions, and Advanced materials business, and also engaged in Life Sciences business acquired through a merger with LG Life Sciences, Ltd. in January 2017. In addition, the Parent Company acquired 100% shares of FarmHannong Co., Ltd., in April 2016, which is engaged to manufacture crop protection products, seeds, fertilizers and others.

The Petrochemical business includes production of olefin petrochemicals, such as ethylene, propylene, butadiene from Naphtha, and aromatic petrochemicals such as benzene. It also includes production of synthetic resin and synthetic components from olefin, and aromatic petrochemicals. This business bears characteristics of a large-volume process industry. The Group's major products are PE, PP, BPA, ABS, EP, PVC, plasticizers, acrylic, SAP, synthetic rubber, a special resin, and others.

The Energy solutions business manufactures and supplies batteries ranging from IT & New application batteries for mobile phones and laptop computers, to automotive batteries for electric vehicles and ESS batteries. Demand of small sized batteries for new applications such as electric tools and electric driving devices as well as traditional IT devices is increasing recently and the automotive battery business is also expected to expand rapidly due to an increasing demand of the batteries in associated with enhanced environment regulation in developed countries. Demand for ESS is expanding with an increasing importance of efficient usage of electricity and generation of renewable energy.

The Advanced material business manufactures and supplies various kinds of IT materials such as polarizer, automotive material, glass substrate, OLED film, semiconductor materials and display and battery materials for LCD Photoresist, OLED materials, battery materials and others and RO membranes, which will be the next growth engine for future.

The Life Sciences business manufactures and supplies pharmaceutical products, such as human growth hormone 'Eutropin', diabetes drug 'Zemiglo', bovine somatotropin 'Boostin', hyaluronic acid filler 'YVOIRE' and others, as well as fine chemical products, such as herbicide 'PYANCHOR' for rice farming and others.

FarmHannong Co., Ltd., subsidiary of the Parent Company, manufactures and sells crop protection products, seeds, fertilizers and others. The crop protection business provides high value products such as environmentally-friendly pesticide. The fertilizer business leads developing a next generation fertilizers such as eco-friendly organic and functional fertilizers, and potting soil. The

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seed business puts priority on retaining various genetic resources and developing rare breeds with high profit in order to remain competitive in a future food industry.

1.3 Consolidated Subsidiaries, Associates and Joint Ventures

	June 30, 2019			
	Percentage of ownership (%)	Business location	Closing month	Business activities
Consolidated subsidiaries				
Ningbo LG Yongxing Chemical Co., Ltd. ¹	75	China	December	ABS/SBL manufacturing and sales
Ningbo Zhenhai LG Yongxing Trade Co., Ltd. ¹	75	China	December	ABS sales
LG Chem HK Ltd.	100	Hong Kong	December	Sales and trading
LG Chem America, Inc. ²	100	USA	December	Sales and trading
LG Chemical India Pvt. Ltd. ³	100	India	December	Synthetic resin manufacturing and sales
LG Polymers India Pvt. Ltd. ³	100	India	December	PS manufacturing
LG Chemical (Guangzhou) Engineering Plastics Co., Ltd.	100	China	December	EP manufacturing and sales
LG Chem (Nanjing) Information & Electronics Materials Co., Ltd. ⁴	100	China	December	Battery/ Polarizer Manufacturing and sales
LG Chem (Taiwan), Ltd.	100	Taiwan	December	Polarizer manufacturing and sales
LG Chem Display Materials (Beijing) Co., Ltd.	100	China	December	Polarizer manufacturing
Tianjin LG Bohai Chemical Co., Ltd.	75	China	December	PVC, VCM, EDC manufacturing and sales
Tianjin LG BOTIAN Chemical Co., Ltd.	58	China	December	SBS manufacturing and sales
LG Chem (China) Investment Co., Ltd. ⁵	100	China	December	China holding company
LG Chem (Tianjin) Engineering Plastics Co., Ltd.	100	China	December	ABS/EP manufacturing and sales
LG Chem Europe GmbH	100	Germany	December	Sales and trading
LG Chem Poland Sp. z o.o.	100	Poland	December	Polarizer/EP manufacturing
LG Chem Michigan Inc. ²	100	USA	December	Automotive battery research and manufacturing
LGC Petrochemical India Private Ltd.	100	India	December	Synthetic resin manufacturing and sales
HAENGBOKNURI CO., LTD.	100	Korea	December	Facility management and general cleaning
LG CHEM TK Kimya SANAYI VE TIC. Ltd. STI.	100	Turkey	December	Sales and trading
LG Chem Japan Co., Ltd.	100	Japan	December	Sales and trading
LG NanoH2O, Inc. ²	100	USA	December	Water processing membrane research and manufacturing
NanoH2O (Jiangsu) Water Processing Technology Co. Ltd.	100	China	December	Water processing membrane research and manufacturing
Nanjing LG Chem New Energy Battery Co., Ltd. ⁶	50	China	December	Automotive battery manufacturing and sales
LG Chem (Chongqing) Engineering Plastics Co., Ltd.	100	China	December	EP manufacturing and sales
LG Chem Wroclaw Energy sp. z o.o. ⁷	100	Poland	December	Automotive battery research and manufacturing
LG Chem(HUIZHOU) Petrochemical Co., Ltd.	70	China	December	ABS manufacturing and sales
FarmHannong Co., Ltd. ⁸	100	Korea	December	Agricultural pesticide manufacturing and sales
Farm Hannong (Heilongjiang) Chemical Co., Ltd. ⁸	100	China	December	Agricultural pesticide manufacturing
LG Life Sciences India Pvt. Ltd.	100	India	December	Pharmaceutical products sales
LG Life Sciences (Beijing) Co., Ltd.	100	China	December	Pharmaceutical products sales
LG Life Sciences (Thailand) Ltd.	100	Thailand	December	Pharmaceutical products sales
Farmhannong America, Inc. ⁸	100	USA	December	Agricultural pesticide sales
LG Chem Hai Phong Vietnam Co., Ltd.	100	Vietnam	December	Polarizer manufacturing and sales

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LG Chem Australia Pty Ltd.	100	Australia	December	ESS sales
LG Chem Mexico S.A. de C.V.	100	Mexico	December	Sales and trading
FarmHannong(Thailand) Ltd. ⁸	100	Thailand	December	Research and development on seeds
LG Chem Hai Phong engineering Plastics Ltd.	100	Vietnam	December	EP manufacturing and sales
LG Chem (Guangzhou) Information & Electronics Materials Co.,Ltd.	100	China	December	Polarizer manufacturing
LEYOU NEW ENERGY MATERIALS(WUXI) Co.,LTD	51	China	December	Battery materials manufacturing and sales
LG Chem Fund I LLC ⁹	100	USA	December	Investments in venture companies
Ugimag Korea Co., Ltd ¹⁰	100	Korea	December	Electronic parts manufacturing and sales
Uniseal,Inc. ^{2,11}	100	USA	December	Adhesive manufacturing and sales
Uniseal Europe Ltd. ¹¹	80	England	December	Adhesive manufacturing and sales
LG Chem Nanjing Energy Solution Co., Ltd. ¹²	100	China	December	Battery manufacturing and sales
LG Chem Life Science Innovation Center, Inc. ^{2,13}	100	USA	December	Pharmaceutical products research
Associates				
LG Holdings (HK) Ltd.	26	Hong Kong	December	Sales and trading
TECHWIN Co., Ltd.	21	Korea	December	Environment solution and construction of chemical plant
LG Chem BRASIL INTERMEDIACAO DE NEGOCIOS DO SETOR QUIMICO LTDA. ¹⁴	100	Brazil	December	Sales and trading
LG Chem Malaysia SDN.BHD. ¹⁴	100	Malaysia	December	Sales and trading
LG Fuel Cell Systems Inc.	23	USA	December	Power fuel cell research
FJ Composite Material Co., Ltd.	33	Japan	May	Heat diffuser research and manufacturing
WUXI CL New Energy Technology Ltd.	30	China	December	ESS manufacturing and sales
LG Life Sciences Poland Ltd. ¹⁴	100	Poland	December	Pharmaceutical products sales
Combustion Synthesis Co., Ltd.	30	Japan	December	Nitride-based ceramic powder production
HUAJIN NEW ENERGY MATERIALS(QUZHOU)CO., LTD. ¹⁵	49	China	December	Battery materials manufacturing and sales
Joint ventures				
LG VINA Chemical Co., Ltd.	50	Vietnam	December	DOP production and sales
HL Greenpower Co., Ltd.	49	Korea	December	Automotive battery manufacturing and sales
SEETEC Co., Ltd.	50	Korea	December	Plant utility and distribution, research assistance service

¹ As at June 30, 2019, Ningbo LG Yongxing Chemical Co., Ltd. owns 100% of Ningbo Zhenhai LG Yongxing Trading Co., Ltd.'s shares.

² During the six-month period ended June 30, 2019, the Group acquired additional shares of LG Chem Michigan Inc. for ₩1,128 million. In addition, LG Chem Michigan Inc. owns 100% of LG Chem America, Inc., LG NanoH20, Inc., Uniseal,Inc. and LG Chem Life Science Innovation Center, Inc. 's shares.

³ As at June 30, 2019, LG Chemical India Pvt. Ltd. owns 100% of LG Polymers India Pvt. Ltd.'s shares.

⁴ As at June 30, 2019, the Group acquired additional shares of LG Chem (Nanjing) Information & Electronics Materials Co.,Ltd. for ₩356,464 million.

⁵ During the six-month period ended June 30, 2019, the Parent Company acquired additional shares of LG Chem (China) Investment Co.,Ltd. for ₩68,591 million.

⁶ Although the Parent Company owns less than 50% of the voting rights of Nanjing LG Chem New Energy Battery Co., Ltd., the Parent Company is considered to have control over the investee as the Parent Company can exercise the majority voting rights in its decision-making process in accordance with the shareholders' agreement.

⁷ During the six-month period ended June 30, 2019, the Parent Company acquired additional shares of LG Chem Wroclaw Energy sp. z o.o for ₩653,862 million.

LG Chem, Ltd. and Subsidiaries

Notes to the Consolidated Interim Financial Statements

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⁸ As at June 30, 2019, FarmHannong Co., Ltd. owns 100% of Farm Hannong (Heilongjiang) Chemical Co., Ltd., Farmhannong America, Inc. and FarmHannong(Thailand) Ltd.,.

⁹ The Parent Company acquired additional shares LG CHEM FUND I LLC for ₩3,682 million.

¹⁰ During the six-month period ended June 30, 2019, the Parent Company acquired additional shares of Ugimag Korea Co., Ltd for ₩ 4,500 million.

¹¹ Uniseal, Inc. holds 80% of Uniseal Europe Ltd.

¹² During the six-month period ended June 30, 2019, the Parent Company acquired additional shares of LG Chem Nanjing Energy Solution Co., Ltd. for ₩161,466 million.

¹³ LG Chem Life Science Innovation Center, Inc. was newly established during the six-month period ended June 30, 2019, and the Group acquired 100% shares of LG Chem Life Science Innovation Center, Inc. for ₩1,128 million.

¹⁴ Classified as an investment in associate due to its small size.

¹⁵ During the six-month period ended June 30, 2019, the Parent Company acquired additional shares of HUAJIN NEW ENERGY MATERIALS(QUZHOU)CO., LTD. for ₩27,676 million.

1.4 Summarized Financial Information of Subsidiaries, Associates and Joint Ventures

Summarized financial information (before elimination of intercompany transactions and adjustments for differences in accounting policies) of subsidiaries, associates and joint ventures is as follows:

(in millions of Korean won)

	June 30, 2019				
	Assets	Liabilities	Equity	Revenue	Profit (loss) for the period
Subsidiaries					
Ningbo LG Yongxing Chemical Co., Ltd.	845,954	290,797	555,157	916,162	77,063
Ningbo Zhenhai LG Yongxing Trade Co., Ltd.	6,401	2,145	4,256	9,089	170
LG Chem HK Ltd.	7,609	18	7,591	-	6
LG Chem America, Inc.	216,355	195,555	20,800	394,774	(1,454)
LG Chemical India Pvt. Ltd.	32,800	30	32,770	-	25
LG Polymers India Pvt. Ltd.	136,882	50,983	85,899	115,553	5,457
LG Chemical (Guangzhou) Engineering Plastics Co., Ltd.	103,509	47,596	55,913	100,382	4,423
LG Chem (Nanjing) Information & Electronics Materials Co., Ltd.	3,951,772	2,178,729	1,773,043	1,661,208	10,055
LG Chem (Taiwan), Ltd.	107,191	42,587	64,604	77,615	2,280
LG Chem Display Materials (Beijing) Co., Ltd.	45,170	15,321	29,849	50,920	2,974
Tianjin LG Bohai Chemical Co., Ltd.	257,870	114,986	142,884	270,453	31,054
Tianjin LG BOTIAN Chemical Co., Ltd.	50,650	40,328	10,322	73,092	6,732
LG Chem (China) Investment Co., Ltd.	533,370	231,454	301,916	30,099	1,931
LG Chem (Tianjin) Engineering Plastics Co., Ltd.	51,286	12,577	38,709	34,329	(848)
LG Chem Europe GmbH	382,692	347,805	34,887	426,200	(762)
LG Chem Poland Sp. z o.o.	72,809	35,762	37,047	61,545	414
LG Chem Michigan Inc. ¹	683,761	436,928	246,833	208,354	(56,350)
LGC Petrochemical India Private Ltd.	3,820	992	2,828	2,101	217
HAENGBOKNURI CO., LTD.	3,365	1,583	1,782	5,089	229
LG CHEM TK Kimya SANAYI VE TIC. Ltd. STI.	7,125	5,934	1,191	17,254	270
LG Chem Japan Co., Ltd.	5,053	765	4,288	3,296	314
LG NanoH2O, Inc.	20,451	3,518	16,933	14,478	2,105
NanoH2O (Jiangsu) Water Processing Technology Co. Ltd.	4,448	-	4,448	-	1,369
Nanjing LG Chem New Energy Battery Co., Ltd.	955,497	812,563	142,934	460,083	17,395
LG Chem (Chongqing) Engineering Plastics Co., Ltd.	36,227	12,206	24,021	17,239	(1,154)
LG Chem Wroclaw Energy sp. z o.o.	2,740,081	1,660,845	1,079,236	876,233	(111,485)

LG Chem, Ltd. and Subsidiaries
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LG Chem(HUIZHOU) Petrochemical Co., Ltd.	343,794	262,221	81,573	261,512	2,914
FarmHannong Co., Ltd. ¹	1,063,668	648,747	414,921	397,844	27,404
LG Life Sciences India Pvt. Ltd.	4,810	5,056	(246)	3,088	(335)
LG Life Sciences (Beijing) Co., Ltd.	1,281	13	1,268	647	37
LG Life Sciences (Thailand) Ltd.	23,799	14,824	8,975	18,538	2,723
LG Chem Hai Phong Vietnam Company Ltd.	21,048	17,354	3,694	20,520	(1,048)
LG Chem Austrailia Pty Ltd.	1,554	703	851	1,207	150
LG Chem Mexico S.A. de C.V.	769	103	666	698	100
LG Chem Hai Phong engineering Plastics Ltd.	20,639	5,354	15,285	3	(622)
LG Chem (Guangzhou) Information & electronics Materials Co.,Ltd.	152,678	25,271	127,407	-	(4,073)
LEYOU NEW ENERGY MATERIALS(WUXI) Co.,LTD	124,682	26,897	97,785	-	(186)
LG Chem Fund I LLC	7,844	-	7,844	-	(1,691)
Ugimag Korea Co., Ltd	40,972	30,571	10,401	10,592	(3,230)
Uniseal,Inc. ¹	36,206	7,222	28,984	32,114	1,052
LG Chem Nanjing Energy Solution Co., Ltd.	418,212	145,431	272,781	-	(1,649)
LG Chem Life Science Innovation Center, Inc.	3,650	2,465	1,185	499	29

Associates

LG Holdings (HK) Ltd.	261,863	43,586	218,277	24,470	8,168
TECHWIN Co., Ltd.	112,881	56,115	56,766	-	-
LG Chem BRASIL INTERMEDIACAO DE NEGOCIOS DO SETOR QUIMICO LTDA.	380	130	250	886	164
LG Chem Malaysia SDN.BHD.	363	3	360	158	18
LG Fuel Cell Systems Inc.	3,607	600	3,007	-	(3,723)
FJ Composite Material Co., Ltd.	8,067	4,401	3,666	597	(13)
WUXI CL New Energy Technology Ltd.	6,400	2,606	3,794	22	(648)
LG Life Sciences Poland Ltd.	174	70	104	172	30
Combustion Synthesis Co., Ltd.	668	56	612	26	(332)
HUAJIN NEW ENERGY MATERIALS(QUZHOU)CO., LTD.	130,608	20,713	109,895	-	(408)

Joint ventures

LG VINA Chemical Co., Ltd.	32,679	25,102	7,577	28,702	262
HL Greenpower Co., Ltd.	384,776	340,479	44,297	467,048	2,357
SEETEC Co., Ltd.	334,088	49,162	284,926	291,917	6,984

¹ Included its subsidiaries' financial information from an intermediate parent perspective and not applied adjustments of a fair value evaluation due to the business combination in the consolidated financial statements.

(in millions of Korean won)

	December 31, 2018			2018	
	Assets	Liabilities	Equity	Revenue	Profit (loss) for the period
Subsidiaries					
Ningbo LG Yongxing Chemical Co., Ltd.	759,966	204,733	555,233	1,100,282	114,922
Ningbo Zhenhai LG Yongxing Trade Co., Ltd.	5,599	1,642	3,957	14,036	301
LG Chem HK Ltd.	17,884	42	17,842	238,173	214
LG Chem America, Inc.	225,686	204,163	21,523	380,099	1,517
LG Chemical India Pvt. Ltd.	32,705	19	32,686	-	12
LG Polymers India Pvt. Ltd.	118,542	41,852	76,690	126,527	5,328
LG Chemical (Guangzhou) Engineering Plastics Co., Ltd.	95,906	46,013	49,893	110,085	(6,222)
LG Chem (Nanjing) Information & Electronics	3,073,898	1,706,052	1,367,846	1,538,925	(313)

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Materials Co., Ltd.					
LG Chem (Taiwan), Ltd.	129,680	63,300	66,380	82,043	(267)
LG Chem Display Materials (Beijing) Co., Ltd.	44,617	18,580	26,037	42,659	939
Tianjin LG Bohai Chemical Co., Ltd.	281,710	173,408	108,302	268,828	7,309
Tianjin LG BOTIAN Chemical Co., Ltd.	45,562	42,030	3,532	77,958	3,401
LG Chem (China) Investment Co., Ltd.	405,664	174,737	230,927	28,057	2,251
LG Chem (Tianjin) Engineering Plastics Co., Ltd.	60,467	22,165	38,302	44,224	(3,055)
LG Chem Europe GmbH	336,761	302,034	34,727	338,485	3,639
LG Chem Poland Sp. z o.o.	75,187	39,958	35,229	64,011	1,390
LG Chem Michigan Inc.	675,367	377,280	298,087	156,450	7,829
LGC Petrochemical India Private Ltd.	2,950	463	2,487	2,203	225
HAENGBOKNURI CO., LTD.	2,755	1,201	1,554	4,246	244
LG CHEM TK Kimya SANAYI VE TIC. Ltd. STI.	7,757	6,791	966	15,713	370
LG Chem Japan Co., Ltd.	4,261	518	3,743	2,957	293
LG NanoH2O, Inc. ¹	19,577	5,255	14,322	9,366	1,488
NanoH2O (Jiangsu) Water Processing Technology Co. Ltd.	4,155	1,167	2,988	-	(12)
Nanjing LG Chem New Energy Battery Co., Ltd.	786,416	664,865	121,551	262,793	5,188
LG Chem (Chongqing) Engineering Plastics Co., Ltd.	35,967	11,599	24,368	17,545	(2,150)
LG Chem Wroclaw Energy sp. z o.o.	1,555,511	1,056,111	499,400	49,875	(37,019)
LG Chem(HUIZHOU) Petrochemical Co., Ltd.	287,824	211,589	76,235	200,618	6,199
FarmHannong Co., Ltd. ¹	1,075,222	687,757	387,465	424,502	36,364
LG Life Sciences India Pvt. Ltd.	4,164	4,056	108	5,565	(162)
LG Life Sciences (Beijing) Co., Ltd.	1,237	44	1,193	502	(111)
LG Life Sciences (Thailand) Ltd.	17,432	11,799	5,633	13,426	2,329
LG Chem Hai Phong Vietnam Company Ltd.	23,134	18,420	4,714	10,159	2,898
LG Chem Austrailia Pty Ltd.	768	85	683	812	98
LG Chem Mexico S.A. de C.V.	646	99	547	301	45
LG Chem Hai Phong engineering Plastics Ltd.	15,574	115	15,459	-	(50)
LG Chem (Guangzhou) Information & electronics Materials Co.,Ltd.	147,413	20,119	127,294	-	4
LEYOU NEW ENERGY MATERIALS(WUXI) Co.,LTD	106,817	11,904	94,913	-	-
LG Chem Fund I LLC	5,598	-	5,598	-	-
Ugimag Korea Co., Ltd	40,344	31,214	9,130	-	-
Uniseal,Inc. ¹	38,503	11,596	26,907	-	-
LG Chem Nanjing Energy Solution Co., Ltd.	131,144	20,293	110,851	-	-
Associates					
LG Holdings (HK) Ltd.	245,651	42,181	203,470	25,129	10,503
TECHWIN Co., Ltd.	79,106	32,206	46,900	-	-
LG Chem BRASIL INTERMEDIACAO DE NEGOCIOS DO SETOR QUIMICO LTDA.	172	93	79	833	20
LG Chem Malaysia SDN.BHD.	305	17	288	308	8
LG Fuel Cell Systems Inc.	11,845	5,182	6,663	3,030	(25,398)
FJ Composite Material Co., Ltd.	6,393	2,916	3,477	763	(179)
WUXI CL New Energy Technology Ltd.	6,714	2,407	4,307	-	(237)
LG Life Sciences Poland Ltd.	158	155	3	86	(23)
Combustion Synthesis Co., Ltd.	991	28	963	93	(235)
HUAJIN NEW ENERGY MATERIALS(QUZHOU)CO., LTD.	55,749	2,444	53,305	-	-
Joint ventures					
LG VINA Chemical Co., Ltd.	28,668	19,862	8,806	28,545	407
HL Greenpower Co., Ltd.	314,328	274,399	39,929	114,126	181

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SEETEC Co., Ltd.	346,423	48,187	298,236	245,892	7,184
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¹ Included its subsidiaries' financial information from an intermediate parent perspective and not applied adjustments of a fair value evaluation due to the business combination in the consolidated financial statements.

1.5 Changes in Scope for Consolidation

Subsidiaries newly included in the consolidation for the six-month period ended June 30, 2019, are as follows:

Subsidiary	Reason
LG Chem Life Science Innovation Center, Inc.	Newly established

2. Summary of Significant Accounting Policies

The principal accounting policies applied in the preparation of these consolidated interim financial statements are set out below. These policies have been consistently applied to all the periods presented, unless otherwise stated.

2.1 Basis of Preparation

The Group maintains its accounting records in Korean won and prepares statutory financial statements in the Korean language (Hangul) in accordance with International Financial Reporting Standards as adopted by the Republic of Korea (Korean IFRS). The accompanying consolidated interim financial statements have been condensed, restructured and translated into English from the Korean language financial statements.

The Group's consolidated interim financial statements for the six-month period ended June 30, 2019, have been prepared in accordance with Korean IFRS 1034 *Interim Financial Reporting*. These consolidated interim financial statements have been prepared in accordance with Korean IFRS which is effective or early adopted as at June 30, 2019.

(a) New and amended standards and interpretations adopted by the Group

The Group has applied the following new and amended standards and interpretations for the first time for their annual reporting period commencing January 1, 2019.

- Enactment of Korean IFRS 1116 *Leases*

Korean IFRS 1116 *Leases* replaces Korean IFRS 1017 *Leases*. Under Korean IFRS 1116, with implementation of a single lease model, lessee is required to recognize assets and liabilities for all lease which lease term is over 12 months and underlying assets are not low value assets. A lessee is required to recognize a right-of-use asset and a lease liability representing its obligation to make lease payments.

With implementation of Korean IFRS 1116 *Lease*, the Group has changed accounting policy. The Group has adopted Korean IFRS 1116 retrospectively, as permitted under the specific transitional provisions in the standard, and recognized the cumulative impact of initially applying the standard as at January 1, 2019, the date of initial application. The Group has not restated comparatives for the 2018 reporting period. The impact of the adoption of the leasing standard and the new accounting policies are disclosed in Note 11.

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- Amendments to Korean IFRS 1109 *Financial Instruments*

The narrow-scope amendments made to Korean IFRS 1109 *Financial Instruments* enable entities to measure certain prepayable financial assets with negative compensation at amortized cost. When a modification of a financial liability measured at amortized cost that does not result in the derecognition, a modification gain or loss shall be recognized in profit or loss. The amendment does not have a significant impact on the consolidated interim financial statements.

- Amendments to Korean IFRS 1019 *Employee Benefits*

The amendments require that an entity shall calculate current service cost and net interest for the remainder of the reporting period after a plan amendment, curtailment or settlement based on updated actuarial assumptions from the date of the change. The amendments also require that a reduction in a surplus must be recognized in profit or loss even if that surplus was not previously recognized because of the impact of the asset ceiling. The amendment does not have a significant impact on the consolidated interim financial statements.

- Amendments to Korean IFRS 1028 *Investments in Associates and Joint Ventures*

The amendments clarify that an entity shall apply Korean IFRS 1109 to financial instruments in an associate or joint venture to which the equity method is not applied. These include long-term interests that, in substance, form part of the entity's net investment in an associate or joint venture. The amendment does not have a significant impact on the consolidated interim financial statements.

- Enactment to Interpretation of Korean IFRS 2123 *Uncertainty over Income Tax Treatments*

The Interpretation explains how to recognize and measure deferred and current income tax assets and liabilities where there is uncertainty over a tax treatment, and includes guidance on how to determine whether each uncertain tax treatment is considered separately or together. It also presents examples of circumstances where a judgement or estimate is required to be reassessed. The enactment does not have a significant impact on the consolidated interim financial statements.

- Annual Improvements to Korean IFRS 2015 – 2017 Cycle:

• Korean IFRS 1103 *Business Combination*

The amendments clarify that when a party to a joint arrangement obtains control of a business that is a joint operation, and had rights to the assets and obligations for the liabilities relating to that joint operation immediately before the acquisition date, the transaction is a business combination achieved in stages. In such cases, the acquirer shall remeasure its entire previously held interest in the joint operation. The amendment does not have a significant impact on the consolidated interim financial statements.

• Korean IFRS 1111 *Joint Agreements*

The amendments clarify that when a party that participates in, but does not have joint control of, a joint operation might obtain joint control of the joint operation in which the activity of the joint operation constitutes a business. In such cases, previously held interests in the joint operation are not remeasured. The amendment does not have a significant impact on the consolidated interim financial statements.

• Paragraph 57A of Korean IFRS 1012 *Income Tax*

The amendment is applied to all the income tax consequences of dividends and requires an entity to recognize the income tax consequences of dividends in profit or loss, other comprehensive

LG Chem, Ltd. and Subsidiaries

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income or equity according to where the entity originally recognized those past transactions or events. The amendment does not have a significant impact on the consolidated interim financial statements.

- Korean IFRS 1023 *Borrowing Costs*

The amendments clarify that if a specific borrowing remains outstanding after the related qualifying asset is ready for its intended use (or sale), it becomes part of general borrowings. The amendment does not have a significant impact on the consolidated interim financial statements.

(b) New and amended standards and interpretations not adopted by the Group

Certain new accounting standards and interpretations that have been published that are not mandatory for annual reporting period commencing January 1, 2019 and have not been early adopted by the Group are set out below.

2.2 Significant Accounting Policies

Significant accounting policies and method of computation used in the preparation of the condensed consolidated interim financial statements are consistent with those of the consolidated financial statements for the year ended December 31, 2018, except for the changes due to the application of amendment and enactments of standards described in Note 2.1.(a) and the ones described below.

2.2.1 Income Tax Expense

Income tax expense for the interim period is recognized based on management's best estimate of the weighted average annual income tax rate expected for the full financial year. The estimated average annual tax rate is applied to the pre-tax income.

3. Financial Risk Management

3.1 Financial Risk Factors

The Group's activities expose it to a variety of financial risks: market risk, credit risk and liquidity risk. The Group's overall risk management program focuses on the unpredictability of financial markets and seeks to minimize potential adverse effects on the financial performance of the Group. The Group uses derivative financial instruments to hedge certain risk exposures.

Risk management is carried out by the Group's finance team under policies approved by the Corporate Management Committee. The finance team identifies, evaluates and hedges financial risks in close co-operation with the Group's operating units. The Corporate Management Committee reviews and approves written principles for overall risk management, as well as written policies covering specific areas, such as foreign exchange risk, interest rate risk, and credit risk, use of derivative financial instruments and non-derivative financial instruments, investment of excess liquidity.

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(1) Market risk

1) Foreign exchange risk

The Group operates internationally and is exposed to foreign exchange risk arising from foreign currency exposures, primarily with respect to the US dollar. Foreign exchange risk arises from future commercial transactions, recognized assets and liabilities.

Management has set up a policy to require group companies to manage their foreign exchange risk against their functional currency. The Group manages maximum loss for currency risk exposures within acceptable range by using currency risk management model and hires employees who are exclusively responsible for currency risk management.

The Group has certain investments in foreign operations, whose net assets are exposed to foreign currency translation risk. Currency exposure arising from the net assets of the Group's foreign operations is managed primarily through borrowings denominated in the relevant foreign currencies.

As at June 30, 2019 and December 31, 2018, the Group's monetary assets and liabilities denominated in currencies other than its functional currency, are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019		December 31, 2018	
	Assets	Liabilities	Assets	Liabilities
USD	2,811,363	3,064,172	2,458,886	2,396,650
EUR	266,632	2,138,585	197,975	892,963
JPY	36,173	148,397	27,849	114,399
CNY and others	546,031	1,187	128,392	6,085

As at June 30, 2019 and December 31, 2018, if the Group's functional currency had weakened / strengthened by 10% against the US dollar with all other variables held constant, profit before income tax would have been affected as follows:

<i>(in millions of Korean won)</i>	June 30, 2019		December 31, 2018	
	10% Increase	10% Decrease	10% Increase	10% Decrease
USD	(25,281)	25,281	6,224	(6,224)

The above sensitivity analysis has been performed for monetary assets and liabilities denominated in foreign currencies other than the Group's functional currency at the reporting date.

2) Price risk

The Group is exposed to equity securities price risk arises from investments held by the Group and classified in the consolidated interim statement of financial position as non-current financial assets. The Group's equity investments are publicly traded and are related to the KOSDAQ, NASDAQ and HSI index.

The table below summarizes the impact of increases/decreases of the listed stock price index on the Group's equity before tax effects as at June 30, 2019 and December 31, 2018. The analysis is based on the assumption that the equity index has increased/decreased by 10% with all other variables held constant, and that all the Group's equity instruments moved in line with the index.

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<i>(in millions of Korean won)</i>	June 30, 2019		December 31, 2018	
	10% Increase	10% Decrease	10% Increase	10% Decrease
KOSDAQ	424	(424)	315	(315)
NASDAQ	383	(383)	168	(168)
HSI	5,739	(5,739)	7,798	(7,798)
Total	6,546	(6,546)	8,281	(8,281)

3) Interest rate risk

Interest rate risk is defined as the risk that the interest income or expenses arising from deposits and borrowings will fluctuate because of changes in future market interest rate. The interest rate risk mainly arises through floating rate deposits and borrowings. The objective of interest rate risk management lies in maximizing corporate value by minimizing uncertainty in interest rates fluctuations and net interest expense.

The Group adequately minimizes risks from interest rate fluctuations through various policies, such as sharing excess cash within the Group (internal cash sharing) to minimize external borrowings, avoiding high rate borrowings, reforming capital structure, managing an appropriate ratio of fixed rate borrowings and floating rate borrowings, monitoring a fluctuation of domestic and foreign interest rates daily, weekly and monthly, establishing alternatives, and balancing floating rate short-term borrowings with floating rate deposits.

The table below summarizes the impact of increases/decreases of interest rate on the Group's equity and post-tax profit for the six-month periods ended June 30, 2019 and 2018. The analysis is based on the assumption that the interest rate has increased/decreased by 1% (100 basis points) with all other variables held constant.

<i>(in millions of Korean won)</i>	Impact on post-tax profit		Impact on equity	
	2019	2018	2019	2018
Increase	(22,764)	(14,501)	(22,764)	(14,501)
Decrease	22,764	14,501	22,764	14,501

(2) Credit risk

Credit risk arises from trade receivables and that the Group holds, as well as debt instruments at amortized cost or fair value through other comprehensive income.

A. Trade receivables

The Group applies the simplified approach to measuring expected credit losses which uses a lifetime expected loss allowance for trade receivables. To measure the expected credit losses, trade receivables have been grouped based on shared credit risk characteristics and the days past due. The loss allowance provision as at June 30, 2019 is as follows. Expected credit losses include forward-looking information.

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(in millions of Korean won)

	Receivables not past due ¹	Receivables past due but not impaired ¹	Impaired receivables ²	Total
June 30, 2019				
(trade receivables)				
Gross carrying amount	4,534,959	204,263	5,326	4,744,548
Expected loss rate	0.1%	0.4%	62.4%	0.1%
Loss allowance provision	2,243	893	3,321	6,457
December 31, 2018				
(trade receivables)				
Gross carrying amount	4,115,060	268,488	5,561	4,389,109
Expected loss rate	0.1%	0.4%	78.0%	0.2%
Loss allowance provision	2,512	1,063	4,335	7,910

¹ See Note 7.(3)

² Impaired receivables are those for which impairment indicators have been confirmed, such as significant lack of collectability (See Note 7.(3)).

Movements in the loss allowance provision for trade receivables for the six-month period ended June 30, 2019 and for the year ended December 31, 2018, are as follows:

(in millions of Korean won)

	Trade receivables	
	June 30, 2019	December 31, 2018
Beginning balance	7,910	7,552
Business combination (Note 34)	-	23
Increase in loss allowance recognized in profit or loss during the six-month period ended June 30, 2019	(612)	701
Receivables written off during the six-month period ended June 30, 2019, as uncollectible	(651)	(333)
Exchange differences	(190)	(33)
Ending balance	6,457	7,910

As at June 30, 2019, the carrying amount of trade receivables representing the maximum exposure to credit risk amounts to ₩4,744,548 million (December 31, 2018: ₩4,389,109 million).

LG Chem, Ltd. and Subsidiaries
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B. Other financial assets at amortized cost

Movements in loss allowance provision for other financial assets at amortized cost for the six-month period ended June 30, 2019 and for the year ended December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	Other receivables	
	June 30, 2019	December 31, 2018
Beginning balance	2,726	959
Increase in loss allowance recognized as 'other expenses' in profit or loss during the six-month period ended June 30, 2019	(639)	1,783
Exchange differences	22	(16)
Ending balance	2,109	2,726

All of the financial assets at amortized costs are considered to have low credit risk, and the loss allowance recognized during the period was, therefore, limited to 12 months expected losses.

The Group has established the following policies and procedures to manage credit risks.

To manage credit risks relating to trade receivables, the Group evaluates the credit rating of customers and determines credit limit for each customer based on the information provided by credit rating agencies and other available financial information before commencing business with new customers. The credit risks relating to trade receivables are also mitigated by insurance contracts, collateral as well as payment guarantees.

The Group has entered into export bond insurance contracts with Korea Trade Insurance Corporation to mitigate credit risks relating to export trade receivables to overseas customers. The Group is also provided with collateral by customers depending on their credit rating or payment guarantees from the customers' financial institutions if necessary.

The Group has deposited its cash and cash equivalents and other long-term deposits in several financial institutions, such as Woori Bank and others. The Group has also entered into derivative contract with several financial institutions. The Group maintains business relationship with those financial institutions with high credit ratings evaluated by independent credit rating agencies and accordingly, credit risks associated with these financial institutions are limited.

(3) Liquidity risk

Finance team of the Group monitors rolling forecasts of the Group's liquidity requirements to ensure it has sufficient cash to meet operational needs while maintaining sufficient headroom on its undrawn committed borrowing facilities at all times so that the Group does not breach borrowing limits or covenants (where applicable) on any of its borrowing facilities. The Group's liquidity management policy involves projecting cash flows in major currencies and considering the level of liquid assets necessary to meet these, monitoring balance sheet liquidity ratios against internal and external regulatory requirements and maintaining debt financing plans.

The table below analyzes the Group's non-derivative financial liabilities into relevant maturity groupings based on the remaining period at the reporting period to the contractual maturity date. Cash flows presented below are gross cash flows before discount, and includes cash flows for interests.

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(in millions of Korean won)

	June 30, 2019			
	Less than 1 year	Between 1-2 years	Between 2-5 years	Over 5 years
Borrowings (excluding lease liabilities)	1,618,828	1,730,414	3,766,511	2,555,210
Lease liabilities	29,001	22,568	35,476	49,915
Trade and other payables	4,933,609	9,586	109	98
Total	6,581,438	1,762,568	3,802,096	2,605,223

(in millions of Korean won)

	December 31, 2018			
	Less than 1 year	Between 1-2 years	Between 2-5 years	Over 5 years
Borrowings (excluding financial lease liabilities)	1,694,761	840,260	2,250,480	910,985
Finance lease liabilities	5,177	5,177	15,887	5,000
Trade and other payables	4,717,445	6,710	3,177	97
Total	6,417,383	852,147	2,269,544	916,082

As at June 30, 2019, the Group has entered into swap contracts for which cash flow hedge accounting is applied, to avoid market price fluctuation of raw materials.

(in millions of Korean won)

June 30, 2019					
	Purpose of the contracts	Hedged items	Financial institution	Maturity	Fair value
Merchandise (raw materials) swap ¹	Cash flow hedge	Non-ferrous metal	Citi bank	~2021. 12	4,091

Details of derivative assets and liabilities as at June 30, 2019 and December 31, 2018, are as follows:

	June 30, 2019		December 31, 2018	
	Assets	Liabilities	Assets	Liabilities
Merchandise (raw materials) swap ¹	4,447	356	-	18,477
Total	4,447	356	-	18,477

¹ Gain (loss) resulting from the contracts to avoid cash flow fluctuation risk of expected future transaction is accounted for as accumulated other comprehensive income (Note 5).

3.2 Capital Risk Management

The Group's objectives for managing capital are to safeguard the Group's ability to continue as a going concern, so the Group can continue to provide returns for shareholders and benefits for other stakeholders, and to maintain an optimal capital structure to reduce the cost of capital.

Consistent with others in the industry, the Group monitors capital on the basis of the gearing ratio. This ratio is calculated as net debt divided by total capital. Net debt is calculated as total borrowings less cash and cash equivalents. Total capital is calculated as 'equity' as shown in the consolidated statement of financial position plus net debt.

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The gearing ratio and debt-to-equity ratio as at June 30, 2019 and December 31, 2018, were as follows:

<i>(in millions of Korean won, except for ratios)</i>	June 30, 2019	December 31, 2018
Total borrowings (Note 14) (A)	8,480,437	5,321,147
Less: cash and cash equivalents (B)	(2,631,013)	(2,513,702)
Net debt (C=A+B)	5,849,424	2,807,445
Total liabilities (D)	15,156,692	11,622,009
Total equity (E)	17,278,855	17,322,128
Total capital (F=C+E)	23,128,279	20,129,573
Gearing ratio (C/F)	25.3%	13.9%
Debt-to-equity ratio (D/E)	87.7%	67.1%

3.3 Fair Value

(1) Carrying amount and fair value of financial instruments by category as at June 30, 2019 and December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019		December 31, 2018	
	Carrying amount	Fair value	Carrying amount	Fair value
Financial assets (current)				
Cash and cash equivalents	2,631,013	1	2,513,702	1
Deposits held by financial institutions	35,548	1	42,902	1
Trade receivables	4,738,091	1	4,381,199	1
Other receivables (excluding deposits held by financial institutions)	265,594	1	283,191	1
Current derivative financial assets	418	418	-	1
Financial assets (non-current)				
Deposits held by financial institutions	107,563	1	64,331	1
Other receivables (excluding deposits held by financial institutions)	76,391	1	64,919	1
Other non-current financial assets (carried at fair value)				
Marketable financial assets	46,848	46,848	49,214	49,214
Non-marketable financial assets	51,406	1	44,136	-
Non-current derivative financial assets	4,029	4,029	-	-
Financial liabilities (current)				
Trade and other payables	4,933,609	1	4,717,445	1
Current borrowings (excluding lease liabilities)	1,413,240	1	1,608,138	1
Current lease liabilities	18,612	2	5,008	1
Current derivative financial liabilities	356	356	18,477	18,477
Financial liabilities (non-current)				
Non-current borrowings (excluding lease liabilities)	6,950,322	7,185,501	3,684,765	3,740,154
Non-current lease liabilities	98,263	2	23,236	24,689

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	June 30, 2019		December 31, 2018	
	Carrying amount	Fair value	Carrying amount	Fair value
Other non-current payables	9,793	¹	9,984	¹
Other non-current financial liabilities (Conversion rights)	18,138	18,138	30,384	30,384

¹ These financial assets and liabilities are not included in the disclosure above as their carrying amount is a reasonable approximation of the fair value.

² Fair values for these financial assets and liabilities are not disclosed above in accordance with related Korean IFRS.

(2) Fair value for measurement and disclosure are determined based on the following method:

Fair values of financial liabilities(non-current) are based on cash outflows discounted by using Korean won currency note yield in the same credit grade with the Parent Company (AA+), and the applied discount rates as at June 30, 2019 and December 31, 2018, are as follows:

(in percentage)	June 30, 2019	December 31, 2018
Discount rate	1.70% ~ 2.14%	2.01% ~ 2.53%

(3) Fair value hierarchy

Items that are measured at fair value or for which the fair value is disclosed are categorized by the fair value hierarchy levels, and the levels are defined as follows:

- Level 1: The fair value of financial instruments traded in active markets (such as publicly traded derivatives and equity securities) is based on quoted market prices at the end of the reporting period. The quoted market price used for financial assets held by the Group is the current bid price. These instruments are included in level 1.

- Level 2: The fair value of financial instruments that are not traded in an active market (for example, over-the-counter derivatives) is determined using valuation techniques which maximize the use of observable market data and rely as little as possible on entity-specific estimates. If all significant inputs required to fair value an instrument are observable, the instrument is included in level 2.

- Level 3: If one or more of the significant inputs is not based on observable market data, the instrument is included in level 3. This is the case for unlisted equity securities.

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Fair value hierarchy classifications of the financial instruments that are measured at fair value or their fair value are disclosed as at June 30, 2019 and December 31, 2018, are as follows:

(in millions of Korean won)

	June 30, 2019			
	Level 1	Level 2	Level 3	Total
Financial assets/liabilities measured at fair value				
Other non-current financial assets (marketable financial assets)	46,848	-	-	46,848
Current derivative financial assets	-	418	-	418
Non-current derivative financial assets	-	4,029	-	4,029
Current derivative financial liabilities	-	356	-	356
Non-current financial liabilities (conversion rights)	-	-	18,138	18,138
Financial assets/liabilities not measured at fair value				
Non-current borrowings (excluding finance lease liabilities)	-	6,524,647	660,854	7,185,501

(in millions of Korean won)

	December 31, 2018			
	Level 1	Level 2	Level 3	Total
Financial assets/liabilities measured at fair value				
Other non-current financial assets (marketable financial assets)	49,214	-	-	49,214
Other current financial liabilities (derivative instruments)	-	18,477	-	18,477
Other non-current financial liabilities (conversion rights)	-	-	30,384	30,384
Financial assets/liabilities not measured at fair value				
Non-current borrowings (excluding finance lease liabilities)	-	3,120,475	619,679	3,740,154
Non-current finance lease liabilities	-	24,689	-	24,689

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(4) Valuation Technique and the Inputs

Valuation techniques and inputs used in level 3 fair value measurements are as follows:

<i>(in millions of Korean won)</i>					
June 30, 2019					
	Fair value	Level	Valuation Technique	Inputs	Coverage of Level 3 inputs
Financial liabilities					
– Convertible Bond					
Convertible Bond	660,854	3	Binominal option pricing model	Annual rates of credit volatility	-0.5%p ~ +0.5%p
Equity Conversion Option	18,138	3	Binominal option pricing model	Annual rates of credit volatility Underlying asset (equity) volatility	-0.5%p ~ +0.5%p -5% ~ +5%
<i>(in millions of Korean won)</i>					
December 31, 2018					
	Fair value	Level	Valuation Technique	Inputs	Coverage of Level 3 inputs
Financial liabilities					
– Convertible Bond					
Convertible Bond	619,679	3	Binominal option pricing model	Annual rates of credit volatility	-0.5%p ~ +0.5%p
Equity Conversion Option	30,384	3	Binominal option pricing model	Annual rates of credit volatility Underlying asset (equity) volatility	-0.5%p ~ +0.5%p -5% ~ +5%

(5) Sensitivity analysis for Recurring Fair Value Measurements Categorized Within Level 3

Sensitivity analysis of financial instruments is performed to measure favorable and unfavorable changes in the fair value of financial instruments which are affected by the unobservable parameters, using a statistical technique. When the fair value is affected by more than two input parameters, the most favorable or most unfavorable amounts are presented.

The results of the sensitivity analysis for the effect on profit or loss from changes in inputs for convertible notes categorized as level 3 and subject to sensitivity analysis, are as follows:

<i>(in millions of Korean won)</i>			June 30, 2019	
			The effect on profit	The effect on loss
Financial liabilities				
– Convertible Bond				
Annual rates of credit volatility			5,869	(5,951)
Financial liabilities				
– Equity Conversion Option				
Annual rates of credit volatility			666	(626)
Underlying asset (equity) volatility			2,340	(2,395)

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<i>(in millions of Korean won)</i>	December 31, 2018	
	The effect on profit	The effect on loss
Financial liabilities		
– Convertible Bond		
Annual rates of credit volatility	6,899	(7,011)
Financial liabilities		
– Equity Conversion Option		
Annual rates of credit volatility	985	(966)
Underlying asset (equity) volatility	3,237	(3,434)

4. Critical Accounting Estimates and Assumptions

The preparation of financial statements requires the Group to make estimates and assumptions concerning the future. Estimates and assumptions are continually evaluated and are based on historical experience and other factors, including expectations of future events that are believed to be reasonable under the circumstances. The resulting accounting estimates will, by definition, seldom equal the related actual results.

Significant accounting estimates and assumptions applied in the preparation of these condensed consolidated interim financial statements are the same as those applied to the consolidated financial statements for the year ended December 31, 2018, except for the estimates used to determine income tax expense, and accounting estimates and assumptions for implementation of Korean IFRS 1116 explained as below.

(1) Lease

On adoption of Korean IFRS 1116, the Group recognized lease liabilities in relation to leases which had previously been classified as ‘operating leases’ under the principles of Korean IFRS 1017. These liabilities were measured at the present value of the remaining lease payments, discounted using the lessee’s incremental borrowing rate as at January 1, 2019.

For leases previously classified as ‘finance leases’, the Group recognized the carrying amount of the lease asset and lease liability immediately before the initial application as the carrying amount of the right-of-use asset and the lease liability at the date of initial application. Right-of use assets were measured at the amount equal to the lease liability, adjusted by the amount of any prepaid or accrued lease payments relating to that lease as at December 31, 2018 (Note 11).

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5. Financial Instruments by Category

Categorizations of financial instruments as at June 30, 2019 and December 31, 2018, are as follows:

(in millions of Korean won)

	June 30, 2019			Total
	Financial assets at amortized cost	Financial assets at fair value through profit or loss	Financial assets at fair value through other comprehensive income	
Financial assets				
Cash and cash equivalents	2,631,013	-	-	2,631,013
Trade receivables	4,447,794	-	290,297	4,738,091
Other receivables	301,142	-	-	301,142
Other non-current receivables	183,954	-	-	183,954
Other current financial assets	-	-	418	418
Other non-current financial assets	-	22,714	79,569	102,283
Total	7,563,903	22,714	370,284	7,956,901

(in millions of Korean won)

	June 30, 2019			Total
	Financial liabilities at fair value through profit or loss	Financial liabilities at amortized cost	Other financial liabilities ¹	
Financial liabilities				
Trade payables	-	2,548,447	-	2,548,447
Other payables	-	2,385,162	-	2,385,162
Borrowings (current)	-	1,413,240	18,612	1,431,852
Other current financial liabilities	-	-	356	356
Other non-current financial liabilities	18,138	-	-	18,138
Other non-current payables	-	9,793	-	9,793
Borrowings (non-current)	-	6,950,322	98,263	7,048,585
Total	18,138	13,306,964	117,231	13,442,333

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	December 31, 2018			Total
	Financial assets at amortized cost	Financial assets at fair value through profit or loss	Financial assets at fair value through other comprehensive income	
Financial assets				
Cash and cash equivalents	2,513,702	-	-	2,513,702
Trade receivables	3,986,675	-	394,524	4,381,199
Other receivables	326,093	-	-	326,093
Other non-current receivables	129,251	-	-	129,251
Other non-current financial assets	-	16,077	77,273	93,350
Total	6,955,721	16,077	471,797	7,443,595

(in millions of Korean won)

	December 31, 2018			Total
	Financial liabilities at fair value through profit or loss	Financial liabilities at amortized cost	Other financial liabilities ¹	
Financial liabilities				
Trade payables	-	2,165,969	-	2,165,969
Other payables	-	2,551,476	-	2,551,476
Borrowings (current)	-	1,608,138	5,008	1,613,146
Other current financial liabilities	-	-	18,477	18,477
Other non-current financial liabilities	30,384	-	-	30,384
Other non-current payables	-	9,984	-	9,984
Borrowings (non-current)	-	3,684,765	23,236	3,708,001
Total	30,384	10,020,332	46,721	10,097,437

¹ Other financial liabilities include financial lease liabilities that are not subject to the categorizations and financial liabilities that are related to transfer transactions not qualified for derecognition.

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Net gains or losses on each category of financial instruments for the three-month and six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019		2018	
	Three months	Six months	Three months	Six months
Dividend income				
Financial assets at fair value through other comprehensive income	24	49	8	8
Interest income				
Financial assets at amortized cost	13,684	25,392	12,233	23,497
Interest expense				
Financial liabilities at amortized cost	(61,857)	(106,363)	(35,742)	(63,752)
Other financial liabilities	(641)	(1,293)	(263)	(523)
Gain (loss) on valuation				
Financial assets at fair value through profit or loss	48	78	-	-
Financial assets at fair value through other comprehensive income	(7,821)	(830)	2,510	6,167
Derivative instruments	9,445	34,816	2,188	2,188
Loss on disposal				
Financial assets at fair value through other comprehensive income	-	-	(205)	(1,542)
Exchange differences				
Financial assets at amortized cost	58,632	105,983	142,296	128,410
Financial liabilities at amortized cost	(80,569)	(86,757)	(168,129)	(116,558)
Other financial liabilities	(245)	(436)	235	142

6. Cash and Cash Equivalents

Details of cash and cash equivalents as at June 30, 2019 and December 31, 2018, are as follows:

(in millions of Korean won)

	June 30, 2019	December 31, 2018
Bank deposits and cash on hand	868,847	872,337
Deposits held by financial institutions and others	1,762,166	1,641,365
Total	2,631,013	2,513,702

As at June 30, 2019, cash and cash equivalents include ₩4,642 million which is subject to a restriction on the use in association with the national R&D projects.

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7. Trade and Other Receivables

Trade and other receivables and its provisions for impairment, as at June 30, 2019 and December 31, 2018, are as follows:

(in millions of Korean won)

	June 30, 2019		
	Gross amount	Provision for impairment	Carrying amount
Trade receivables	4,744,548	(6,457)	4,738,091
Other current receivables	303,251	(2,109)	301,142
Other non-current receivables ¹	183,954	-	183,954
Total	5,231,753	(8,566)	5,223,187

(in millions of Korean won)

	December 31, 2018		
	Gross amount	Provision for impairment	Carrying amount
Trade receivables	4,389,109	(7,910)	4,381,199
Other current receivables	328,819	(2,726)	326,093
Other non-current receivables ¹	129,251	-	129,251
Total	4,847,179	(10,636)	4,836,543

¹ As at June 30, 2019, ₩963 million of other non-current receivables represents deposits which are restricted from withdrawal in connection with maintaining checking accounts (2018: ₩931 million).

Details of other receivables as at June 30, 2019 and December 31, 2018, are as follows:

(in millions of Korean won)

	June 30, 2019	December 31, 2018
Current		
Non-trade receivables	227,670	242,740
Deposits held by financial institutions ¹	35,548	42,902
Accrued income	2,854	3,533
Guarantee deposits provided	35,070	36,918
	301,142	326,093
Non-current		
Non-trade receivables	15,255	7,030
Deposits held by financial institutions ²	107,563	64,331
Loans	328	312
Guarantee deposits provided	60,808	57,578
	183,954	129,251
Total	485,096	455,344

¹ As at June 30, 2019, ₩300 million (2018: ₩300 million) is pledged as a collateral for borrowings and others.

² As at June 30, 2019, ₩106,600 million (2018: ₩63,400 million) is restricted from being withdrawn in relation to large, small and medium-sized companies cooperation agreement and others.

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The aging analysis of trade and other receivables as at June 30, 2019 and December 31, 2018, is as follows:

<i>(in millions of Korean won)</i>	June 30, 2019		December 31, 2018	
	Trade receivables	Other receivables	Trade receivables	Other receivables
Receivables not past due	4,534,959	454,943	4,115,060	445,357
Past due but not impaired				
Up to 3 months	172,861	10,610	247,287	6,850
Between 3-6 months	16,059	8,501	5,631	1,907
Over 6 months	15,343	8,840	15,570	1,847
	204,263	27,951	268,488	10,604
Impaired receivables	5,326	4,311	5,561	2,109
	4,744,548	487,205	4,389,109	458,070

Movements on the provision for impairment of trade and other receivables for the six-month period ended June 30, 2019 and for the year ended December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019			
	Trade receivables		Other receivables	
	Current	Non-current	Current	Non-current
Beginning balance	7,910	-	2,726	-
Business combination (Note 34)	-	-	-	-
Reversal	(612)	-	(639)	-
Write-off	(651)	-	-	-
Exchange differences	(190)	-	22	-
Ending balance	6,457	-	2,109	-

<i>(in millions of Korean won)</i>	December 31, 2018			
	Trade receivables		Other receivables	
	Current	Non-current	Current	Non-current
Beginning balance	7,552	-	959	-
Business combination (Note 34)	23	-	-	-
Additions	701	-	1,783	-
Write-off	(333)	-	-	-
Exchange differences	(33)	-	(16)	-
Ending balance	7,910	-	2,726	-

As at June 30, 2019 and December 31, 2018, the carrying amounts of trade and other receivables are approximation of their fair values.

The Group transferred trade and other receivables to financial institutions for ₩532,882 million at June 30, 2019, and derecognized the trade and other receivables from the financial statements at the date of disposal, as substantial all the risks and rewards were transferred.

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8. Other Financial Assets

Details of other financial assets as at June 30, 2019 and December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019	December 31, 2018
Other financial assets		
Financial assets at fair value through other comprehensive income (futures contract) (current)	418	-
Financial assets at fair value through other comprehensive income (excluding futures contract) (non-current)	75,541	77,273
Financial assets at fair value through other comprehensive income (futures contract) (non-current)	4,029	-
Financial assets at fair value through profit or loss (excluding futures contract) (non-current)	22,713	16,077
	<u>102,701</u>	<u>93,350</u>
Other financial liabilities		
Financial liabilities at fair value through other comprehensive income (futures contract) (current)	356	18,477
Financial liabilities at fair value through profit or loss (conversion rights) (non-current)	18,138	30,384
	<u>18,494</u>	<u>48,861</u>

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Changes in equity securities and debts instruments included in other financial assets for the six-month period ended June 30, 2019 and for the year ended December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019	December 31, 2018
Beginning balance	93,350	23,782
Acquisitions / Transfer	7,017	89,240
Disposals	(1,361)	(14,009)
Loss on valuation (before income tax effects) through other comprehensive income	(830)	(5,736)
Loss on valuation (before income tax effects) through profit or loss	78	73
Ending balance	<u>98,254</u>	<u>93,350</u>

During the six-month period ended June 30, 2019 and the year ended December 31, 2018, the Group did not recognize impairment for other financial assets.

9. Inventories

Details of inventories as at June 30, 2019 and December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019		
	Gross Amount	Valuation allowance	Carrying amount
Merchandise	164,164	(3,481)	160,683
Finished / Semi-finished products	2,693,078	(110,067)	2,583,011
Work-in-process	20,601	(906)	19,695
Raw materials	1,260,110	(16,761)	1,243,349
Supplies	161,958	-	161,958
Materials-in-transit	602,190	-	602,190
Total	<u>4,902,101</u>	<u>(131,215)</u>	<u>4,770,886</u>

<i>(in millions of Korean won)</i>	December 31, 2018		
	Gross Amount	Valuation allowance	Carrying amount
Merchandise	167,842	(958)	166,884
Finished / Semi-finished products	2,480,102	(125,479)	2,354,623
Work-in-process	15,530	-	15,530
Raw materials	1,111,386	(18,573)	1,092,813
Supplies	154,304	-	154,304
Materials-in-transit	505,309	-	505,309
Total	<u>4,434,473</u>	<u>(145,010)</u>	<u>4,289,463</u>

During the six-month period ended June 30, 2019, the cost of inventories recognized as expense and included in 'cost of sales' amounted to ₩8,596,173 million (2018: ₩8,304,042 million).

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10. Investments in Associates and Joint Ventures

Changes in investments in associates and joint ventures for the six-month period ended June 30, 2019 and for the year ended December 31, 2018, are as follows:

(in millions of Korean won)

	June 30, 2019						
	Beginning balance	Acquisitions / transfer	Dividends	Share of profit (loss) of associates and joint ventures	Share of other comprehensive income of associates and joint ventures	Others	Ending balance
LG VINA Chemical Co., Ltd	4,479	-	-	95	267	-	4,841
HL Greenpower Co., Ltd.	19,565	-	-	3,279	-	(118)	22,726
LG Holdings (HK) Ltd.	54,735	-	-	2,123	596	-	57,454
TECHWIN Co., Ltd.	9,828	-	-	2,096	(15)	-	11,909
SEETEC Co., Ltd.	145,649	-	(10,000)	3,359	-	(14)	138,994
LG Chem BRASIL INTERMEDIACAO DE NEGOCIOS DO SETOR QUIMICO LTDA.	579	-	-	-	-	-	579
LG Chem Malaysia SDN.BHD	150	-	-	-	-	-	150
LG Fuel Cell Systems Inc.	-	-	-	-	-	-	-
FJ Composite Materials Co., LTD.	2,315	-	-	(104)	107	-	2,318
WUXI CL New Energy Technology Ltd.	1,288	-	-	(255)	71	-	1,104
LG Life Sciences Poland Ltd.	17	-	-	-	-	-	17
Combustion Synthesis Co., Ltd.	1,397	-	-	(123)	20	90	1,384
HUAJIN NEW ENERGY MATERIALS(QUZHOU)CO., LTD. ¹	26,120	27,676	-	(200)	253	-	53,849
	<u>266,122</u>	<u>27,676</u>	<u>(10,000)</u>	<u>10,270</u>	<u>1,299</u>	<u>(42)</u>	<u>295,325</u>

(in millions of Korean won)

	December 31, 2018						
	Beginning balance	Acquisitions / transfer	Dividends	Share of profit (loss) of associates and joint ventures	Share of other comprehensive income of associates and joint ventures	Others	Ending balance
LG VINA Chemical Co., Ltd	3,327	1,767	(810)	246	(51)	-	4,479
HL Greenpower Co., Ltd.	20,239	-	-	(467)	-	(207)	19,565
LG Holdings (HK) Ltd.	51,028	-	-	4,029	(322)	-	54,735
TECHWIN Co., Ltd.	8,010	-	-	1,818	-	-	9,828
SEETEC Co., Ltd.	146,741	-	(10,000)	9,368	-	(460)	145,649
LG Chem BRASIL INTERMEDIACAO DE NEGOCIOS DO SETOR QUIMICO LTDA.	579	-	-	-	-	-	579
LG Chem Malaysia SDN.BHD	150	-	-	-	-	-	150
LG Fuel Cell Systems Inc.	30,334	5,036	-	(9,647)	718	(26,441)	-
FJ Composite Materials Co., LTD.	2,669	-	-	(198)	(156)	-	2,315
WUXI CL New Energy Technology Ltd.	1,002	559	-	(224)	(49)	-	1,288
LG Life Sciences Poland Ltd.	17	-	-	-	-	-	17
Combustion Synthesis Co.,	-	1,503	-	(118)	(4)	16	1,397

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Ltd.												
HUAJIN NEW ENERGY MATERIALS(QUZHOU)CO., LTD.	-	26,129	-	279	(288)	-	26,120					
	<u>264,096</u>	<u>34,994</u>	<u>(10,810)</u>	<u>5,086</u>	<u>(152)</u>	<u>(27,092)</u>	<u>266,122</u>					

¹During the six-month period ended June 30, 2019, the Parent Company acquired additional shares of HUAJIN NEW ENERGY MATERIALS(QUZHOU)CO., LTD. for ₩27,676 million.

11. Property, Plant and Equipment

Changes in property, plant and equipment for the six-month period ended June 30, 2019 and for the year ended December 31, 2018, are as follows:

(in millions of Korean won)

	June 30, 2019											
	Land	Buildings	Structures	Machinery	Vehicles	Tools	Equipment	Others	Right-of-use assets	Constructi on-in-progress	Machinery -in-transit	Total
Beginning balance	1,620,153	3,187,757	827,775	4,691,884	12,865	471,130	149,599	115,901	-	2,588,018	174,116	13,839,198
Cost	1,657,105	3,959,198	1,407,903	14,412,619	41,803	1,233,217	420,342	315,049	-	2,641,276	174,116	26,262,628
Accumulated depreciation	-	(735,173)	(566,151)	(9,564,688)	(28,783)	(750,202)	(268,298)	(196,996)	-	-	-	(12,110,291)
Accumulated impairment	(36,952)	(36,268)	(13,977)	(156,047)	(155)	(11,885)	(2,445)	(2,152)	-	(53,258)	-	(313,139)
Changes in accounting policy	-	-	(17,697)	(9,668)	-	-	-	-	164,016	-	-	136,651
Restated beginning balance	1,620,153	3,187,757	810,078	4,682,216	12,865	471,130	149,599	115,901	164,016	2,588,018	174,116	13,975,849
Acquisitions/ Transfer	15,400	528,520	149,326	1,865,820	5,141	156,085	21,586	121,317	17,611	2,566,142	131,545	5,578,493
Disposals/ Transfer	(2,252)	(803)	(537)	(85,839)	(10,082)	(10,727)	(986)	(173)	(5,761)	(2,778,852)	(114,373)	(3,010,385)
Exchange differences	513	35,658	3,323	56,141	49	4,403	1,052	-	2,242	42,063	-	145,444
Depreciation	-	(54,573)	(26,368)	(566,410)	(1,404)	(78,113)	(22,081)	(40,864)	(12,346)	-	-	(802,159)
Impairment	-	(2,909)	(1,545)	(13,949)	-	(37)	(44)	-	-	-	-	(18,484)
Transfer to non-current asset held for sale (Note 35)	-	-	-	(5,422)	-	(53)	-	-	-	-	-	(5,475)
Ending balance	<u>1,633,814</u>	<u>3,693,650</u>	<u>934,277</u>	<u>5,932,557</u>	<u>6,569</u>	<u>542,688</u>	<u>149,126</u>	<u>196,181</u>	<u>165,762</u>	<u>2,417,371</u>	<u>191,288</u>	<u>15,863,283</u>
Cost	1,670,767	4,529,427	1,533,092	16,143,410	32,817	1,362,008	437,498	355,374	205,772	2,469,008	191,288	28,930,461
Accumulated depreciation	-	(796,259)	(583,025)	(10,059,585)	(26,097)	(807,726)	(285,937)	(157,041)	(40,010)	-	-	(12,755,680)
Accumulated impairment	(36,953)	(39,518)	(15,790)	(151,268)	(151)	(11,594)	(2,435)	(2,152)	-	(51,637)	-	(311,498)

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	December 31, 2018										
	Land	Buildings	Structures	Machinery	Vehicles	Tools	Equipment	Others	Construction-in-progress	Machinery-in-transit	Total
Beginning balance	1,568,295	2,762,588	654,629	4,169,473	13,654	403,522	105,759	73,399	1,317,877	142,286	11,211,482
Cost	1,605,247	3,438,000	1,190,383	13,157,481	39,945	1,085,752	352,106	211,585	1,361,431	142,286	22,584,216
Accumulated depreciation	-	(637,025)	(521,806)	(8,840,809)	(26,143)	(669,189)	(243,973)	(136,034)	-	-	(11,074,979)
Accumulated impairment	(36,952)	(38,387)	(13,948)	(147,199)	(148)	(13,041)	(2,374)	(2,152)	(43,554)	-	(297,755)
Business combination (Note 34)	12,115	13,497	632	22,163	247	1,992	159	-	1,310	-	52,115
Acquisitions/ Transfer	42,589	523,470	222,046	2,336,407	2,235	217,702	86,201	113,754	4,741,547	181,833	8,467,784
Disposals/ Transfer	(2,817)	(5,098)	(1,765)	(792,444)	(183)	(11,304)	(2,624)	(3,485)	(3,461,294)	(150,003)	(4,431,017)
Exchange differences	(29)	(6,950)	(466)	(20,254)	(2)	(138)	320	-	(1,865)	-	(29,384)
Depreciation	-	(95,479)	(47,000)	(986,099)	(3,066)	(139,783)	(40,127)	(67,767)	-	-	(1,379,321)
Impairment	-	(4,295)	(343)	(37,727)	(25)	(862)	(104)	-	(9,557)	-	(52,913)
Reversal of impairment	-	24	42	365	5	1	15	-	-	-	452
Ending balance	1,620,153	3,187,757	827,775	4,691,884	12,865	471,130	149,599	115,901	2,588,018	174,116	13,839,198
Cost	1,657,105	3,959,198	1,407,903	14,412,619	41,803	1,233,217	420,342	315,049	2,641,276	174,116	26,262,628
Accumulated depreciation	-	(735,173)	(566,151)	(9,564,688)	(28,783)	(750,202)	(268,298)	(196,996)	-	-	(12,110,291)
Accumulated impairment	(36,952)	(36,268)	(13,977)	(156,047)	(155)	(11,885)	(2,445)	(2,152)	(53,258)	-	(313,139)

During the six-month period ended June 30, 2019, the Group capitalized ₩11,868 million of borrowing costs (2018: ₩9,101 million), in relation to acquisition of property, plant and equipment, on property, plant and equipment. The capitalization rate of borrowings used to determine the amount of borrowing costs eligible for capitalization is 2.35% (2018: 2.32%).

Line items including depreciation in the consolidated statements of profit or loss for the three-month and six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019		2018	
	Three months	Six months	Three months	Six months
Cost of sales	386,440	727,527	306,967	608,894
Selling and administrative expenses	38,279	72,194	28,540	55,751
Others	1,198	2,438	660	1,495
Total	<u>425,917</u>	<u>802,159</u>	<u>336,167</u>	<u>666,140</u>

Lease

The Group has applied Korean IFRS 1116 retrospectively with the cumulative effect of initially applying the new lease standard recognized at the date of initial application, as permitted under the specific transitional provisions in the standard. Accordingly, reclassifications and adjustments arising from the new lease standard were recognized in the statement of financial position as at January 1, 2019.

- Adjustments recognized on adoption of Korean IFRS 1116 Lease

On adoption of Korean IFRS 1116, the Group recognized lease liabilities in relation to leases which had previously been classified as 'operating leases' under the principles of Korean IFRS 1017. These liabilities were measured at the present value of the remaining lease payments, discounted using the lessee's incremental borrowing rate as at January 1, 2019. The weighted average

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lessee's incremental borrowing rate applied to the lease liabilities on January 1, 2019 was 2.45%.

For leases previously classified as 'finance leases', the Group recognized the carrying amount of the lease asset and lease liability immediately before the initial application as the carrying amount of the right-of-use asset and the lease liability at the date of initial application.

Right-of use assets were measured at the amount equal to the lease liability, adjusted by the amount of any prepaid or accrued lease payments relating to that lease recognized in the statement of financial position as at December 31, 2018. There were no onerous lease contracts that would have required an adjustment to the right-of-use assets at the date of initial application.

(i) Amounts recognized in the consolidated interim statement of financial position

The consolidated interim statement of financial position shows the following amounts relating to leases:

<i>(in millions of Korean won)</i>	June 30, 2019	January 1, 2019
Right-of-use assets ¹		
Real-estate	130,343	124,952
Machinery	16,373	17,968
Vehicles	16,195	17,844
Tools	11	17
Equipment	2,840	3,235
	<u>165,762</u>	<u>164,016</u>

¹ Included in the line item 'Property, plant and equipment' in the interim statements of financial position.

<i>(in millions of Korean won)</i>	June 30, 2019	January 1, 2019
Lease liabilities ¹		
Current	18,612	18,406
Non-current	98,263	97,029
	<u>116,875</u>	<u>115,435</u>

¹ Included in the line item 'borrowings' in the interim statements of financial position. In the previous year, the Group only recognized lease liabilities in relation to leases that were classified as 'finance leases' under Korean IFRS 1017 *Leases*. These were presented as part of the Group's borrowings.

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(ii) Amounts recognized in the consolidated interim statement of profit or loss

The consolidated interim statement of profit or loss shows the following amounts relating to leases:

<i>(in millions of Korean won)</i>	2019
Depreciation of right-of-use assets	
Real-estate	7,245
Machinery	1,592
Vehicles	3,053
Tools	7
Equipment	449
	<hr/>
	12,346
Interest expense relating to lease liabilities (included in finance cost)	1,294
Expense relating to short-term leases (included in cost of goods sold and administrative expenses)	22,489
Expense relating to leases of low-value assets that are not short-term leases (included in cost of goods sold and administrative expenses)	5,307
Expense relating to variable lease payments not included in lease liabilities (included in cost of goods sold and administrative expenses)	15

The total cash outflow for leases during the six-month period ended June 30, 2019 was ₩32,850 million.

Financial line items affected by the initial application of Korea IFRS 1116 in the consolidated interim statement of financial position as at January 1, 2019 are as follows:

- property, plant and equipment: decreased by ₩27,365 million
- right-of-use assets: increased by ₩164,016 million
- long-term prepaid expenses: decreased by ₩49,460 million
- lease liabilities: increased by ₩87,191 million

(iii) Practical expedients applied

In applying Korean IFRS 1116 for the first time, the Group has used the following practical expedients permitted by the standard:

- the use of a single discount rate to a portfolio of leases with reasonably similar characteristics
- reliance on previous assessments on whether leases are onerous
- the accounting for operating leases with a remaining lease term of less than 12 months as at January 1, 2019, as short-term leases

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- the exclusion of initial direct costs for the measurement of the right-of-use asset at the date of initial application, and
- the use of hindsight in determining the lease term where the contract contains options to extend or terminate the lease

- The Group's leasing activities and how these are accounted for

The Group leases various offices, warehouses, machinery and cars. Lease contracts are typically made for fixed periods, but may have extension options. Lease terms are negotiated on an individual basis and contain a wide range of different terms and conditions. The lease agreements do not impose any covenants, but leased assets shall not be provided as collateral for borrowing purposes.

Until the 2018 financial year, leases of property, plant and equipment were classified as either finance or operating leases. Payments made under operating leases (net of any incentives received from the lessor) were charged to profit or loss on a straight-line basis over the period of the lease.

From January 1, 2019, leases are recognized as a right-of-use asset and a corresponding liability at the date at which the leased asset is available for use by the Group. Each lease payment is allocated between the liability and finance cost. The finance cost is charged to profit or loss over the lease period so as to produce a constant periodic rate of interest on the remaining balance of the liability for each period. The right-of-use asset is depreciated over the shorter of the asset's useful life and the lease term on a straight-line basis.

Assets and liabilities arising from a lease are initially measured on a present value basis. Lease liabilities include the net present value of the following lease payments:

- fixed payments (including in-substance fixed payments), less any lease incentives receivable
- variable lease payment that are based on an index or a rate
- amounts expected to be payable by the lessee under residual value guarantees
- the exercise price of a purchase option if the lessee is reasonably certain to exercise that option, and
- payments of penalties for terminating the lease, if the lease term reflects the lessee exercising that option

The lease payments are discounted using the interest rate implicit in the lease, if that rate can be readily determined. If that rate cannot be readily determined, the lessee's incremental borrowing rate is used. The lessee's incremental borrowing is defined as the rate of interest that a lessee would have to pay to borrow over a similar term, and with a similar security, the funds necessary to obtain an asset of a similar value to the right-of-use asset in a similar economic environment.

Right-of-use assets are measured at cost comprising the following:

- the amount of the initial measurement of lease liability
- any lease payments made at or before the commencement date less any lease incentives received
- any initial direct costs, and

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- restoration costs

Payments associated with short-term leases and leases of low-value assets are recognized on a straight-line basis as an expense in profit or loss. Short-term leases are leases with a lease term of 12 months or less. Low-value assets comprise IT-equipment and small items of office furniture.

(i) Variable lease payments

Some property leases contain variable payment terms that are linked to usage generated from warehouses. Variable lease payments that depend on the usage are recognized in profit or loss in the period in which the condition that triggers those payments occurs.

(ii) Extension and termination options

Extension and termination options are included in a number of property and equipment leases across the Group. These terms are used to maximize operational flexibility in terms of managing contracts. The majority of extension and termination options held are exercisable only by the Group and not by the respective lessor. In determining the lease term, management considers all facts and circumstances that create an economic incentive to exercise an extension option, or not to exercise a termination option. Periods covered by extension options (or termination options) are only included in the lease term if it is reasonably certain to exercise an extension option, or not to exercise a termination option.

12. Intangible Assets

Changes in intangible assets for the six-month period ended June 30, 2019 and for the year ended December 31, 2018, are as follows:

(in millions of Korean won)

	June 30, 2019					
	Development costs	Industrial property rights	Goodwill	Memberships	Others	Total
Beginning balance	220,860	405,282	1,017,855	50,885	311,356	2,006,238
Separate acquisitions/ Transfer ¹	14,223	135,785	-	-	33,975	183,983
Additions – internal development	6,629	-	-	-	-	6,629
Disposals/ Transfer	(6,400)	(1,873)	-	(115)	(31)	(8,419)
Exchange differences	589	1,352	787	19	77	2,824
Amortization	(22,616)	(19,509)	-	-	(19,552)	(61,677)
Ending balance	213,285	521,037	1,018,642	50,789	325,825	2,129,578

¹ Intangible assets acquired from Dupont related to S-OLED are included.

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(in millions of Korean won)

	December 31, 2018					
	Development costs	Industrial property rights	Goodwill	Memberships	Others	Total
Beginning balance	192,046	371,381	925,593	50,806	283,329	1,823,155
Business combination (Note 34)	-	4	87,871	-	51,829	139,704
Separate acquisitions/ Transfer	83,049	63,008	-	702	34,750	181,509
Additions – internal development	16,065	-	-	-	-	16,065
Disposals/ Transfer	(15,149)	(69)	-	(623)	(23,150)	(38,991)
Exchange differences	(115)	1,433	4,391	-	(120)	5,589
Amortization	(42,276)	(30,475)	-	-	(35,197)	(107,948)
Impairment	(12,760)	-	-	-	(85)	(12,845)
Ending balance	220,860	405,282	1,017,855	50,885	311,356	2,006,238

Line items including amortization of intangible assets for the three-month and six-month periods ended June 30, 2019 and 2018, as follows:

(in millions of Korean won)

	2019		2018	
	Three months	Six months	Three months	Six months
Cost of sales	6,134	12,085	6,023	11,870
Selling and administrative expenses	26,633	49,593	20,820	41,070
Total	32,767	61,678	26,843	52,940

The Group recognized total research and development costs of ₩534,087 million (2018: ₩475,941 million) as expenses.

Changes in greenhouse gas emission permits for the six-month period ended June 30, 2019 and for the year ended December 31, 2018, are as follows:

(in thousands of tons
and millions of
Korean won)

	June 30, 2019			
	2018		2019	
	Quantity	Amount	Quantity	Amount
Beginning balance	7,903	7,359	7,546	-
Allocation with nil consideration	245	-	-	-
Purchase	100	2,790	-	-
Borrowings/ Carry forwards between years	-	-	-	-
Surrendered to the government	-	-	-	-
Ending balance	8,248	10,149	7,546	-

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<i>(in thousands of tons and millions of Korean won)</i>	December 31, 2018					
	2017		2018		2019	
	Quantity	Amount	Quantity	Amount	Quantity	Amount
Beginning balance	7,520	18,635	6,648	-	-	-
Allocation with nil consideration	160	-	897	-	7,546	-
Purchase	481	11,826	-	-	-	-
Borrowings/Carry forwards between years	(358)	(7,359)	358	7,359	-	-
Surrendered to the government	(7,803)	(23,102)	-	-	-	-
Ending balance	-	-	7,903	7,359	7,546	-

13. Other Current and Non-Current Assets

Details of other current and non-current assets as at June 30, 2019 and December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019	December 31, 2018
Current		
Prepayments to suppliers and prepaid expenses	299,839	138,502
Prepaid value added tax	423,057	373,187
Others	127,934	61,771
Total	850,830	573,460
Non-current		
Long-term prepayments and long-term prepaid expenses	78,223	112,223
Others	164	157
Total	78,387	112,380

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14. Borrowings

Borrowings as at June 30, 2019 and December 31, 2018, consist of:

<i>(in millions of Korean won)</i>	June 30, 2019	December 31, 2018
Current		
Short-term borrowings	1,000,550	1,254,142
Current portion of long-term borrowings of bank loans	192,867	304,004
Current-portion of debentures	219,823	49,992
Finance lease liabilities	18,612	5,008
	<u>1,431,852</u>	<u>1,613,146</u>
Non-current		
Long-term borrowings	1,647,454	981,858
Debentures	5,302,869	2,702,907
Finance lease liabilities	98,263	23,236
	<u>7,048,585</u>	<u>3,708,001</u>
Total	<u>8,480,437</u>	<u>5,321,147</u>

Details of short-term borrowings as at June 30, 2019 and December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	Bank	Latest maturity date	Interest rate(%) as at June 30, 2019	June 30, 2019	December 31, 2018
Bank loans	Nonghyup Bank, others	Jun. 5, 2020	2.60 and others	1,000,550	1,254,142
Total				<u>1,000,550</u>	<u>1,254,142</u>

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Details of long-term borrowings as at June 30, 2019 and December 31, 2018, are as follows:

(in millions of Korean won)	June 30, 2019				
	Bank	Annual interest rate (%)	Amount in Korean won	Current	Non-current
Borrowings in Korean won	KEB Hana Bank ¹	1.75	176	176	-
	KDB ¹	1Y + 1.45 ~ 1.99	8,509	-	8,509
Borrowings in foreign currencies	HSBC	USD: 3M LIBOR + 0.95~2.10 CNY: PBOC × 0.95	210,770	-	210,770
	SMBC	3M LIBOR + 0.65~1.05	105,221	37,674	67,547
	Agricultural Bank of China	USD: 3M LIBOR + 0.80 CNY: PBOC × 0.90~1.10	39,031	10,173	28,858
	Construction Bank of China	PBOC × 0.90	22,735	3,873	18,862
	Communications Bank of China	PBOC × 0.90~1.00	40,533	4,353	36,180
	CITI	USD: 3M LIBOR + 0.95 EUR: EURIBOR + 0.70 CNY: PBOC × 1.00	217,182	2,311	214,871
	Bank of America	3M LIBOR + 0.90	45,115	-	45,115
	ING	6M EURIBOR + 0.70~0.83	157,817	-	157,817
	UOB	6M LIBOR + 1.15	112,148	54,373	57,775
	Standard Chartered Bank	USD: 3M LIBOR + 1.20 CNY: PBOC × 0.95	77,092	9,039	68,053
	Mizuho Banking Corporation	3M LIBOR + 0.98	34,623	6,925	27,698
	BNP	3M EURIBOR + 0.80~0.99	19,727	19,727	-
	CNOOC Finance	PBOC × 0.90	46,558	16,304	30,254
	Hangseng	3M LIBOR + 1.00	31,197	3,466	27,731
	Bank of China	3M LIBOR + 0.95	24,526	12,479	12,047
	MUFG	USD: 3LIBOR + 1.00 EUR: 3M EURIBOR + 0.60~0.80	177,710	5,774	171,936
	ANZ	3M LIBOR + 1.42	115,550	-	115,550
	Industrial and Commercial Bank of Chin	PBOC × 1.00	33,299	3,330	29,969
	CIMB	3LIBOR + 1.50	57,774	2,890	54,884
	KEB Hana Bank	3M EURIBOR + 0.62	263,029	-	263,029
Total			<u>1,840,322</u>	<u>192,867</u>	<u>1,647,454</u>

¹ Other receivables are pledged as collateral for the above long-term borrowings (Note 18).

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(in millions of Korean won)	December 31, 2018				
	Bank	Annual interest rate (%)	Amount in Korean won	Current	Non-current
Borrowings in Korean won	KEB Hana Bank ¹	1.75	353	353	-
	KDB ¹	1Y + 1.45 ~ 1.99	8,508	-	8,508
Borrowings in foreign currencies	HSBC	3M LIBOR + 1.00~1.05	240,167	39,097	201,070
	SMBC	3M LIBOR + 0.98~1.05	94,568	50,265	44,303
	Agricultural Bank of China	USD: 3M LIBOR + 0.80 CNY: PBOC ×0.90	42,694	8,665	34,029
	Construction Bank of China	PBOC ×0.90	23,890	3,750	20,140
	Communications Bank of China	PBOC	40,617	2,751	37,866
	CITI	USD: 3M LIBOR + 0.95 Euro: EURIBOR + 0.70	146,957	-	146,957
	Bank of America	3M LIBOR + 0.90	11,181	11,181	-
	ING	6M Euribor + 0.70~0.83	153,422	-	153,422
	UOB	6M LIBOR + 1.15~1.55	108,954	53,101	55,853
	Standard Chartered Bank	3M LIBOR + 1.60	26,216	26,216	-
	Mizuho Banking Corporation	3M LIBOR + 0.98~1.02	78,154	48,030	30,124
	BNP	Euro: EURIBOR + 0.99 PLN: WIBOR + 0.55	19,178	19,178	-
	CNOOC Finance	PBOC ×0.90	54,850	22,298	32,552
	Hangseng	3M LIBOR + 1.00	31,836	3,352	28,484
	Bank of China	3M LIBOR + 0.95	29,743	12,065	17,678
	MUFG	3M Libor + 1.00	44,659	2,791	41,868
	ANZ	3M Libor +1.42	111,705	-	111,705
	Industrial and Commercial Bank of Chin	PBOC	18,210	911	17,299
Total			<u>1,285,862</u>	<u>304,004</u>	<u>981,858</u>

¹ Other receivables are pledged as collateral for the above long-term borrowings (Note 18).

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Details of debentures as at June 30, 2019 and December 31, 2018, are as follows:

(in millions of Korean won)

		June 30, 2019				
	Financial institution	Annual interest rate (%)	Latest maturity date	Amount in Korean won	Current	Non-current
50-1st Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	1.95	2020.05.19	120,000	120,000	-
50-2nd Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	2.28	2022.05.19	400,000	-	400,000
50-3rd Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	2.53	2024.05.19	280,000	-	280,000
51-1st Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	2.56	2021.02.20	190,000	-	190,000
51-2nd Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	2.88	2023.02.20	240,000	-	240,000
51-3rd Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	3.07	2025.02.20	270,000	-	270,000
51-4th Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	3.29	2028.02.20	300,000	-	300,000
52-1st Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	2.02	2022.03.13	160,000	-	160,000
52-2nd Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	2.11	2024.03.13	240,000	-	240,000
52-3rd Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	2.21	2026.03.13	200,000	-	200,000
52-4th Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	2.40	2029.03.13	400,000	-	400,000
1-1st USD Overseas Convertible bonds¹	Credit Suisse	-	2021.04.16	254,496	-	254,496
1-2nd EUR Overseas Convertible bonds²	Credit Suisse	-	2021.04.16	414,523	-	414,523
USD foreign currency debenture with maturity in 2024	CITI and others	3.25	2024.10.15	578,400	-	578,400
USD foreign currency debenture with maturity in 2029	CITI and others	3.63	2029.04.15	578,400	-	578,400
EUR foreign currency debenture with maturity in 2023	CITI and others	0.50	2023.04.15	657,555	-	657,555
Debentures in Korean won (non-guaranteed)	NH Investment & Securities Co., Ltd. and others	1.93	2020.02.16	100,000	100,000	-
	NH Investment & Securities Co., Ltd. and others	2.26	2022.02.16	100,000	-	100,000
	NH Investment & Securities Co., Ltd. and others	2.71	2021.03.02	50,000	-	50,000
	NH Investment & Securities Co., Ltd. and others	3.00	2023.03.02	40,000	-	40,000
Less: discount on debentures				(50,682)	(177)	(50,505)
Total				5,522,692	219,823	5,302,869

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¹ Details of 1-1st USD overseas convertible bonds are as follows:

	Details
Aggregate principal amount	USD 220,000,000
Issue price	USD 220,000,000
Coupon rate (%)	0.00
Issue date	April 16, 2018
Maturity date	April 16, 2021
Redemption	- Redemption at maturity: Outstanding bond principal, which is not repaid early or which call option is not exercised on, is repaid at maturity as a lump sum. - Prepayment: The issuer has a call option.
Underlying shares	509,606 registered ordinary shares (treasury shares)
Conversion price (Korean won/shares)	460,000
Conversion period	From May 27, 2018 to April 06, 2021
Call option by the issuer	- Share price (based on closing price) is higher than 130% of conversion price for more than 20 trading days during 30 consecutive trading days in a row, after 1 year from the closing date. - The amount of outstanding bonds is less than 10% in aggregate principal amount of the bonds originally issued (clean up call). - As a result of changes relating to tax laws in Korea, the issuer becomes obliged to pay any additional amounts.
Call option by bondholders	- The shares cease to be listed or admitted to trading or are suspended for a period equal to or exceeding 30 consecutive trading days. - The occurrence of a change of control

² Details of 1-2nd EUR overseas convertible bonds are as follows:

	Details
Aggregate principal amount	EUR 315,200,000
Issue price	EUR 315,200,000
Coupon rate (%)	0.00
Issue date	April 16, 2018
Maturity date	April 16, 2021
Redemption	- Redemption at maturity: Outstanding bond principal, which is not repaid early or which call option is not exercised on, is repaid at maturity as a lump sum. - Prepayment: The issuer has a call option.
Underlying shares	775,128 registered ordinary shares (treasury shares)
Conversion price (Korean won/shares)	533,600
Conversion period	From May 27, 2018 to April 06, 2021
Call option by the issuer	- Share price (based on closing price) is higher than 130% of conversion price for more than 20 trading days during 30 consecutive trading days in a row, after 1 year from the closing date. - The amount of outstanding bonds is less than 10% in aggregate principal amount of the bonds originally issued (clean up call). - As a result of changes relating to tax laws in Korea, the issuer becomes obliged to pay any additional amounts.
Call option by bondholders	- The shares cease to be listed or admitted to trading or are suspended for a period equal to or exceeding 30 consecutive trading days. - The occurrence of a change of control

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		December 31, 2018				
	Financial institution	Annual interest rate (%)	Latest maturity date	Amount in Korean won	Current	Non-current
48th Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	3.77	2019.02.21	50,000	50,000	-
50-1st Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	1.95	2020.05.19	120,000	-	120,000
50-2nd Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	2.28	2022.05.19	400,000	-	400,000
50-3rd Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	2.53	2024.05.19	280,000	-	280,000
51-1st Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	2.56	2021.02.20	190,000	-	190,000
51-2nd Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	2.88	2023.02.20	240,000	-	240,000
51-3rd Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	3.07	2025.02.20	270,000	-	270,000
51-4th Debenture (non-guaranteed/public)	NH Investment & Securities Co., Ltd. and others	3.29	2028.02.20	300,000	-	300,000
1-1st USD Overseas Convertible bonds¹	Credit Suisse	-	2021.04.16	245,982	-	245,982
1-2nd EUR Overseas Convertible bonds²	Credit Suisse	-	2021.04.16	403,191	-	403,191
Debentures in Korean won (non-guaranteed)	NH Investment & Securities Co., Ltd. and others	1.93	2020.02.16	100,000	-	100,000
	NH Investment & Securities Co., Ltd. and others	2.26	2022.02.16	100,000	-	100,000
	NH Investment & Securities Co., Ltd. and others	2.71	2021.03.02	50,000	-	50,000
	NH Investment & Securities Co., Ltd. and others	3.00	2023.03.02	40,000	-	40,000
Less: discount on debentures				(36,274)	(8)	(36,266)
Total				2,752,899	49,992	2,702,907

¹ Certain property, plant and equipment are pledged as collateral for the above debentures (Note 18).

Details of lease liabilities as at June 30, 2019 and December 31, 2018, are as follows:

(in millions of Korean won)

		June 30, 2019			
Leaser	Annual interest rate (%)	Latest maturity date	Total amount	Current	Non-current
Hyundai Oil Bank and others	1.98 ~ 4.13	2068.12.31	116,875	18,612	98,263

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Leaser	December 31, 2018				
	Annual interest rate (%)	Latest maturity date	Total amount	Current	Non-current
Hyundai Oil Bank	3.12	2024.12.31	27,168	4,886	22,282
CHUNGBUK					
TECHNOPARK	4.13	2023.12.31	1,076	122	954
Total			28,244	5,008	23,236

15. Provisions

Changes in provisions for other liabilities and charges for the six-month period ended June 30, 2019 and for the year ended December 31, 2018, as follows:

(in millions of Korean won)

	June 30, 2019				
	Warranty ¹	Greenhouse gas emission ²	Legal Claims ³	Restoration ⁴	Total
Beginning balance	198,575	11,700	402	126,976	337,653
Additions	210,706	12,771	14	160	223,651
Used	(71,453)	-	-	(5,823)	(77,276)
Ending balance	337,828	24,471	416	121,313	484,028
Less : current portion	(183,380)	(24,471)	-	(26,727)	(234,578)
Total	154,448	-	416	94,586	249,450

(in millions of Korean won)

	December 31, 2018				
	Warranty ¹	Greenhouse gas emission ²	Legal claims ³	Restoration ⁴	Total
Beginning balance	92,662	23,069	20,629	90,056	226,416
Additions	208,511	11,733	7,070	50,439	277,753
Used	(102,598)	(23,102)	(27,297)	(13,519)	(166,516)
Ending balance	198,575	11,700	402	126,976	337,653
Less : current portion	(81,146)	(11,700)	-	(26,520)	(119,366)
Total	117,429	-	402	100,456	218,287

¹ Warranty provisions have been accrued for the estimated warranty costs to be incurred due to quality control, exchange, refunds with the regard to products based on historical experience. In addition, provisions related to operational loss compensation for ESS fire accidents are included.

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² Greenhouse gas emission provisions have been accrued for estimated expenditures to be obligated for any excess emission. The estimated emission as at June 30, 2019 amounts to 3,988 thousand tons (March 31, 2018: 3,953 thousand tons).

³ Lawsuit provisions have been accrued for certain pending cases.

⁴ As at June 30, 2019, restoration provisions have been accrued for the estimated expenses to restore land pollutions and others.

16. Net Defined Benefit Liabilities

Details of net defined benefit liabilities recognized in the consolidated interim statements of financial position as at June 30, 2019 and December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019	December 31, 2018
Present value of defined benefit obligations ¹	1,210,208	1,167,524
Fair value of plan assets	(899,998)	(939,980)
Liabilities in the consolidated interim statement of financial position	310,210	227,544

¹ The present value of retirement benefit obligations is net of existing contributions to the National Pension Plan of ₩784 million as at June 30, 2019 (2018: ₩837 million).

The amounts recognized in the consolidated interim statements of profit or loss for the three-month and six-month periods ended June 30, 2019 and 2018, are as follows:

<i>(in millions of Korean won)</i>	2019		2018	
	Three months	Six months	Three months	Six months
Current service cost ¹	40,106	80,484	36,078	71,986
Interest cost	1,502	3,030	1,447	2,884
Total, included in employee benefit expenses	41,608	83,514	37,525	74,870

¹ The above amounts excluded ₩894 million (2018: ₩490 million) of expenses capitalized to construction in progress and development costs.

Post-employment benefits recognized for defined contribution plan for the six-month period ended June 30, 2019, amounted to ₩4,093 million (2018: ₩3,321 million).

Post-employment benefits recognized in the consolidated interim statements of profit or loss for the three-month and six-month periods ended June 30, 2019 and 2018, are as follows:

<i>(in millions of Korean won)</i>	2019		2018	
	Three months	Six months	Three months	Six months
Cost of sales	28,554	58,071	26,452	52,626
Selling and administrative expenses	14,929	29,536	12,764	25,565
Total	43,483	87,607	39,216	78,191

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Movements in the present value of defined benefit obligations for the six-month period ended June 30, 2019 and for the year ended December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019	December 31, 2018
Beginning balance	1,167,524	1,049,511
Business combination	-	2,461
Transfer in	2,851	12,012
Transfer out	(2,353)	(8,412)
Current service cost	81,378	146,272
Past service cost	-	812
Interest expense	15,324	32,609
Remeasurements:		
Actuarial loss from change in demographic assumptions	-	2,553
Actuarial gain from change in financial assumptions	-	62,476
Actuarial loss from experience adjustments	-	2,139
Others	-	(91)
Exchange differences	(304)	(666)
Payments from plans	(54,212)	(134,152)
Ending balance	1,210,208	1,167,524

Movements in the fair value of plan assets for the six-month period ended June 30, 2019 and for the year ended December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019	December 31, 2018
Beginning balance	939,980	868,830
Transfer in	-	1,546
Transfer out	(66)	(628)
Interest income	12,294	26,763
Remeasurements:		
Return on plan assets (excluding amounts included in interest income)	(5,270)	(8,942)
Contributions:		
Employers	-	155,567
Payments from plans	(45,938)	(102,229)
Administrative costs	(1,002)	(927)
Ending balance	899,998	939,980

The actual return on plan assets for the six-month period ended June 30, 2019, was ₩7,024 million (December 31, 2018: ₩17,821 million).

The significant actuarial assumptions as at June 30, 2019 and December 31, 2018, are as follows:

	June 30, 2019	December 31, 2018
Discount rate	2.7% ~ 3.0%	2.7% ~ 3.5%
Salary growth rate	2.2% ~ 5.0%	2.2% ~ 5.0%

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The sensitivity analysis for changes in key actuarial assumptions as at June 30, 2019, is as follows:

<i>(in millions of Korean won)</i>	Increase by 0.5%	Decrease by 0.5%
Discount rate:		
Increase (decrease) in defined benefit obligations	(65,588)	71,872
Salary growth rate:		
Increase (decrease) in defined benefit obligations	70,096	(64,697)

A decrease in corporate bond yields may lead most significantly to an increase in defined benefit liabilities.

The above sensitivity analyses are based on a change in an assumption while holding all other assumptions constant. In practice, this is unlikely to occur, and changes in some of the assumptions may be correlated. The sensitivity of the defined benefit obligation to changes in principal actuarial assumptions is calculated using the projected unit credit method, the same method applied when calculating the defined benefit obligations recognized on the statement of financial position.

The methods and types of assumptions used in preparing the sensitivity analysis did not change compared to the prior period.

Plan assets as at June 30, 2019 and December 31, 2018, consist of:

<i>(in millions of Korean won)</i>	June 30, 2019		December 31, 2018	
	Amount	Composition	Amount	Composition
Insurance contracts with guaranteed yield	892,213	99.13%	922,829	98.18%
Equity linked bonds	7,449	0.83%	15,576	1.66%
Time deposits	336	0.04%	1,575	0.16%
	<u>899,998</u>	<u>100.00%</u>	<u>939,980</u>	<u>100.00%</u>

Plan assets consist of various debt instruments with principal and interest protection and others which have no quoted market prices in an active market.

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17. Other Current and Non-Current Liabilities

Details of other current and non-current liabilities as at June 30, 2019 and December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019	December 31, 2018
Current		
Advances from customers	166,465	128,308
Withholdings	82,566	117,442
Unearned revenues	21,910	13,105
Accrued expenses	286,760	298,458
Total	557,701	557,313
Non-current		
Long-term accrued expenses	54,987	52,359
Long-term unearned revenues	15,272	15,272
Long-term advanced received	36,257	28,788
Total	106,516	96,419

18. Commitments and Contingencies

(1) As at June 30, 2019, the Parent Company and certain subsidiaries have been guaranteed from Seoul Guarantee Insurance Company for the execution of contracts and others.

(2) As at June 30, 2019, the Parent Company has provided one blank promissory note to Korea National Oil Corporation as a collateral in relation to petroleum import surcharges.

(3) As at June 30, 2019, the Parent Company and certain subsidiaries have various specific line of credit agreements with several financial institutions, as follows:

(unit: Korean won in millions, foreign currencies in millions)

Classification	The Parent Company		Certain Overseas Subsidiaries					
	KRW	USD	KRW	USD	CNY	EUR	INR	THB
Limit of bank overdraft	59,100	-	-	180	2,153	29	-	10
Limit of the letter of credit	32,000	478	-	399	380	2	-	-
Limit of discount of notes from export	-	1,153	-	-	-	-	-	-
Limit of payment guarantees in other foreign currency	-	135	-	1	-	-	-	-
Limit of loan arrangements	-	-	123,876	2,205	7,282	630	2,894	-

The Group also entered into credit line agreements with other financial institutions relating to trade finance and import/export amounting to ₩20,000 million and USD 55 million.

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- (4) As at June 30, 2019, the Parent Company and certain subsidiaries have B2B purchase arrangements with several financial institutions with limit of ₩450,000 million and ₩152,400 million, respectively.
- (5) As at June 30, 2019, in relation to price fixing of mobile batteries, the consumers in Canada and Israel have filed two class actions against the Parent Company and certain overseas subsidiaries. However, the ultimate outcome of these cases cannot be determined at the reporting date.
- (6) In addition, as at June 30, 2019, the Parent Company and certain subsidiaries have been named as a plaintiff in 15 and 13 legal actions, respectively, involving ₩17,611 million and ₩3,127 million in claims, respectively. They have been named as a defendant in 104 and 58 legal actions, respectively, with ₩6,430 million and ₩19,829 million in claims, respectively. The ultimate outcome of these cases cannot be determined at the reporting date.
- (7) As at June 30, 2019, the Parent Company is under investigation by the related authorities in relation to the manipulation of the emission of fine dust-causing substance in the Yeosu Industrial Complex, and the final outcome of these investigations cannot be determined at the reporting date. As at June 30, 2019, the Parent Company shut down the relevant production facilities.
- (8) The Parent Company has entered into manufacture and production technical contracts with ExxonMobil and others.
- (9) The Parent Company has entered into a license agreement with LG Corp. to use trademarks on the products that the Group manufactures and sells, and on the services the Group provides in relation to its business.
- (10) As at June 30, 2019, the Parent Company has entered into payment guarantee contract of US\$ 5 million, EUR 7 million and KRW 2,983 million with financial institutions to guarantee the warrant of certain installed products. Also, certain subsidiaries have entered into payment guarantee contract of CNY 208 million with financial institutions in relation to custom of imported raw materials.
- (11) As at June 30, 2019 and December 31, 2018, assets pledged as collateral for the borrowings are as follows:

(in millions of Korean won)

	June 30, 2019			
	Secured amount	Borrowings / Loan	Limit	Secured party
Other receivables	300	Long-term borrowings	176	KEB Hana Bank
Factory	20,880	Short-term and long-term borrowings	16,250	KDB
	<u>21,180</u>		<u>16,426</u>	

(in millions of Korean won)

	December 31, 2018			
	Secured amount	Borrowings / Loan	Limit	Secured party
Other receivables	300	Long-term borrowings	353	KEB Hana Bank

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Factory	20,880	Short-term and long-term borrowings	16,800	KDB
Dormitory	600	Long-term borrowings	1,038	Woori Bank
	<u>21,780</u>		<u>18,191</u>	

(12) Capital expenditure arrangement that has not been incur at the end of the reporting period is as follows:

<i>(in millions of Korean won)</i>	June 30, 2019	December 31, 2018
Property, plant and equipment	2,963,421	2,041,834

19. Share Capital

Changes in share capital and share premium for the six-month period ended June 30, 2019 and for the year ended December 31, 2018, are as follows:

<i>(in millions of Korean won and in shares)</i>	Ordinary shares		Preferred shares		Share premium
	Number of shares	Share capital	Number of shares	Share capital	
January 1, 2018	70,592,343	352,962	7,688,800	38,444	2,014,038
December 31, 2018	70,592,343	352,962	7,688,800	38,444	2,014,038
June 30, 2019	<u>70,592,343</u>	<u>352,962</u>	<u>7,688,800</u>	<u>38,444</u>	<u>2,014,038</u>

Changes in treasury shares for the six-month period ended June 30, 2019 and for the year ended December 31, 2018, are as follows:

<i>(in millions of Korean won and in shares)</i>	Number of shares		Carrying amount	Gain on disposal of treasury shares
	Ordinary shares	Preferred shares		
January 1, 2018	1,652,416	16,367	354,945	13,855
Acquisition of fractional shares	1	-	-	-
December 31, 2018	<u>1,652,417</u>	<u>16,367</u>	<u>354,945</u>	<u>13,855</u>
June 30, 2019	<u>1,652,417</u>	<u>16,367</u>	<u>354,945</u>	<u>13,855</u>

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20. Retained Earnings

Retained earnings as at June 30, 2019 and December 31, 2018, consist of:

<i>(in millions of Korean won)</i>	June 30, 2019	December 31, 2018
Legal reserve ¹	332,535	329,554
Discretionary reserve ²	13,608,917	12,541,819
Retained earnings before appropriation	850,170	2,122,879
Total	14,791,622	14,994,252

¹ The Commercial Code of the Republic of Korea requires the Parent Company to appropriate for each financial period, as a legal reserve, an amount equal to a minimum of 10% of cash dividends paid until such reserve equals 50% of its issued share capital. The reserve is not available for cash dividends payment, but may be transferred to share capital or used to reduce accumulated deficit. When the accumulated legal reserves (the sum of capital reserves and earned profit reserves) are greater than 1.5 times the paid-in capital amount, the excess legal reserves may be distributed in accordance with a resolution of the shareholders' meeting.

² The Group separately accumulates a discretionary reserve for research and human resource development through appropriation of retained earnings, which has been included as deductible expense for the corporate income tax return according to the Special Tax Treatment Law. The reserve could be reversed in accordance with the terms of related tax laws.

21. Other Components of Equity

Details of other components of equity as at June 30, 2019 and December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019	December 31, 2018
Treasury shares (Note 19)	(354,945)	(354,945)
Capital transactions within the Group ¹	(19,298)	(19,298)
Total	(374,243)	(374,243)

¹ Includes gain or loss on disposal of investments and investment differences due to changes in equity, net of deferred tax.

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22. Selling and Administrative Expenses

Selling and administrative expenses for the three-month and six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019		2018	
	Three months	Six months	Three months	Six months
Wages and salaries	231,136	468,039	209,171	401,204
Post-employment benefits (Note 16)	14,929	29,536	12,764	25,565
Employee benefits	49,790	91,918	38,219	72,324
Travel expense	20,863	37,166	14,888	28,158
Water & utilities	11,443	25,327	8,875	22,569
Packaging expense	1,758	3,614	2,039	4,033
Rental expenses	24,353	48,125	24,471	44,784
Commission expenses	119,853	231,455	104,440	198,804
Depreciation (Note 11)	38,282	72,200	28,543	55,757
Advertising expense	11,321	17,736	10,596	16,103
Freight expenses	146,384	285,937	140,005	272,891
Training expense	6,859	11,484	5,967	9,944
Amortization (Note 12)	26,633	49,593	20,820	41,070
Sample expense	5,219	9,882	5,045	9,126
Development costs	58,440	105,105	50,244	89,610
Others	113,224	287,981	92,202	167,067
Total	880,487	1,775,098	768,289	1,459,009

23. Breakdown of Expenses by Nature

Cost of sales, and selling and administrative expenses by nature for the three-month and six-month periods ended June 30, 2019 and 2018, consist of:

(in millions of Korean won)

	2019		2018	
	Three months	Six months	Three months	Six months
Changes in inventories of merchandise, finished goods, semi-finished goods and work in process	(84,865)	(226,353)	(21,878)	(276,369)
Raw materials and consumables used	4,379,636	8,308,513	4,025,658	7,943,159
Purchase of merchandise	234,459	514,013	341,923	637,252
Employee benefit expenses (Note 24)	685,850	1,364,214	619,935	1,180,724
Advertising expenses	11,654	18,345	10,975	16,685
Freight expenses	156,104	307,437	149,384	292,254
Commission expenses	212,336	397,433	168,325	324,583
Depreciation and amortization	457,489	861,405	362,353	717,591
Operating lease payments	21,024	43,066	22,646	46,094
Other expenses	836,241	1,685,562	669,241	1,369,338
Total	6,909,928	13,273,635	6,348,562	12,251,311

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24. Employee Benefit Expenses

Details of employee benefit expenses for the three-month and six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019		2018	
	Three months	Six months	Three months	Six months
Salaries	574,122	1,149,109	523,448	994,721
Post-employment benefits –				
Defined benefit plan (Note 16)	41,608	83,514	37,525	74,870
Post-employment benefits –				
Defined contribution plan (Note 16)	1,875	4,093	1,691	3,321
Others	68,245	127,498	57,271	107,812
Total	685,850	1,364,214	619,935	1,180,724

25. Finance Income and Costs

Details of finance income and costs for the three-month and six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019		2018	
	Three months	Six months	Three months	Six months
Finance income				
Interest income ¹	13,684	25,392	12,233	23,497
Dividend income	24	49	8	8
Exchange differences	57,868	116,320	55,772	92,335
Gain on valuation of derivative instruments	12,962	13,012	2,019	2,019
Total	84,538	154,773	70,032	117,859
Finance costs				
Interest expense ²	55,961	95,788	29,595	55,174
Exchange differences	90,754	124,926	116,718	125,036
Loss on valuation of derivative instruments	-	273	-	13
Total	146,715	220,987	146,313	180,223

¹ Details of interest income for the three-month and six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019		2018	
	Three months	Six months	Three months	Six months
Deposits held by financial institutions	12,271	22,617	11,349	21,192
Other loans and receivables	1,413	2,775	884	2,305
Total	13,684	25,392	12,233	23,497

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² Details of interest expense for the three-month and six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019		2018	
	Three months	Six months	Three months	Six months
Interest on bank overdraft and borrowings	24,650	47,366	23,447	33,317
Interest on finance lease liabilities	641	1,293	260	513
Interest on debentures	32,814	51,665	10,691	27,438
Other interest expenses	4,393	7,332	1,607	3,007
Capitalized interest for qualifying assets	(6,537)	(11,868)	(6,410)	(9,101)
Total	55,961	95,788	29,595	55,174

26. Other Non-Operating Income

Details of other non-operating income for the three-month and six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019		2018	
	Three months	Six months	Three months	Six months
Exchange differences	134,589	213,290	168,860	226,605
Gain on disposal of property, plant and equipment	2,195	4,493	2,884	3,019
Gain on disposal of intangible assets	-	160	2	2
Reversal of impairment loss on property, plant and equipment (Note 11)	-	-	311	311
Others	6,479	12,002	7,795	13,867
Total	143,263	229,945	179,852	243,804

27. Other Non-Operating Expenses

Details of other non-operating expenses for the three-month and six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019		2018	
	Three months	Six months	Three months	Six months
Exchange differences	123,885	185,894	133,512	181,911
Loss on disposal of property, plant and equipment	13,817	26,260	3,851	17,061
Loss on disposal of intangible assets	28	917	28	77
Impairment loss on property, plant and equipment (Note 11)	13,692	18,484	15,110	16,385
Impairment loss on intangible assets (Note 12)	-	-	1,704	1,704
Donations	2,755	3,078	2,172	5,668
Others	5,189	9,723	5,033	14,861
Total	159,366	244,356	161,410	237,667

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28. Tax Expense and Deferred Tax

Income tax expense is recognized based on the best estimate of weighted average annual income tax rate expected for the full financial year. The estimated average annual income tax rate used for the year ending December 31, 2019, is 24.3% (the estimated tax rate for the year ended December 31, 2018: 23.9%).

29. Earnings per Share

Basic earnings per share is calculated by dividing the profit attributable to ordinary shares by the weighted average number of shares in issue excluding shares purchased by the Parent Company and held as treasury shares. Preferred shares have a right to participate in the profits of the Parent Company. These participation rights have been considered in presenting the EPS for ordinary shares and preferred shares.

Basic earnings per share attributable to the owners of the Parent Company for the three-month and six-month periods ended June 30, 2019 and 2018, is computed as follows:

Basic earnings per ordinary share

*(in millions of Korean won and
in number of shares)*

	2019		2018	
	Three months	Six months	Three months	Six months
Profit attributable to ordinary shares ¹	61,183	236,107	429,796	907,846
Weighted average number of ordinary shares outstanding ²	68,939,926	68,939,926	68,939,927	68,939,927
Basic earnings per ordinary shares <i>(in won)</i>	<u>887</u>	<u>3,425</u>	<u>6,234</u>	<u>13,169</u>

Basic earnings per preferred share

*(in millions of Korean won and
in number of shares)*

	2019		2018	
	Three months	Six months	Three months	Six months
Profit attributable to preferred shares ¹	6,905	26,469	47,928	101,227
Weighted average number of preferred shares outstanding ²	7,672,433	7,672,433	7,672,433	7,672,433
Basic earnings per preferred shares <i>(in won)</i>	<u>900</u>	<u>3,450</u>	<u>6,247</u>	<u>13,194</u>

LG Chem, Ltd. and Subsidiaries
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¹ Profit attributable to ordinary and preferred shares are as follows:

*(in millions of Korean won and
in number of shares)*

	2019		2018	
	Three months	Six months	Three months	Six months
Profit attributable to the equity holders of the Parent Company	68,088	262,575	477,724	1,009,073
Ordinary shares dividends (A)	61,184	206,820	103,410	206,820
Preferred shares dividends (B)	6,905	23,209	11,604	23,209
Undistributed earnings for the period	-	32,546	362,710	779,044
Undistributed earnings available for ordinary shares (C)	-	29,286	326,386	701,026
Undistributed earnings available for preferred shares (D)	-	3,260	36,324	78,018
Profit for the period attributable to ordinary shares (A+C)	61,183	236,106	429,796	907,846
Profit for the period attributable to preferred shares (B+D)	6,905	26,469	47,928	101,227

² Weighted average numbers of shares are calculated as follows:

Ordinary shares outstanding	2019			
	Period	Number of shares	Number of days	Number of shares x days
Beginning balance	2019. 1. 1 - 2019. 6. 30	68,939,926	181	12,478,126,606
Total				12,478,126,606

Weighted average number of ordinary shares outstanding: $12,478,126,606 / 181 = 68,939,926$ shares

Preferred shares outstanding	2019			
	Period	Number of shares	Number of days	Number of shares x days
Beginning balance	2019. 1. 1 - 2019. 6. 30	7,672,433	181	1,388,710,373
Total				1,388,710,373

Weighted average number of preferred shares outstanding: $1,388,710,373 / 181 = 7,672,433$ shares

Ordinary shares outstanding	2018			
	Period	Number of shares	Number of days	Number of shares x days
Beginning balance	2018. 1. 1 - 2018. 6. 30	68,939,927	181	12,478,126,787
Total				12,478,126,787

Weighted average number of ordinary shares outstanding: $12,478,126,787 / 181 = 68,939,927$ shares

Preferred shares outstanding	2018			
	Period	Number of shares	Number of days	Number of shares x days
Beginning balance	2018. 1. 1 - 2018. 6. 30	7,672,433	181	1,388,710,373
Total				1,388,710,373

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Weighted average number of preferred shares outstanding: $1,388,710,373 / 181 = 7,672,433$ shares

Diluted earnings per share is calculated based on the weighted average number of ordinary shares outstanding, adjusted for the assumption that all of dilutive potential ordinary shares to be converted. The Parent Company has one category of dilutive potential ordinary shares: convertible bonds, which were issued during the six-month period ended June 30, 2018. Convertible bonds are considered to be converted into potential ordinary shares and the amount, subtracting income tax effect from related gain and loss such as interest expense on convertible bonds, is added to profit for the period attributable to ordinary shares and preferred shares.

(in millions of Korean won and in number of shares)

	2019	
	Three months	Six months
Diluted earnings per ordinary shares		
Profit for the period attributable to the ordinary shares	61,183	236,107
Gain and loss on convertible bonds (after tax effects)	(3,639)	(2,959)
Profit used in calculating diluted earnings per share	57,544	233,148
Weighted average number of ordinary shares outstanding	68,939,926	68,939,926
Adjustments for calculation of diluted earnings per share:		
Assumed conversion of convertible bonds	1,284,734	1,284,734
Weighted average number of ordinary shares and potential ordinary shares used as the denominator in calculating diluted earnings per share	70,224,660	70,224,660
Diluted earnings per share attributable to the ordinary shares <i>(in won)</i>	819	3,320

(in millions of Korean won and in number of shares)

	2019	
	Three months	Six months
Diluted earnings per preferred shares		
Profit for the period attributable to preferred shares	6,905	26,469
Gain and loss on convertible bonds (after tax effects)	(523)	(804)
Profit used in calculating diluted earnings per share	6,382	25,665
Weighted average number of preferred shares outstanding	7,672,433	7,672,433
Adjustments for calculation of diluted earnings per share:		
Weighted average number of preferred shares and potential preferred shares used as the denominator in calculating diluted earnings per share	7,672,433	7,672,433
Diluted earnings per share attributable to the preferred shares <i>(in won)</i>	832	3,345

30. Dividends

The ₩460,058 million (2018: ₩460,058 million) of dividends for the year ended December 31, 2018, was paid to the shareholders of the Parent Company in April 2019.

LG Chem, Ltd. and Subsidiaries **Notes to the Consolidated Interim Financial Statements** **June 30, 2019 and 2018 (Unaudited), and December 31, 2018**

31. Related Party Transactions

As at June 30, 2019 and December 31, 2018, LG Corp. is an entity exercising a significant influence over the Group, which owns 33.34% of the Parent Company's ordinary shares.

Details of associates and other related parties that have sales and other transactions with the Group or have receivables and payables balances as at June 30, 2019 and December 31, 2018, are as follows, and the details of investments in subsidiaries, associates and joint ventures are described in Note 1.3:

Related party	Related party's subsidiary (Domestic)	Related party's subsidiary (Overseas)	Details
S&I corp.	SERVEONE	Serveone(Nanjing).Co.,LTD, and others	Subsidiary of LG Corp.
LG CNS Co., Ltd.	Biz Tech Partners Co., Ltd. and others	LG CNS America Inc. and others	Subsidiary of LG Corp.
LG Management Development Institute	-	-	Subsidiary of LG Corp.
LG Sports Ltd.	-	-	Subsidiary of LG Corp.
LG Holdings Japan	-	-	Subsidiary of LG Corp.
LG MMA Corporation	-	-	Joint venture of LG Corp.
LG Display Co., Ltd.	-	LG Display (China) Co., Ltd. and others	LG Enterprise group ¹
LG Electronics, Inc.	LG Innotek Co., Ltd. and others	Inspur LG Digital Mobile Communications Co., Ltd. and others	LG Enterprise group ¹
LG International Corp.	Pantos Logistics Co., Ltd. and others	LG International (Japan) Ltd. and others	LG Enterprise group ¹
LG Hausys, Ltd.	-	LG Hausys Tianjin Co., Ltd. and others	LG Enterprise group ¹
LG Household & Health Care Ltd.	Coca-Cola Beverage Co. and others	-	LG Enterprise group ¹
LG Uplus Corp.	-	-	LG Enterprise group ¹
G II R Inc.	HS AD Inc.	GIIR Rus LLC	LG Enterprise group ¹
Silicon Works Co., Ltd.	-	-	LG Enterprise group ¹

¹ Although the entity is not the related party of the Group in accordance with Korean IFRS 1024, the entity belongs to a large enterprise group in accordance with the Monopoly Regulation and Fair Trade Act.

LG Chem, Ltd. and Subsidiaries
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Sales and purchases with related parties for the six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019			
	Sales and others	Purchase and others		
		Purchase of raw materials /merchandises	Acquisition of property, plant and equipment and intangible assets	Others
Entity with a significant influence over the Group				
LG Corp.	2,655	-	-	35,113
Associates and joint ventures				
SEETEC Co., Ltd.	18,870	98,764	330	42,817
TECWIN Co., Ltd.	3	26	2,334	74
HL Greenpower Co., Ltd.	407,473	-	-	449
Others	17	-	-	1,546
Other related parties				
LG MMA Corporation	56,486	102,602	-	3,093
S&I Corporation and its subsidiaries	7,068	325,136	426,406	86,808
LG CNS Co., Ltd. and its subsidiaries	8,593	510	93,619	41,104
Others	-	-	-	10,083
Others				
LG Display Co., Ltd. and its subsidiaries	589,146	66	81,460	699
LG Electronics Inc. and its subsidiaries	519,326	272,481	233,140	23,296
LG International Corp. and its subsidiaries	101,820	241,049	7,858	273,246
LG Hausys, Ltd. and its subsidiaries	97,873	4,498	761	3,529
Others	7,367	12,374	210	4,895
Total	1,816,697	1,057,506	846,118	526,752

LG Chem, Ltd. and Subsidiaries
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(in millions of Korean won)

	2018			
	Sales and others	Purchase of raw materials /merchandises	Purchase and others	
			Acquisition of property, plant and equipment and intangible assets	Others
Entity with a significant influence over the Group				
LG Corp.	-	-	-	33,144
Associates and joint ventures				
SEETEC Co., Ltd.	11,466	57,504	124	40,520
TECWIN Co., Ltd.	-	131	2,055	160
HL Greenpower Co., Ltd.	164,654	-	-	364
Others	26	-	-	1,310
Other related parties				
LG MMA Corporation	60,519	132,692	-	3,635
SERVEONE and its subsidiaries	6,891	273,594	297,062	83,402
LG CNS Co., Ltd. and its subsidiaries	36,747	1,105	87,738	47,758
Others	-	-	-	7,746
Others				
LG Display Co., Ltd. and its subsidiaries	576,206	-	1,564	-
LG Electronics Inc. and its subsidiaries	495,524	199,196	395,763	66,755
LG International Corp. and its subsidiaries	140,827	263,955	576	186,883
LG Hausys, Ltd. and its subsidiaries	105,503	1,582	942	3,661
Others	9,124	14,148	2,216	5,495
Total	1,607,487	943,907	788,040	480,833

LG Chem, Ltd. and Subsidiaries **Notes to the Consolidated Interim Financial Statements** **June 30, 2019 and 2018 (Unaudited), and December 31, 2018**

Balances of receivables and payables arising from sales and purchases of goods and services as at June 30, 2019 and December 31, 2018, are as follows:

(in millions of Korean won)

	June 30, 2019		
	Receivables		
	Trade receivables and others	Other receivables	Total
Entity with a significant influence over the Group			
LG Corp.	-	12,793	12,793
Associates and joint ventures			
SEETEC Co., Ltd.	6,325	1,172	7,497
TECHWIN Co., Ltd.	-	-	-
HL Greenpower Co., Ltd.	106,633	-	106,633
Others	-	13	13
Other related parties			
LG MMA Corporation	10,127	673	10,800
S&I Corporation and its subsidiaries	1,928	27,948	29,876
LG CNS Co., Ltd. and its subsidiaries	11,757	31	11,788
Others	660	4,351	5,011
Others			
LG Display Co., Ltd. and its subsidiaries	240,433	9	240,442
LG Electronics Inc. and its subsidiaries	314,413	17,746	332,159
LG International Corp. and its subsidiaries	23,080	-	23,080
LG Hausys, Ltd. and its subsidiaries	40,718	40	40,758
Others	162	875	1,037
Total	756,236	65,651	821,887

(in millions of Korean won)

	June 30, 2019		
	Payables		
	Trade payables	Other payables	Total
Entity with a significant influence over the Group			
LG Corp.	-	6,682	6,682
Associates and joint ventures			
SEETEC Co., Ltd.	27,129	10,572	37,701
TECHWIN Co., Ltd.	-	1,253	1,253
HL Greenpower Co., Ltd.	-	-	-
Others	-	284	284
Other related parties			
LG MMA Corporation	36,945	116	37,061
S&I Corporation and its subsidiaries	8,988	516,926	525,914
LG CNS Co., Ltd. and its subsidiaries	19	82,095	82,114
Others	-	1,016	1,016
Others			
LG Display Co., Ltd. and its subsidiaries	133	1,048	1,181
LG Electronics Inc. and its subsidiaries	60,090	231,743	291,833
LG International Corp. and its subsidiaries	51,458	76,644	128,102
LG Hausys, Ltd. and its subsidiaries	609	2,717	3,326
Others	2,002	6,542	8,544
Total	187,373	937,638	1,125,011

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(in millions of Korean won)

	December 31, 2018		
	Receivables		
	Trade receivables and others	Other receivables	Total
Entity with a significant influence over the Group			
LG Corp.	-	11,286	11,286
Associates and joint ventures			
SEETEC Co., Ltd.	4,520	300	4,820
TECHWIN Co., Ltd.	-	-	-
HL Greenpower Co., Ltd.	89,122	-	89,122
Others	-	837	837
Other related parties			
LG MMA Corporation	12,402	610	13,012
S&I Corporation and its subsidiaries	2,859	27,949	30,808
LG CNS Co., Ltd. and its subsidiaries	13,155	108	13,263
Others	549	4,357	4,906
Others			
LG Display Co., Ltd. and its subsidiaries	182,223	1,978	184,201
LG Electronics Inc. and its subsidiaries	245,029	61,263	306,292
LG International Corp. and its subsidiaries	43,346	712	44,058
LG Hausys, Ltd. and its subsidiaries	16,005	47	16,052
Others	59	721	780
Total	609,269	110,168	719,437

(in millions of Korean won)

	December 31, 2018		
	Payables		
	Trade payables	Other payables	Total
Entity with a significant influence over the Group			
LG Corp.	-	5,102	5,102
Associates and joint ventures			
SEETEC Co., Ltd.	17,384	10,728	28,112
TECHWIN Co., Ltd.	-	871	871
HL Greenpower Co., Ltd.	-	225	225
Others	-	250	250
Other related parties			
LG MMA Corporation	19,803	-	19,803
S&I Corporation and its subsidiaries	5,044	469,309	474,353
LG CNS Co., Ltd. and its subsidiaries	162	167,494	167,656
Others	-	689	689
Others			
LG Display Co., Ltd. and its subsidiaries	14	4	18
LG Electronics Inc. and its subsidiaries	131,680	360,155	491,835
LG International Corp. and its subsidiaries	14,918	85,452	100,370
LG Hausys, Ltd. and its subsidiaries	439	2,233	2,672
Others	1,659	3,852	5,511
Total	191,103	1,106,364	1,297,467

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Fund transactions with related parties for the six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019		2018	
	Equity contributions in cash	Loan (Repayment)	Equity contributions in cash	Loan (Repayment)
Associates and joint ventures				
HUAJIN NEW ENERGY MATERIALS(QUAZHOU)CO.,LTD	27,676	-	-	-
WUXI CL New Energy Technology Ltd.	-	-	559	-
Combustion Synthesis Co., Ltd.	-	-	1,503	-
Total	27,676	-	2,062	-

Dividends received from related parties for the six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019	2018
Associates and joint ventures		
SEETEC Co., Ltd.	10,000	10,000
LG VINA Chemical Co.,Ltd.	-	810
Total	10,000	10,810

Dividends paid by the Group to related parties for the six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019	2018
Entity with a significant influence over the Group		
LG Corp.	141,205	141,205
Total	141,205	141,205

Compensation for key management of the Group for the six-month periods ended June 30, 2019 and 2018, consists of:

(in millions of Korean won)

	2019	2018
Short-term employee benefits	51,933	37,580
Post-employment benefits	3,239	2,954
Total	55,172	40,534

Key management includes directors and audit committee members having duties and responsibilities over planning, operations and controlling of the Group's business activities.

There are no provisions recognized against receivables from related parties as at June 30, 2019.

As at June 30, 2019, there is no payment guarantees provided by the Group for related parties.

LG Chem, Ltd. and Subsidiaries
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32. Cash Generated from Operations

Reconciliation between profit before income tax and cash generated from operations for the six-month periods ended June 30, 2019 and 2018, is as follows:

<i>(in millions of Korean won)</i>	2019	2018
Profit before income tax	472,527	1,297,448
Adjustments for:		
Depreciation	799,727	666,140
Amortization	61,678	52,940
Post-employment benefits	83,514	74,870
Finance income	(113,260)	(146,568)
Finance costs	222,415	185,071
Foreign exchange differences	(5,323)	(256)
Loss on valuation of inventories	(13,795)	(2,701)
Gain on disposal of property, plant and equipment	(4,493)	(3,019)
Gain on disposal of intangible assets	(160)	(2)
Loss on disposal of property, plant and equipment	26,260	17,061
Loss on disposal of intangible assets	917	77
Impairment loss on property, plant and equipment	18,484	16,385
Reversal of impairment loss on property, plant and equipment	-	(310)
Impairment loss on intangible assets	-	1,704
Additions to provisions	223,651	99,060
Other income	1,705	9,602
Increase in inventories	(401,403)	(558,770)
Increase in trade receivables	(320,915)	(548,007)
Decrease in other receivables	9,457	47,265
Decrease (increase) in other current assets	(68,726)	4,366
Increase in trade payables	337,360	30,518
Decrease in other payables	(22,040)	(373,341)
Decrease (increase) in other current liabilities	38,169	(204,929)
Decrease in net defined benefit liabilities	(6,925)	(9,374)
Decrease in provisions	(77,276)	(60,255)
Other cash flows from operations	(30,168)	(2,909)
Cash generated from operations	1,231,380	592,066

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Changes in liabilities arising from financial activities for the six-month period ended June 30, 2019, are as follows:

(in millions of Korean won)

	2019						
	At January 1, 2019	Cash flows from financing activities	Reclassifica tion of current portion	Amortization (transfer)	Lease liabilities	Exchange differences	At June 30, 2019
Short-term borrowings	1,563,153	(501,951)	172,561	-	-	(21,734)	1,212,029
Long-term borrowings	1,005,094	708,426	(172,561)	-	98,553	106,205	1,745,717
Debentures	2,752,900	2,713,579	-	8,144	-	48,069	5,522,692
Conversion rights	30,384	-	-	-	-	(12,246)	18,138
Total	5,351,531	2,920,054	-	8,144	98,553	120,294	8,498,576

The significant non-cash transactions for the six-month periods ended June 30, 2019 and 2018, are as follows:

(in millions of Korean won)

	2019	2018
Transfer of construction-in-progress	2,778,852	1,231,548
Transfer of machinery-in-transit	114,373	34,614
Reclassification of long-term borrowings into current portion	392,384	187,400

33. Segment Information

General information about the Group's reportable segments is as follows:

Segment	Products or services	Major customers
Petrochemicals ¹	ABS, PC, PE, PP, Acrylic, Alcohol, SAP, PVC, Synthetic rubber, Special resin, BPA, Ethylene, Propylene and others	LG Electronics Inc., OCI Group Co. Ltd., Mitsubishi Corp. and others
Energy solutions	Mobile batteries, Automotive batteries, Electricity storage batteries and others	Hewlett-Packard Co., General Motors Corp., and others
Advanced materials ¹	Polarizers, Automotive components, LCD Photoresist, OLED materials, Battery materials and others	LG Display Co., Ltd., Samsung Display Co., Ltd., BOE, AUO and others
Life sciences	Growth hormone, Vaccine, Antidiabetic, agricultural chemicals and others	HUADONG NINGBO, UNICEF, Intervet and others
Common and others	Crop protection products, Seeds, Fertilizers, General management, sales and R&D and others	National Agriculture Cooperative Federation and others

¹ The Group changed the name of segment from Basic materials & Chemicals business to Petrochemical business, and integrated IT & Electronic materials and Advanced materials into Advanced materials business. In addition, part of the petrochemical business was reclassified

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into the Advanced materials business sector. The information for comparative period is restated to reflect these changes.

The segment information on revenue, profit and loss for the six-month periods ended June 30, 2019 and 2018, is as follows:

<i>(in millions of Korean won)</i>	2019					
	Petro- chemicals	Energy solutions	Advanced materials	Life sciences	Common and others³	Total
Total segment revenue	7,689,925	3,659,535	2,482,072	297,484	400,571	14,529,587
Inter-segment revenue	280,587	-	405,461	3,027	23,995	713,070
Revenue from external customers ¹	7,409,338	3,659,535	2,076,611	294,457	376,576	13,816,517
Operating profit (loss) ²	777,946	(275,872)	25,422	22,714	(7,328)	542,882
<i>(in millions of Korean won)</i>	2018					
	Petro- chemicals	Energy solutions	Advanced materials	Life sciences	Common and others³	Total
Total segment revenue	8,496,484	2,738,466	2,243,062	282,066	408,610	14,168,688
Inter-segment revenue	319,384	1	241,630	1,713	517	563,245
Revenue from external customers ¹	8,177,100	2,738,465	2,001,433	280,353	408,093	13,605,443
Operating profit (loss) ²	1,259,808	29,047	49,998	22,819	(7,540)	1,354,132

¹ Revenue from external customers consists of sales of goods. Interest income and dividend income are included in finance income.

² Management assesses the performance of the operating segments based on a measurement of operating profit of segment.

³ Common and other segments include operating segments not qualifying as a reportable segment, supporting divisions as well as R&D divisions.

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The segment information on assets and liabilities as at June 30, 2019 and December 31, 2018, is as follows:

(in millions of Korean won)	June 30, 2019					
	Petro-chemicals	Energy solutions	Advanced materials	Life sciences	Common and others ³	Total
Reportable segment asset ¹	10,272,751	10,000,429	5,004,253	1,951,276	5,206,838	32,435,547
Investments in associates and joint ventures	5,570	23,830	53,849	17	212,059	295,325
Reportable segment liability ¹	3,364,974	4,864,653	1,273,617	219,978	5,433,470	15,156,692

(in millions of Korean won)	December 31, 2018					
	Petro-chemicals	Energy solutions	Advanced materials	Life sciences	Common and others ³	Total
Reportable segment asset ¹	9,376,933	8,110,146	4,743,639	1,873,916	4,839,503	28,944,137
Investments in associates and joint ventures	5,208	20,853	26,120	17	213,924	266,122
Reportable segment liability ¹	3,018,476	4,243,999	1,121,732	194,420	3,043,382	11,622,009

¹ Assets and liabilities are measured in a manner consistent with those in the financial statements, and allocated on the basis of segment operation.

The external sales and non-current assets by geographical segments from continuing operations for the six-month periods ended June 30, 2019 and 2018, and as at June 30, 2019 and December 31, 2018, are as follows:

(in millions of Korean won)	Sales		Non-current assets ¹	
	2019	2018	June 30, 2019	December 31, 2018
Korea ²	4,257,591	4,429,468	12,505,270	11,678,654
China	4,563,802	4,464,091	3,188,783	2,542,444
Asia	1,787,619	2,394,528	60,085	45,648
America	893,302	784,228	559,996	533,924
Europe	2,090,876	1,355,101	1,679,668	1,045,716
Others	223,327	178,027	-	-
Total	13,816,517	13,605,443	17,993,802	15,846,386

¹ Represents aggregate amount of property, plant and equipment, intangible assets and investment properties.

² Domestic sales include the exports made through local letters of credit.

There is no single external customer contributes over 10% of the Group's revenue for the six-month periods ended June 30, 2019 and 2018.

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34. Business Combination

On October 1, 2018, the Group acquired 100% shares of Uniseal, Inc., which manufactures automotive adhesive. As a result of the business combination, the Group expects increase in sales through market diversification.

Goodwill arising from the business combination is attributable to the acquired customer base and sales increase expected from combining the operations of the Parent Group and Uniseal, Inc. The Group recognized a goodwill amounting to ₩64,851 million for the related business combination in the prior year. In 2019, certain intangible assets and goodwill have been subsequently adjusted to reflect the final result of purchase price allocation. In this regard, the Group's prior year financial statement has been partially amended with no effect on total equity.

The following table summarizes the consideration paid for Uniseal, Inc., the fair value of assets acquired and liabilities assumed at the acquisition date:

<i>(in millions of Korean won)</i>	Amount
Consideration	
Cash and cash equivalents	143,327
Total consideration	143,327
Recognized amounts of identifiable assets acquired and liabilities assumed ¹	
Cash and cash equivalents	456
Trade and other receivables ²	9,082
Inventories	5,594
Property, plant and equipment	22,475
Intangible assets	51,829
Trade and other payables	(4,932)
Other payables	(183)
Deferred tax liabilities	(14,399)
Fair value of identifiable net assets	69,922
Goodwill	73,405
Total	143,327

¹ For goodwill at December 31, 2018, the results of the purchase price allocation for the recognition of identifiable assets acquired and liabilities assumed was incomplete. The allocation has been completed during the six-month period ended June 30, 2019.

² The fair value of trade and other receivables equals to the gross contractual amounts.

The contingent consideration arrangement requires the Group to pay in cash the former owners of Uniseal, Inc. if the revenue during the year ended August 31, 2019, exceeds \$60 million.

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On October 1, 2018, the Group acquired 100% shares of Ugimag Korea Co., Ltd, which manufactures parts of electronic products and automobiles. As a result of the business combination, the Group expects sales growth increase through enlarging materials business.

Goodwill of W11,615 million arising from the business combination is attributable to the acquired customer base and expected sales growth combining the operations of the Parent Group and Ugimag Korea Co., Ltd.

The following table summarizes the consideration paid for Ugimag Korea Co., Ltd, the fair value of assets acquired and liabilities assumed at the acquisition date:

<i>(in millions of Korean won)</i>	Amount
Consideration	
Cash and cash equivalents	23,020
Total consideration	23,020
Recognized amounts of identifiable assets acquired and liabilities assumed ¹	
Cash and cash equivalents	359
Trade and other receivables ¹	7,576
Prepaid income tax	1
Inventories	4,403
Property, plant and equipment	29,640
Intangible assets	4
Trade and other payables	(4,100)
Borrowings	(23,908)
Other liabilities	(2,570)
Fair value of identifiable net assets	11,405
Goodwill	11,615
Total	23,020

¹ The fair value of trade and other receivables equals to the gross contractual amounts.

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35. Assets Held for sale

The Group decided to dispose of Electrolyte business, 2CCL business and others with the approval of management in February 2016 and January 2017, respectively. The related assets were reclassified as assets held for sale, and the disposal is expected to be completed in 2019. Research Institute, which was acquired during the course of the business combination of FarmHannong Co., Ltd., are also included. The assets and liabilities of Electrolyte business was completely disposed during this period, and the assets and liabilities of 2CCL business and others are expected to be disposed in 2019.

Details of assets and liabilities of disposal group classified as held for sale as at June 30, 2019 and December 31, 2018, are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019	December 31, 2018
Assets of disposal group		
Property, plant and equipment	7,881	2,406
Intangible assets	358	358
Total	8,239	2,764

Assets of the disposal group were measured at fair value immediately before the initial classification of the assets as held for sale and there are no the related other non-operating expenses for the six-month periods ended June 30, 2019 and 2018.

36. Assets and Liabilities related to Contracts with Customers

Assets and liabilities related to contracts with customers as at June 30, 2019 and December 31, 2018 are as follows:

<i>(in millions of Korean won)</i>	June 30, 2019	December 31, 2018
Contract assets		
Total contract assets	6,072	4,323
Contract liabilities		
Advances in relation to revenue from the Group's main business activities	103,277	47,265
Expected services to be transferred	46,997	34,823
Expected customer incentives	4,946	10,530
Unearned revenue	23,292	16,781
Expected refunds	12,166	9,139
Total contract liabilities	190,678	118,538

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Revenue recognized in relation to contract liabilities

The following table shows how much of the revenue recognized in the current reporting period relates to carried-forward contract liabilities and how much relates to performance obligations that were satisfied in a prior year.

(in millions of Korean won)

June 30, 2019

Revenue recognized in the current year from the contract liability balance at the beginning of the year	4,873
Unearned revenue	1,838
Expected services to be transferred	3,035
Revenue recognized from performance obligations satisfied in previous periods	-