Doosan Infracore Co., Ltd. and Subsidiaries

Consolidated Financial Statements
December 31, 2018 and 2017

Doosan Infracore Co., Ltd. and Subsidiaries
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December 31, 2018 and 2017

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Independent Auditor's Report

(English Translation of a Report Originally Issued in Korean)

To the Board of Directors and Shareholders of
Doosan Infracore Co., Ltd.

Opinion

We have audited the accompanying consolidated financial statements of Doosan Infracore Co., Ltd. and its subsidiaries (collectively referred to as the "Group"), which comprise the consolidated statements of financial position as at December 31, 2018 and 2017, and the consolidated statements of profit or loss, and the consolidated statements of comprehensive income, and consolidated statements of changes in equity and consolidated statements of cash flows for the years then ended, and notes to the consolidated financial statements, including a summary of significant accounting policies.

In our opinion, the accompanying consolidated financial statements present fairly, in all material respects, the consolidated financial position of the Group as at December 31, 2018 and 2017, and its consolidated financial performance and its consolidated cash flows for the years then ended in accordance with International Financial Reporting Standards as adopted by the Republic of Korea (Korean IFRS).

Basis for Opinion

We conducted our audits in accordance with Korean Standards on Auditing. Our responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Consolidated Financial Statements* section of our report. We are independent of the Group in accordance with the ethical requirements of the Republic of Korea that are relevant to our audit of the consolidated financial statements and we have fulfilled our other ethical responsibilities in accordance with the ethical requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Key Audit Matters

Key audit matters are those matters that, in our professional judgment, were of most significance in our audit of the consolidated financial statements of the current period. These matters were addressed in the context of our audit of the consolidated financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on these matters.

(1) Revenue recognition – Estimation of liabilities related to revenue deductions

Why it is determined to be a key audit matter
As at December 31, 2018, the Group has recorded ₩ 195,625 million of liabilities related to revenue deductions, including incentives, promotions and rebates. The Group offers customers a variety of incentive and promotion programs. Costs incurred in connection with these programs are recognized as deductions from revenue, and any unsettled amounts are recognized on an accrual basis. Incentive and rebate arrangements are complex, and judgement of management is required in estimating unsettled amounts. Given the extent of complexity and judgement involved, we consider estimation of revenue deductions related to incentives, promotions and rebates recognized as at December 31, 2018 to be a key audit matter (Note 3).

How our audit addressed the key audit matter
We have, utilizing the work of component auditors, performed related audit procedures including the followings. We:

- Assessed appropriateness of the Group's accounting policies for the incentive and promotion programs
- Evaluated design and tested operating effectiveness of related internal controls
- Performed lookback analysis by comparing the estimation of prior year to actual results
- Evaluated appropriateness of methods used by management and whether they have been consistently used
- Tested completeness of sales quantity information subject to revenue deductions programs
- For selected samples, tested accuracy of the inputs and variables used for the management estimates, including sales quantity information, costs incurred, and associated contractual rate

(2) Impairment assessment of goodwill

Why it is determined to be a key audit matter
As at December 31, 2018, the carrying amount of goodwill is ₩ 2,920,112, million, which accounts for 26.5% of the total assets of the Group. The Group performed an impairment assessment on goodwill by using estimated recoverable amount of goodwill allocated to the cash-generating units group (CGU group) and did not recognize goodwill impairment as the recoverable amount of CGU group exceeds its carrying amount. Given the magnitude of goodwill balance in the consolidated financial statement, and the extent of judgement of management estimating in the recoverable amount, we consider impairment assessment of goodwill to be a key audit matter (Note 13).

How our audit addressed the key audit matter
Key audit procedures we have performed in relation to the goodwill impairment assessment are as follows. We:

- Obtained an understanding and evaluated how management assessed goodwill impairment
- Evaluated reasonableness of identifying CGU by management for its assessment of goodwill impairment
- Evaluated accuracy of the market capitalization used to measure the net fair value of the CGU group and examined subsequent changes in the market capitalization after the reporting period
- Evaluated reasonableness of key assumptions used in measurement of the net fair value by comparing them with relevant external information available

(3) Impairment assessment of capitalized development costs

Why it is determined to be a key audit matter
As at December 31, 2018, the carrying amount of development costs capitalized as intangible asset is ₩ 233,055 million. The Group operates several R&D centers in Korea, the United States, Europe and other regions, and invests significant amounts to develop new products and technologies. Given the magnitude of the balance of development costs capitalized in the consolidated financial statement, and the extent of judgement of management required, we consider impairment assessment of capitalized development costs to be a key audit matter (Note 13).

How our audit addressed the key audit matter
Key audit procedures we have performed in relation to the impairment assessment of capitalized development costs. We:

- Obtained the details of capitalized development costs and reconciled the total amount to the amount recorded in the general ledger
- Tested development costs capitalized by examining management's assessment documentation and assessing whether the criteria set out in the relevant accounting standards have been met on a sampling basis
- Obtained an understanding and evaluated the development progress and prospect of the

- projects selected as a sample by interviewing with appropriate project manager and performing other procedures, and assessed appropriateness of management's conclusion on impairment analysis
- Examined whether the actual sales have been generated from the projects selected and evaluated reasonableness of sales and profitability forecasts to assess future economic benefits of the projects capitalized

(4) Evaluation of provision for warranty

The reason it was determined to be a Key Audit Matter
As at December 31, 2018, the carrying amount of provision for warranty amounts to ₩ 197,492 million. The Group provides product warranties for certain periods after sales of products and recognizes provision for warranty by estimating expected repair expenses. The performance obligation of warranty is determined based on diverse assumptions such as warranty periods, expected warranty expenses and the nature, extent of the warranties the Group provides. We drew attention to the adequacy of the warranty evaluation considering the fact that the management's estimation is intervened in measuring the provision for warranty (Note 18).

How the matter was addressed in the audit
We performed the following audit procedures in relation to the evaluation of provision for warranty of the Group. We:

- Obtained understanding of accounting policies in recognizing provision for warranty, and understood and evaluated the relevant internal control
- Verified the accuracy of basic information for accounting estimation used by the management
- Compared reasons for the major assumptions, that management used for estimating the relevant liabilities, with the past performance
- Independently recalculated the balance of liabilities as at December 31, 2018

Other Matter

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

Responsibilities of Management and Those Charged with Governance for the Consolidated Financial Statements

Management is responsible for the preparation and fair presentation of the consolidated financial statements in accordance with Korean IFRS, and for such internal control as management determines is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, management is responsible for assessing the Group's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Group or to cease operations.

Those charged with governance are responsible for overseeing the Group's financial reporting process.

Auditor's Responsibilities for the Audit of the Consolidated Financial Statements

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Korean Standards on Auditing will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements.

As part of an audit in accordance with Korean Standards on Auditing, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the consolidated financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

We also provide those charged with governance with a statement that we have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, related safeguards.

From the matters communicated with those charged with governance, we determine those matters that were of most significance in the audit of the consolidated financial statements of the current period and are therefore the key audit matters. We describe these matters in our auditor's report unless law or regulation precludes public disclosure about the matter or when, in extremely rare circumstances, we determine that a matter should not be communicated in our report because the adverse consequences of doing so would reasonably be expected to outweigh the public interest benefits of such communication.

The engagement partner on the audit resulting in this independent auditor's report is Hee-Young Park, Certified Public Accountant.

Samil PricewaterhouseCoopers

Seoul, Korea
March 19, 2019

This report is effective as of March 19, 2019, the audit report date. Certain subsequent events or circumstances, which may occur between the audit report date and the time of reading this report, could have a material impact on the accompanying consolidated financial statements and notes thereto. Accordingly, the readers of the audit report should understand that there is a possibility that the above audit report may have to be revised to reflect the impact of such subsequent events or circumstances, if any.

Doosan Infracore Co., Ltd. and Subsidiaries
Consolidated Statements of Financial Position
December 31, 2018 and 2017

(in Korean won)	Notes		2018		2017
Assets					
Current assets					
Cash and cash equivalents	2,4,10,35	₩	1,053,016,029,210	₩	943,481,141,254
Short-term financial instruments	2,4,5,10		261,439,186,727		160,166,932,394
Short-term investment securities	2,4,6,10		14,288,402,916		34,182,400,175
Trade and other receivables	2,3,4,7,10,32,34		1,353,418,884,045		1,197,046,622,163
Derivative assets	2,4,9,10		8,956,727,423		1,868,202,287
Inventories	2,8		1,524,363,766,335		1,254,963,515,735
Other current assets			211,338,773,310		175,725,123,533
			4,426,821,769,966		3,767,433,937,541
Non-current assets					
Long-term financial instruments	2,4,5,10		848,391,912		10,500,000
Long-term investment securities	2,4,6,10		99,008,790,522		93,687,457,663
Long-term trade and other receivables	2,3,4,7,10,34		10,891,458,308		16,150,386,229
Non-current Derivative financial assets	2,4,9,10		7,996,253,597		4,387,862,259
Investments in subsidiaries and associates	2,11,32,34		67,912,129,252		91,838,684,125
Property, plant and equipment	2,3,12,33		1,782,632,844,011		1,786,904,298,672
Intangible assets	2,3,13		4,328,656,381,720		4,169,281,753,860
Investment properties	2,14		26,308,106,687		20,609,998,094
Deferred tax assets	2,29		205,848,185,403		251,122,643,405
Other non-current assets	10		72,242,380,666		74,662,610,602
			6,602,344,922,078		6,508,656,194,909
Total assets		₩	11,029,166,692,044	₩	10,276,090,132,450
Liabilities					
Current liabilities					
Trade and other payables	4,10,15,32,34	₩	1,613,823,764,093	₩	1,281,736,493,268
Short-term borrowings	2,4,10,16,32,33		937,599,855,700		1,409,287,187,360
Current portion of bonds	4,10,16,32		505,338,874,285		474,641,545,632
Current portion of long-term borrowings	2,4,10,16,32,33		173,048,137,404		96,310,179,828
Current tax liabilities	2,4,9,10		25,849,607,446		32,398,041,440
Derivative liabilities	2,4,9,10		12,301,480,333		4,026,802,750
Provisions	2,3,18		179,066,431,365		167,059,619,793
Other current liabilities	10		331,546,013,747		230,185,572,715
			3,778,574,164,373		3,695,645,442,786
Non-current liabilities					
Non-current other payables	4,10,15		1,156,747,007		1,218,603,784
Bonds	4,10,16,32		944,061,136,540		1,154,956,082,362
Long-term borrowings	2,4,10,16,32,33		1,708,761,427,603		1,513,805,807,222
Net defined benefit liabilities	2,17		406,106,460,314		451,858,134,854
Non-current derivative liabilities	2,4,9,10		4,127,632,054		41,708,762,306
Deferred tax liabilities	29		204,364,376,024		93,587,876,395
Non-current provisions			20,377,900,315		9,584,045,726
Other non-current liabilities			140,821,964,241		140,563,747,861
			3,429,777,644,098		3,407,283,060,510
Total liabilities			7,208,351,808,471		7,102,928,503,296
Equity					
Share capital	1,19		1,040,790,385,000		1,040,000,595,000
Capital surplus	19		213,014,383,085		211,545,565,029
Other components of equity	20		(129,310,962,134)		(108,457,073,777)
Accumulated other comprehensive income	6,9,10,11,12,21		(256,805,144,728)		(334,050,917,882)
Retained earnings	22		1,049,189,116,801		784,702,285,730
Equity attributable to owners of the Parent Company			1,916,877,778,024		1,593,740,454,100
Non-controlling interest			1,903,937,105,549		1,579,421,175,054
Total equity			3,820,814,883,573		3,173,161,629,154
Total liabilities and equity		₩	11,029,166,692,044	₩	10,276,090,132,450

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

Doosan Infracore Co., Ltd. and Subsidiaries
Consolidated Statements of Profit or Loss
Years Ended December 31, 2018 and 2017

(in Korean won)	Notes		2018		2017
Revenue	2,23,24,34	₩	7,730,107,942,853	₩	6,567,897,225,498
Cost of sales	2,8,12,13,17,25,34		(5,936,246,301,169)		(5,024,999,368,311)
Gross profit			1,793,861,641,684		1,542,897,857,187
Selling and administrative expenses	7,12,13,14,17,25,26		(945,734,195,514)		(882,128,558,541)
Operating profit			848,127,446,170		660,769,298,646
Finance income	9,10,27		104,252,463,898		296,665,608,495
Finance costs	9,10,27		(303,338,799,287)		(455,734,726,941)
Other non-operating income	10,28		36,084,086,449		64,152,908,525
Other non-operating expenses	7,10,28		(63,697,135,116)		(72,931,806,741)
Loss on disposal of investment in subsidiaries and associates	11		(5,001,734,320)		(3,294,696,326)
Profit before income tax			616,426,327,794		489,626,585,658
Income tax expense	2,29		(222,256,598,381)		(192,983,826,788)
Profit for the year		₩	394,169,729,413	₩	296,642,758,870
Profit is attributable to:					
Owners of the Parent Company		₩	246,409,919,128	₩	148,594,494,986
Non-controlling interests			147,759,810,285		148,048,263,884
Earnings per share attributable to the equity holders the Parent Company	2,30				
Basic earnings per share		₩	1,184	₩	627
Diluted earnings per share			1,115		620

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

Doosan Infracore Co., Ltd. and Subsidiaries
Consolidated Statements of Comprehensive Income
Years Ended December 31, 2018 and 2017

(in Korean won)		2018		2017
Profit for the year	₩	394,169,729,413	₩	296,642,758,870
Other comprehensive income				
Items that will not be reclassified to profit or loss				
Remeasurements of net defined benefit liability		37,545,492,014		(6,717,591,709)
Revaluation reserves of property, plant and equipment		3,000,935,957		34,547,697,525
Gain on valuation of equity instruments at fair value through other comprehensive income		311,745,173		-
Share of other comprehensive income of associates		-		397,099,884
Share of retained earnings of associates		(109,506,066)		(71,846,321)
Items that may be subsequently reclassified to profit or loss				
Changes in the fair value of available-for-sale financial assets		-		(4,403,370,796)
Exchange differences		129,649,536,168		(157,850,633,039)
Cash flow hedges		2,510,805,778		(5,400,168,266)
Other comprehensive income for the year, net of tax		172,909,009,024		(139,498,812,722)
Total comprehensive income for the year	₩	567,078,738,437	₩	157,143,946,148
Total comprehensive income for the year is attributable to:				
Owners of the Parent Company		342,631,656,647		70,873,060,791
Non-controlling interest		224,447,081,790		86,270,885,357
	₩	567,078,738,437	₩	157,143,946,148

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

Doosan Infracore Co., Ltd. and Subsidiaries
Consolidated Statements of Changes in Equity
Years Ended December 31, 2018 and 2017

(in Korean won)

	Attributable to owners of the Parent Company								
	Share capital	Capital surplus	Hybrid capital Instrument	Other Components of Equity	Accumulated Other Comprehensive income	Retained Earnings	Total	Non-controlling Interest	Total Equity
Balance at January 1, 2017	₩ 1,037,276,570,000	₩ 249,488,144,851	₩ 508,259,603,649	₩ (42,440,546,020)	₩ (270,371,100,895)	₩ 578,245,971,895	₩ 2,060,458,643,480	₩ 1,387,918,098,648	₩ 3,448,376,742,128
Total comprehensive income									
Profit for the year	-	-	-	-	-	148,594,494,986	148,594,494,986	148,048,263,884	296,642,758,870
Remeasurement of net defined benefit liabilities	-	-	-	-	-	(5,908,110,490)	(5,908,110,490)	(809,481,219)	(6,717,591,709)
Revaluation reserves of property, plant and equipment	-	-	-	-	33,549,343,476	34,930	33,549,378,406	998,319,119	34,547,697,525
Changes in the fair value of available-for-sale financial assets	-	-	-	-	(4,403,370,796)	-	(4,403,370,796)	-	(4,403,370,796)
Share of other comprehensive income of associates	-	-	-	-	368,821,194	-	368,821,194	28,278,690	397,099,884
Share of retained earnings of associates	-	-	-	-	-	(64,025,578)	(64,025,578)	(7,820,743)	(71,846,321)
Exchange differences	-	-	-	-	(96,515,360,869)	-	(96,515,360,869)	(61,335,272,170)	(157,850,633,039)
Cash flow hedges	-	-	-	-	(4,748,766,062)	-	(4,748,766,062)	(651,402,204)	(5,400,168,266)
Total comprehensive income for the year	-	-	-	-	(71,749,333,057)	142,622,393,848	70,873,060,791	86,270,885,357	157,143,946,148
Transactions with owners									
Cancellation of share options	-	1,053,454,693	-	(1,053,454,693)	-	-	-	-	-
Transfer of capital surplus	-	(82,200,482,487)	-	-	-	82,200,482,487	-	-	-
Issuance of bonds with warrants	-	41,976,882,023	-	-	-	-	41,976,882,023	-	41,976,882,023
Exercise of stock warrants	2,724,025,000	1,227,565,949	-	-	-	-	3,951,590,949	-	3,951,590,949
Dividends paid for hybrid capital securities	-	-	-	-	-	(18,366,562,500)	(18,366,562,500)	-	(18,366,562,500)
Dividend of subsidiary	-	-	-	-	-	-	-	(28,541,041,200)	(28,541,041,200)
Repayment of hybrid capital securities	-	-	(508,259,603,649)	(58,904,993,351)	-	-	(567,164,597,000)	-	(567,164,597,000)
Disposal of subsidiary shares	-	-	-	(6,058,079,713)	8,069,516,070	-	2,011,436,357	133,773,232,249	135,784,668,606
Total transactions with owners	2,724,025,000	(37,942,579,822)	(508,259,603,649)	(66,016,527,757)	8,069,516,070	63,833,919,987	(537,591,250,171)	105,232,191,049	(432,359,059,122)
Balance at December 31, 2017	₩ 1,040,000,595,000	₩ 211,545,565,029	₩ -	₩ (108,457,073,777)	₩ (334,050,917,882)	₩ 784,702,285,730	₩ 1,593,740,454,100	₩ 1,579,421,175,054	₩ 3,173,161,629,154

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

Doosan Infracore Co., Ltd. and Subsidiaries
Consolidated Statements of Changes in Equity
Years Ended December 31, 2018 and 2017

(in Korean won)

	Attributable to owners of the Parent Company								
	Share capital	Capital surplus	Hybrid capital Instrument	Other Components of Equity	Accumulated Other Comprehensive income	Retained Earnings	Total	Non-controlling Interest	Total Equity
Balance at January 1, 2018	₩ 1,040,000,595,000	₩ 211,545,565,029	₩ -	₩ (108,457,073,777)	₩ (334,050,917,882)	₩ 784,702,285,730	₩ 1,593,740,454,100	₩ 1,579,421,175,054	₩ 3,173,161,629,154
Changes in accounting policy	-	-	-	-	-	(899,052,422)	(899,052,422)	(372,370,064)	(1,271,422,486)
Balance after changes	1,040,000,595,000	211,545,565,029	-	(108,457,073,777)	(334,050,917,882)	783,803,233,308	1,592,841,401,678	1,579,048,804,990	3,171,890,206,668
Total comprehensive income									
Profit for the year	-	-	-	-	-	246,409,919,128	246,409,919,128	147,759,810,285	394,169,729,413
Remeasurement of net defined benefit liabilities	-	-	-	-	-	13,693,307,289	13,693,307,289	23,852,184,725	37,545,492,014
Revaluation reserves of property, plant and equipment	-	-	-	-	(2,371,378,063)	5,372,314,020	3,000,935,957	-	3,000,935,957
Gain on valuation of financial assets at fair value through other comprehensive income	-	-	-	-	296,376,151	15,369,022	311,745,173	-	311,745,173
Share of retained earnings of associates	-	-	-	-	-	(105,025,966)	(105,025,966)	(4,480,100)	(109,506,066)
Exchange differences	-	-	-	-	79,549,916,777	-	79,549,916,777	50,099,619,391	129,649,536,168
Cash flow hedges	-	-	-	-	(229,141,711)	-	(229,141,711)	2,739,947,489	2,510,805,778
Total comprehensive income for the year	-	-	-	-	77,245,773,154	265,385,883,493	342,631,656,647	224,447,081,790	567,078,738,437
Transactions with owners									
Cancellation of share options	-	1,117,895,000		(1,117,895,000)	-	-	-	-	-
Exercise of stock warrants	789,790,000	350,923,056	-	-	-	-	1,140,713,056	-	1,140,713,056
Dividend of subsidiary	-	-	-	-	-	-	-	(53,727,499,200)	(53,727,499,200)
Disposal of subsidiary shares	-	-		(19,735,993,357)	-	-	(19,735,993,357)	154,168,717,969	134,432,724,612
Total transactions with owners	789,790,000	1,468,818,056	-	(20,853,888,357)	-	-	(18,595,280,301)	100,441,218,769	81,845,938,468
Balance at December 31, 2018	₩ 1,040,790,385,000	₩ 213,014,383,085	₩ -	₩ (129,310,962,134)	₩ (256,805,144,728)	₩ 1,049,189,116,801	₩ 1,916,877,778,024	₩ 1,903,937,105,549	₩ 3,820,814,883,573

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

Doosan Infracore Co., Ltd. and Subsidiaries
Consolidated Statements of Cash Flows
Years Ended December 31, 2018 and 2017

(in Korean won)	Notes		2018		2017
Cash flows from operating activities					
Cash generated from operations	35	₩	1,043,288,274,293	₩	896,739,191,660
Profit for the year			394,169,729,413		296,642,758,870
Adjustments			731,167,416,259		683,827,770,950
Changes in operating assets and liabilities			(82,048,871,379)		(83,731,338,160)
Interest received			15,117,484,431		11,127,322,178
Interest paid			(166,701,900,364)		(185,853,970,400)
Dividends received			4,265,837,456		2,108,514,977
Income taxes paid			(58,191,953,508)		(58,429,689,782)
Net cash inflow from operating activities			837,777,742,308		665,691,368,633
Cash flows from investing activities					
Decrease in short-term financial instruments			22,809,378,447		25,050,508,204
Disposal of long-term investment securities			229,129,080		3,388,601,075
Decrease in loans			525,036,293		-
Disposal of property, plant and equipment, and investment properties			25,288,647,854		41,292,473,602
Disposal of intangible assets			242,643,718		1,226,414,034
Disposal of investments in associates			36,424,000,000		-
Increase in short-term financial instruments			(101,272,254,333)		(12,141,264,000)
Acquisition of long-term investment securities			(3,393,765,000)		(3,510,363,900)
Increase in loans			(393,666,636)		(168,851,490)
Acquisition of property, plant and equipment			(150,822,172,341)		(134,197,987,710)
Acquisition of intangible assets			(109,604,453,424)		(77,460,993,080)
Acquisition of investments in associates and joint ventures			(18,059,850,000)		(65,864,874,081)
Others			(14,820,807,038)		(33,902,408,352)
Net cash outflow from investing activities			(312,848,133,380)		(256,288,745,698)
Cash flows from financing activities					
Proceeds from borrowings			637,834,889,738		1,380,727,776,826
Proceeds from issuance of bonds			283,474,563,443		1,015,382,768,080
Change in subsidiary equity			140,764,800,002		133,721,600,000
Repayment of borrowings			(909,251,648,286)		(1,115,135,547,875)
Repayment of bonds			(521,653,462,500)		(765,000,000,000)
Dividends paid			(53,727,499,200)		(46,907,603,700)
Exercise of call options from hybrid capital securities			-		(570,521,500,000)
Net cash inflow(outflow) from financing activities			(422,558,356,803)		32,267,493,331
Effects of exchange rate changes on cash and cash equivalents			7,163,635,831		(36,766,746,091)
Net increase in cash and cash equivalents			109,534,887,956		404,903,370,175
Cash and cash equivalents at the beginning of the financial year			943,481,141,254		538,577,771,079
Cash and cash equivalents at the end of the year		₩	1,053,016,029,210	₩	943,481,141,254

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

1. General Information

(1) The Parent Company

Doosan Infracore Co., Ltd. (the Parent Company) was incorporated on October 23, 2000, through a spin-off from Daewoo Heavy Industries Ltd. (“DHI”) under the corporate restructuring agreement dated January 20, 2000, between DHI and its creditors, and approved by DHI’s shareholders on June 27, 2000. The Parent Company operates and manages manufacturing and selling businesses of industrial machinery and equipment.

The spin-off of the Parent Company was done by acquiring assets and assuming liabilities of machinery business sector of DHI as at September 30, 2000, amounting to ₩ 2,494 billion and ₩ 2,806 billion, respectively. Accordingly, DHI’s shareholders became shareholders of the Parent Company, the newly established company

On February 2, 2001, the Parent Company listed its stock on the Korea Exchange, and changed its name to Doosan Infracore Co., Ltd. from Daewoo Heavy Industries & Machinery Ltd. on April 29, 2005. The Parent Company’s common stock as at December 31, 2018, amount to ₩ 1,040,790 million, of which 36.28% is owned by Doosan Heavy Industries and Construction Co., Ltd.

(2) Consolidated Subsidiaries

1) The Parent Company’s consolidated subsidiaries as at December 31, 2018 and 2017, are as follows:

Subsidiary	Main business	Location	Ownership interest held by the Group[1] (%) 2018	2017	Ownership interest held by non-controlling interests[1] (%) 2018	2017	Fiscal year end
Doosan Infracore China Co., Ltd.	Manufacturing and Sales	China	80.00	80.00	20.00	20.00	December 31
Doosan Infracore (China) Investment Co., Ltd.	Holdings	China	100.00	100.00	-	-	December 31
Doosan Infracore North America LLC.	Sales	USA	100.00	100.00	-	-	December 31
Doosan Infracore Japan Corp.	Purchases	Japan	100.00	100.00	-	-	December 31
Doosan (China) Financial Leasing Corp.	Finance	China	100.00	100.00	7.80	7.80	December 31
Doosan Bobcat Chile S.A.	Sales	Chile	100.00	100.00	-	-	December 31
Doosan Infracore (Shandong) Co., Ltd.	Manufacturing and Sales	China	100.00	100.00	13.00	13.00	December 31
Doosan Infracore Norway AS.	Manufacturing and Sales	Norway	100.00	100.00	-	-	December 31
Doosan Infracore South America Industria E Comercio De Maquinas De Construcao LTDA	Sales	Brazil	99.99	99.99	0.01	0.01	December 31
Doosan Infracore Construction Equipment India Private Ltd.	Sales	India	100.00	100.00	-	-	March 31
Doosan Bobcat Co., Ltd.	Holdings	Korea	51.05	55.34	48.95	44.66	December 31
Doosan Bobcat Singapore Pte. Ltd.[5]	Holdings	Singapore	100.00	100.00	48.95	44.66	December 31
Doosan Bobcat Korea Co., Ltd.[5]	Sales	Korea	100.00	100.00	48.95	44.66	December 31
Doosan Bobcat Chile Compact SpA	Sales	Chile	100.00	100.00	48.95	44.66	December 31
Doosan Bobcat India Private Ltd.[5]	Manufacturing and Sales	India	100.00	100.00	48.95	44.66	March 31
Bobcat Corp.	Sales	Japan	100.00	100.00	48.95	44.66	December 31
Doosan Bobcat Mexico S.A. de C.V.[5]	Other Service	Mexico	100.00	100.00	48.95	44.66	December 31
Doosan Bobcat China Co., Ltd.	Manufacturing and Sales	China	100.00	100.00	48.95	44.66	December 31

Clark Equipment Co.	Manufacturing and Sales	USA	100.00	100.00	48.95	44.66	December 31
Bobcat Equipment Ltd.	Sales	Canada	100.00	100.00	48.95	44.66	December 31
Doosan International Australia Pty Ltd.	Sales	Australia	100.00	100.00	48.95	44.66	December 31
Doosan Infracore Europe S.A.	Sales	Belgium	100.00	100.00	48.95	44.66	December 31
Bobcat Bensheim GmbH.	Sales	Germany	100.00	100.00	48.95	44.66	December 31
Doosan Holdings France S.A.S. [2]	Holdings	France	100.00	100.00	48.95	44.66	December 31
Doosan Techno Holding Co., Ltd.	Management	Ireland	100.00	100.00	48.95	44.66	December 31
Doosan Benelux SA.	Sales	Belgium	100.00	100.00	48.95	44.66	December 31
Doosan Infracore Europe B.V. [5]	Sales	Netherlands	100.00	100.00	-	-	December 31
CJSC Doosan International Russia	Sales	Russia	100.00	100.00	48.95	44.66	December 31
Doosan International UK Ltd.	Sales	England	100.00	100.00	48.95	44.66	December 31
Doosan International South Africa Pty Ltd.	Sales	South Africa	100.00	100.00	48.95	44.66	December 31
Doosan Bobcat EMEA s.r.o. [3,4]	Manufacturing	Czech	100.00	100.00	48.95	44.66	December 31
Bobcat France S.A.	Manufacturing	France	100.00	100.00	48.95	44.66	December 31
Geith International Ltd.	Sales	Ireland	100.00	100.00	48.95	44.66	December 31
Doosan International Luxemburg S.a.r.l.	Management	Luxemburg	100.00	100.00	48.95	44.66	December 31

[1] The ‘ownership interest held by the Group’ refers to the simply aggregated portion of ownership interests directly held by the Parent Company and its subsidiaries. On the other hand, the ‘ownership interests held by non-controlling interests’, which do not belong to the Group directly nor indirectly, refers to the effective portion calculated by subtracting ‘ownership interest held by the Group’ from 100%. Accordingly, there may be a discrepancy between the calculated portion of ‘ownership interests held by non-controlling interests’ and the aggregated ratio of ownership in a certain subsidiary held by each entity in the Group.

[2] For the year ended December 31, 2018, Doosan Infracore Bobcat Ireland Ltd., and Doosan International Italia S.r.L were liquidated, and Bobcat Lyon SAS was merged into Doosan Holding France S.A.S.

[3] For the year ended December 31, 2017, Doosan Trading Ltd. was merged into Doosan Holdings Europe Ltd., and for the year ended December 31, 2018, Doosan Holdings Europe Ltd. was merged into Doosan Bobcat EMEA s.r.o.

[4] For the year ended December 31, 2017, Doosan Bobcat Engineering s.r.o. was merged into Doosan Bobcat EMEA s.r.o.

[5] For the year ended December 31, 2017, the company names have changed from Doosan International South East Asia Pte. Ltd. to Doosan Bobcat Singapore Pte. Ltd., from Doosan Infracore India Private Ltd. to Doosan Bobcat India Private Ltd., from Doosan Infracore Bobcat Korea Co., Ltd. to Doosan Bobcat Korea Co., Ltd., from Doosan International Mexico S.A. de C.V. to Doosan Bobcat Mexico S.A. de C.V., and from Doosan Infracore Customization Center Europe B.V. to Doosan Infracore Europe B.V, respectively.

2) Summarized financial information for major consolidated subsidiaries as at and for the year ended December 31, 2018 is as follows:

(in millions of Korean won)	Assets	Liabilities	Sales	Profit for the year	Total comprehensive income
Doosan Infracore China Co., Ltd.	₩ 1,263,506	₩ 810,343	₩ 1,349,404	₩ 136,878	₩ 136,878
Doosan Infracore (China) Investment Co., Ltd.	216,075	5,885	11,022	2,830	2,830
Doosan Infracore North America LLC	283,852	218,800	259,405	3,460	3,040
Doosan (China) Financial Leasing Corp.	678,155	506,497	47,188	7,374	7,374

(in millions of Korean won)

	Assets	Liabilities	Sales	Profit for the year	Total comprehensive income
Doosan Infracore Europe B.V.	281,619	275,760	501,261	6,093	6,127
Doosan Bobcat Inc. and its subsidiaries	6,446,324	2,706,721	3,970,766	264,497	282,749

3) Financial information for subsidiaries attributable to significant non-controlling interests as at and for the year ended December 31, 2018, is as follows:

(in millions of Korean won)

	Net income allocated to non-controlling interests	Cumulative non-controlling interests	Dividends allocated to non-controlling interests
Doosan Infracore China Co., Ltd.	₩ 27,376	₩ 89,561	₩ -
Doosan Bobcat Inc. and its subsidiaries	119,089	1,830,571	53,727

(3) Changes in the Scope of Consolidation

1) Changes in the scope of consolidation for the year ended December 31, 2018, are as follows:

Subsidiary	Description	Reason
Doosan Holdings Europe Ltd.	Excluded from consolidation	Merger
KSD 1st Co.,Ltd.	Newly included in consolidation	New agreement
Doosan Infracore Bobcat Ireland Ltd.	Excluded from consolidation	Liquidation
Doosan International Italia S.r.L	Excluded from consolidation	Liquidation
KSD 1st Co.,Ltd.	Excluded from consolidation	Termination of agreement
Bobcat Lyon SAS	Excluded from consolidation	Merger

2) Changes in the scope of consolidation for the year ended December 31, 2017, are as follows:

Subsidiary	Description	Reason
Doosan Bobcat Engineering s.r.o.	Excluded from consolidation	Merger
Doosan Trading Ltd.	Excluded from consolidation	Merger

2. Significant Accounting Policies

2.1 Basis of Preparation

The consolidated financial statements of the Group have been prepared in accordance with Korean IFRS.

The significant accounting policies under Korean IFRS followed by the Group in the preparation of its consolidated financial statements are summarized below, and these accounting policies, except for the effects of the changes in accounting policies that are described below, have been applied consistently to the consolidated financial statements for the current period and the accompanying comparative period.

The accompanying consolidated financial statements have been prepared on the historical cost basis, except for certain non-current assets and financial instruments that are measured at fair values, as explained in the accounting policies below. Historical cost, in general, is estimated based on the fair values of the consideration given in exchange for assets.

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

The Group has applied the following standards and amendments for the first time for their annual reporting period commencing January 1, 2018.

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

When an investment in an associate or a joint venture is held by, or is held indirectly through, an entity that is a venture capital organization, or a mutual fund, unit trust and similar entities including investment-linked insurance funds, the entity may elect to measure each investment separately at fair value through profit or loss in accordance with Korean IFRS 1109. The amendment does not have a significant impact on the financial statements because the Group is not a venture capital organization.

- Amendment to Korean IFRS 1040 *Transfers of Investment Property*

The amendment to Korean IFRS 1040 clarifies that a transfer to, or from, investment property, including property under construction, can only be made if there has been a change in use that is supported by evidence, and the list of evidence for a change of use in the standard was re-characterized as a non-exclusive list of example. The amendment does not have a significant impact on the financial statements.

- Amendment to Korean IFRS 1102 *Share-based Payment*

Amendments to Korean IFRS 1102 clarify accounting for a modification to the terms and conditions of a share-based payment that changes the classification of the transaction from cash-settled to equity-settled. Amendments also clarify that the measurement approach should treat the terms and conditions of a cash-settled award in the same way as for an equity-settled award. The amendment does not have a significant impact on the financial statements.

- Enactment of Interpretation 2122 *Foreign Currency Transaction and Advance Consideration*

According to the enactment, the date of the transaction for the purpose of determining the exchange rate to use on initial recognition of the related asset, expense or income (or part of it) is the date on which an entity initially recognizes the non-monetary asset or non-monetary liability arising from the payment or receipt of advance consideration. The enactment does not have a significant impact on the financial statements.

- Korean IFRS 1109 *Financial Instruments*

The Group has applied Korean IFRS 1109 *Financial Instruments* on January 1, 2018, the date of initial application. In accordance with the transitional provisions in Korean IFRS 1109, comparative figures have not been restated, and the differences between previous book amounts and book amounts at the date of initial application are recognized to retained earnings. See Note 36 for further details on the impact of the application of the standard.

- Korean IFRS 1115 *Revenue from Contracts with Customers*

The Group has applied Korean IFRS 1115 *Revenue from Contracts with Customers*. In accordance with the transition provisions in Korean IFRS 1115, comparative figures have not been restated. The Group elected the modified retrospective approach, and recognized the cumulative impact of initially applying the revenue standard as an adjustment to retained earnings as at January 1, 2018, the period of initial application. See Note 36 for further details on the impact of the application of the standard.

(2) New standards and interpretations not yet 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, 2018 and have not been early adopted by the Group are set out below.

- Korean IFRS 1116 *Leases*

Korean IFRS 1116 *Leases* issued on May 22, 2017 is effective for annual periods beginning on or after January 1, 2019, with early adoption permitted. This standard will replace Korean IFRS 1017 *Leases*. The Group will apply the standards for annual periods beginning on or after January 1, 2019.

Under the new standard, 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.

The Group performed an impact assessment to identify potential financial effects of applying Korean IFRS 1116. The Group is analyzing the effects on the financial statements based on available information as at December 31, 2018 to identify effects on 2018 financial statements.

- 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. These amendments will be applied for annual periods beginning on or after January 1, 2019, with early adoption permitted.

- 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 amendments are effective for plan amendments, curtailments and settlements occurring in reporting periods that begin on or after 1 January 2019.

- 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. These amendments will be applied for annual periods beginning on or after January 1, 2019, with early adoption permitted. In accordance with the transitional provisions in Korean IFRS 1109, the restatement of the comparative information is not required and the cumulative effects of initially applying the amendments retrospectively should be recognized in the beginning balance of retained earnings at the date of initial application.

- 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. This Interpretation will be applied for annual periods beginning on or after January 1, 2019, and an entity can either restate the comparative financial statements retrospectively or recognize the cumulative effect of initially applying the Interpretation as an adjustment in the beginning balance at the date of initial application.

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. These amendments will be applied to business combinations for which the acquisition date is on or after the beginning of the first annual reporting period beginning on or after 1 January 2019, with early adoption permitted.

- 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. These amendments will be applied to transactions in which an entity obtains joint control on or after the beginning of the first annual reporting period beginning on or after 1 January 2019, with early adoption permitted.

- 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 income or equity according to where the entity originally recognized those past transactions or events. These amendments will be applied for annual reporting periods beginning on or after January 1, 2019, with early adoption permitted.

- 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. These amendments will be applied to borrowing costs incurred on or after the beginning of the first annual reporting period beginning on or after January 1, 2019, with early adoption permitted.

2.2 Consolidation

The Group has prepared the consolidated financial statements in accordance with Korean IFRS 1110 *Consolidated Financial Statements*, and the consolidated financial statements incorporate the financial statements of the Parent Company and all of the subsidiaries controlled by the Parent Company (or its subsidiaries).

1) Subsidiaries

Subsidiaries are all entities over which the Group has control. The Group controls an entity when the Group is exposed to, or has rights to, variable returns from its involvement with the entity and has the ability to affect those returns through its power to direct the activities of the entity. The power refers to the current ability to direct relevant activities (i.e., the activities that significantly affect the investee’s returns). Generally the power can be assessed by considering the voting rights from shareholdings, however, other factors including voting patterns at previous shareholders’ meeting must also be considered. There are some cases when the power arise from a contractual agreement. The Group is exposed, or has rights, to variable returns from its involvement with the investee when the Group’s returns from its involvement have the potential to vary as a result of the investee’s performance.

Subsidiaries are fully consolidated from the date on which control is transferred to the Group. They are deconsolidated from the date that control ceases.

The acquisition method of accounting is used to account for business combinations by the Group. The consideration transferred is measured at the fair values of the assets transferred, and identifiable assets acquired and liabilities and contingent liabilities assumed in a business combination are measured initially at their fair values at the acquisition date. The Group recognizes any non-controlling interest in the acquired entity on an acquisition-by-acquisition basis either at fair value or at the non-controlling interest's proportionate share of the acquired entity's net identifiable assets. All other non-controlling interests are measured at fair values, unless otherwise required by other standards. Acquisition-related costs are expensed as incurred.

The excess of consideration transferred, amount of any non-controlling interest in the acquired entity and acquisition-date fair value of any previous equity interest in the acquired entity over the fair value of the net identifiable assets acquired is recoded as goodwill. If those amounts are less than the fair value of the net identifiable assets of the business acquired, the difference is recognized directly in the profit or loss as a bargain purchase.

Intercompany transactions, balances and unrealized gains on transactions between group companies are eliminated. Unrealized losses are also eliminated unless the transaction provides evidence of an impairment of the transferred asset. Accounting policies of subsidiaries have been changed where necessary to ensure consistency with the policies adopted by the Group.

The Group treats transactions with non-controlling interests that do not result in a loss of control as transactions with equity owners of the Group. Any difference between the amount of the adjustment to non-controlling interest and any consideration paid or received is recognized in a separate reserve within equity attributable to owners of the Parent Company. A changed in ownership interest results in an adjustment between the carrying amounts of the controlling and non-controlling interest to reflect their relative interest in the subsidiary. When the Group ceases to consolidate for a subsidiary because of a loss of control, any retained interest in the subsidiary is remeasured to its fair value with the changed in carrying amount recognized in profit or loss.

2) Investments in Associates and Joint Ventures

Associates are entities over which the Group has significant influence but not control or joint control, where the Group in general holds 20% or more and 50% or less of the voting rights. Investments in joint ventures are investees sharing control over its economic activities with the Group based on a contractual agreement. The contractually agreed sharing of control of an arrangement only exist when financial and operating policy decisions of the investee require the unanimous consent of the parties sharing control.

Investments in associates and joint ventures (collectively referred to as the "associates, etc.") are accounted for using the equity method of accounting, after initially being recognized at cost. The carrying amount of the investments contains the goodwill identified on initial recognition and is presented at the amount less accumulated impairment losses.

The Group's proportionate interest of the investee's profit or loss and changes in other comprehensive income after the date of acquisition is respectively recognized in the Group's profit or loss and other comprehensive income. Cumulative changes after acquisition are adjusted from the carrying amount of the investment. If the Group's share of losses of the associates, etc. is greater than or equal to the investment in the associate, etc., including other unsecured notes, the Group discontinues to recognize further losses, except where it is obligated or required to be paid on behalf of the associates, etc.

Unrealized gains on transactions between the Group and its associates, etc are eliminated to the extent of the Group's interest in the associates. If there is an objective evidence of impairment for the investment in the associate, the Group recognizes the difference between the recoverable amount of the associate and its book amount as impairment loss.

Accounting policies of associate, etc. are changed if necessary for consistency with those of the Group.

For overseas investees whose financial statements are prepared in foreign currencies, the equity method is applied to financial statements translated in accordance with the accounting treatments of the translation of the financial statements of overseas' subsidiaries. The amount of difference between the translated amount of assets less liabilities and translated amount of equity is recognized as changes in the investee's equity (accumulated other comprehensive income) to the extent equivalent to the Group's interest.

2.3 Foreign Currency Translation

1) Functional and presentation currency

Items included in the financial statements of each of the Group's entities are measured using the currency of the primary economic environment in which each entity operates (the "functional currency"). The consolidated financial statements are presented in Korean won, which is the Parent Company's functional and presentation currency.

2) Transactions and balances

Foreign currency transactions are translated into the functional currency using the exchange rates at the dates of the transactions. Foreign exchange gains and losses resulting from the settlement of such transactions and from the translation of monetary assets and liabilities denominated in foreign currencies at year end exchange rates are generally recognized in profit or loss. They are deferred in other comprehensive income if they relate to qualifying cash flow hedges and qualifying effective portion of net investment hedges, or are attributable to monetary part of the net investment in a foreign operation.

3) Translation to the presentation currency

The results and financial position of foreign operations that have a functional currency different from the presentation currency are translated into the presentation currency as follows:

① Assets and liabilities for each statement of financial position presented are translated at the closing rate at the end of the reporting period.

② income and expenses for each statement of profit or loss are translated at average exchange rates, unless this average is not reasonable approximation of the cumulative effect of the rates prevailing on the transaction dates, in which case income and expenses are translated at the rates on the dates of the transactions.

③ All resulting exchange differences are recognized in other comprehensive income.

Exchange differences from the net investment in the foreign operation and from borrowings and other foreign currency instruments designated as hedging instrument for such investment are recognized in other comprehensive income. On disposal of part or all foreign operation, which leads to the loss of control, all of the accumulated exchange differences in respect of that operation are reclassified to profit or loss. Goodwill and fair value adjustments arising from the acquisition of a foreign operation are recognized as assets and liabilities of the foreign operation and translated at the closing exchange rate.

2.4 Cash and Cash Equivalents

Cash and cash equivalents include cash on hand, bank deposits, and other short-term highly liquid investments that are readily convertible to a known amount of cash. Bank overdraft is classified as short-term borrowings in the consolidated statements of financial position.

2.5 Financial Assets

1) Classification

From January 1, 2018, the Group classifies its financial assets in the following measurement categories:

- those to be measured at fair value through profit or loss

- those to be measured at fair value through other comprehensive income, and

- those to be measured at amortized cost.

The classification depends on the Group’s business model for managing the financial assets and the contractual terms of the cash flows. For financial assets measured at fair value, gains and losses will either be recorded in profit or loss or other comprehensive income. For investments in debt instruments, this will depend on the business model in which the investment is held. The Group reclassifies debt investments when, and only when its business model for managing those assets changes.

For investments in equity instruments that are not held for trading, this will depend on whether the Group has made an irrevocable election at the time of initial recognition to account for the equity investment at fair value through other comprehensive income. The changes of fair value of equity investments that are not designated under the fair value option are recorded through profit or loss.

2) Recognition and Measurement

At initial recognition, the Group measures a financial asset at its fair value plus, in the case of a financial asset not at fair value through profit or loss, transaction costs that are directly attributable to the acquisition of the financial asset. Transaction costs of financial assets carried at fair value through profit or loss are expensed in profit or loss. Financial assets with embedded derivatives are considered in their entirety when determining whether their cash flows are solely payment of principal and interest.

① *Debt instruments*

Subsequent measurement of debt instruments depends on the Group's business model for managing the asset and the cash flow characteristics of the asset. The Group classifies its debt instruments into one of the following three measurement categories:

(a) Amortized cost

Assets that are held for collection of contractual cash flows where those cash flows represent solely payments of principal and interest are measured at amortized cost. A gain or loss on a debt investment that is subsequently measured at amortized cost and is not part of a hedging relationship is recognized in profit or loss when the asset is derecognized or impaired. Interest income from these financial assets is included in 'finance income' using the effective interest rate method.

(b) Fair value through other comprehensive income

Assets that are held for collection of contractual cash flows and for selling the financial assets, where the assets' cash flows represent solely payments of principal and interest, are measured at fair value through other comprehensive income. Movements in the carrying amount are taken through other comprehensive income, except for the recognition of impairment loss (reversal of impairment loss), interest income and foreign exchange gains and losses which are recognized in profit or loss. When the financial asset is derecognized, the cumulative gain or loss previously recognized in other comprehensive income is reclassified from equity to profit or loss. Interest income from these financial assets is included in 'finance income' using the effective interest rate method. Foreign exchange gains and losses are presented in 'financial income or expenses' and impairment losses are presented in 'other expenses'.

(c) Fair value through profit or loss

Assets that do not meet the criteria for amortized cost or fair value through other comprehensive income are measured at fair value through profit or loss. A gain or loss on a debt investment that is subsequently measured at fair value through profit or loss and is not part of a hedging relationship is recognized in profit or loss and presented net in the statement of profit or loss within 'other income or expenses' in the year in which it arises.

② *Equity instruments*

The Group subsequently measures all equity investments at fair value. Where the Group's management has elected to present fair value gains and losses on equity investments, which held for long-term investment or strategic purpose, in other comprehensive income, there is no subsequent reclassification of fair value gains and losses to profit or loss following the derecognition of the investment. Dividend income from such investments continue to be recognized in profit or loss as 'finance income' when the right to receive payments is established.

Changes in the fair value of financial assets at fair value through profit or loss are recognized in 'other income and expenses' in the statement of profit or loss as applicable. Impairment loss (reversal of impairment loss) on equity investments measured at fair value through other comprehensive income are not reported separately from other changes in fair value.

3) Impairment

The Group assesses on a forward looking basis the expected credit losses associated with its debt instruments carried at amortized cost and fair value through other comprehensive income. The impairment methodology applied depends on whether there has been a significant increase in credit risk. For trade receivables and lease receivables, the Group applies the simplified approach, which requires expected lifetime credit losses to be recognized from initial recognition of the receivables.

4) Derecognition

If a transfer does not result in derecognition because the Group has retained substantially all the risks and rewards of ownership of the transferred asset, the Group continues to recognize the transferred asset in its entirety and recognizes a financial liability for the consideration received. The Group classified the financial liability as "borrowings" in the statement of financial position.

5) Offsetting of financial instruments

Financial assets and liabilities are offset and the net amount reported in the statements of financial position where there is a legally enforceable right to offset the recognized amounts and there is an intention to settle on a net basis or realize the assets and settle the liability simultaneously.

2.6 Financial Liabilities

1) Classification and measurement

The Group's financial liabilities at fair value through profit or loss are financial instruments held for trading. A financial liability is held for trading if it is incurred principally for the purpose of repurchasing in the near term. A derivative that is not a designated as hedging instruments and an embedded derivative that is separated are also classified as other financial liabilities.

The Group classifies non-derivative financial liabilities, except for financial liabilities at fair value through profit or loss, financial guarantee contracts and financial liabilities that arise when a transfer of financial assets does not qualify for derecognition, as financial liabilities carried at amortized cost and present as 'Trade and other payables', and 'borrowings' in the statement of financial position.

2) Derecognition

Financial liabilities are removed from the statement of financial position when it is extinguished; for example, when the obligation specified in the contract is discharged or cancelled or expired or when the terms of an existing financial liability are substantially modified. The difference between the carrying amount of a financial liability extinguished or transferred to another party and the consideration paid (including any non-cash assets transferred or liabilities assumed) is recognized in profit or loss.

3) Financial guarantee contract liabilities

Financial guarantee contracts are contracts that require the issuer to make specified payments to reimburse the holder for a loss incurred because a specified debtor fails to make payments when due in accordance with the terms of debt instruments.

Financial guarantee contract liabilities are initially measured at their fair values and, if not designated as at fair value through profit or loss, are subsequently measured at the higher of:

① the amount determined in accordance with the expected credit loss model under Korean IFRS 1109 Financial Instruments and

② the amount initially recognized less, where appropriate, the cumulative amount of income recognized in accordance with Korean IFRS 1115 *Revenue from Contracts with Customers*

2.7 Compound Financial Instruments

The liability component and equity component of compound financial instruments issued by the Group are separately classified based on the substance of the contractual terms. The compound financial instruments issued by the Group are classified and presented separately as the financial liability component and equity conversion option which can be converted into equity instruments at the option of the holder. The liability component of the compound instruments is recognized initially at the fair value of a similar bond that does not have an equity conversion option, and subsequently recognized at amortized cost by applying the effective interest rate until extinguished on conversion or maturity of the bonds. The equity component is determined by deducting the amount of the liability component from the fair value of the compound instrument as a whole. This is recognized and included in equity, net of income tax effects, and is not subsequently remeasured. If it is classified not as equity component but as derivatives, it is regarded as embedded derivatives estimated at the fair value of the same derivatives or calculated from a reasonable valuation model. The subsequent gains or losses arising from its fair value fluctuation are recognized in profit or loss.

2.8 Trade Receivables

Trade receivables are amounts owed by customer for products and services provided in the ordinary course of business. Receivables expected to be collected within one year are classified as current assets. Otherwise, they are classified as non-current assets. Trade receivables are initially measured at fair value and are presented as net of allowance for doubtful accounts, estimated on an individual basis based on past bad debt experience.

2.9 Inventories

Inventories are stated at the lower of cost or net realizable value. Cost of inventories includes fixed and variable manufacturing overheads allocated to inventories by the most appropriate method of each category. The cost of inventories is determined by the gross average method (the specific identification method for materials in transit). And during the year, perpetual inventory systems are used to value inventories, which are adjusted to physical inventory counts performed at the end of the year.

The Group periodically reviews changes in net realizable value of inventories (current replacement cost for raw materials) due to damage, obsolescence, decline in selling prices and others and recognizes loss on inventory valuation. Loss on inventory valuation is charged to cost of sales when it is ordinary and to other non-operating expense when it is extraordinary. When the previous circumstances that caused the loss on inventory valuation no longer exist and the new market value of inventories subsequently exceeds the carrying amount, the valuation loss is reversed to the extent not exceeding the initial carrying amount, and the reversal is deducted from cost of sales.

2.10 Property, Plant and Equipment

Property, plant and equipment are stated at cost, less subsequent accumulated depreciation and accumulated impairment losses except for lands to which the revaluation model is applied. When useful life of a certain part of property, plant and equipment is different compared to that of the whole asset, such part is recognized as a separate asset. The historical cost includes expenditure that is directly attributable to the acquisition of the item, including estimated costs of dismantling, removing or restoring the assets at the end of the expected useful life.

Subsequent costs, incurred to replace a part of previously recognized item of property, plant and equipment, are added to the carrying amount of an asset, or recognized as a separate asset, if it is probable that future economic benefits associated with the assets will flow into the Group and the cost of an asset can be measured reliably. In such cases, the carrying amount of what was replaced is derecognized accordingly. Routine maintenance and repairs are expensed as incurred through profit or loss.

Depreciation of all property, plant and equipment, except for land, is calculated using the straight-line method, which reflects the best estimate of the expected consumption pattern of future economic benefits inherent in the asset, to allocate their cost, net of their residual values.

The Group depreciates property, plant and equipment with a limited useful life over the following periods:

	Estimated useful life (years)
Buildings	20 – 40
Structures	10 – 20
Machinery	3 – 15
Vehicles	3 – 10
Tools	3 – 10

	Estimated useful life (years)
Office equipment	3 – 14

If a part of a property, plant and equipment has a cost that is significant in relation to the total cost of property, plant and equipment, it is depreciated separately.

The Group reviews the depreciation method, the estimated useful lives and residual values of property, plant and equipment at the end of each annual reporting period. If expectations differ from previous estimates, the changes are accounted for as a change in an accounting estimate.

When the carrying amount of property, plant and equipment is higher than the recoverable amount, the carrying amount is adjusted to the recoverable amount and the difference is recognized as an impairment loss. Meanwhile, when the recoverable amount subsequently exceeds the carrying amount of the impaired asset, the excess is recorded as a reversal of impairment loss to the extent that the reversed asset does not exceed the carrying amount before the previous impairment, as adjusted by depreciation. Upon derecognition of a property, plant and equipment, the difference between the net disposal amount and carrying amount of the item is recognized as other non-operating income or expense.

2.11 Intangible Assets

Intangible assets are initially measured at cost and are carried at cost, less accumulated amortization and accumulated impairment losses. Subsequent expenditure on an intangible asset is capitalized only when it is probable that the expected future economic benefits that are attributable to the asset will increase.

Intangible assets, expect for goodwill and those with indefinite useful lives, are amortized using the straight-line method with no residual value, with amortization beginning when the asset is available for use, over their estimated useful lives as follows. However, Membership rights that have an indefinite useful life are not subject to amortization because there is no foreseeable limit to the period over which the assets are expected to be utilized. Instead of being amortized they are tested for impairment in each reporting period.

	Estimated useful life (years)
Industrial rights	5 – 10
Development costs	3 – 12
Other intangible assets	3 – 7

Goodwill acquired through business combinations refers to the consideration paid in excess of the fair value of the Group's share of the identifiable net assets of the subsidiary on the date of acquisition. Goodwill recognized from the acquisition of certain subsidiary, is classified as intangible assets. Goodwill is tested for impairment annually and carried at the historical cost at the date of business acquisition, less accumulated impairment losses. Impairment loss recognized for goodwill is not reversed. For the purpose of impairment testing, goodwill is allocated to each of the Group’s cash-generating units (or groups of cash-generating units) that is expected to benefit from the synergies of the combination.

Expenditures relating to development activities are capitalized when 1) the results of development plan were for new product developments or substantial improvement of functions of existing products, 2) there is technical and commercial feasibility of completing the development and 3) the Group has the ability to measure the expenditures attributable to the development with reliability. Capitalized development costs include expenditure on materials, salaries and related overhead cost that is reasonably allocated. Capitalized development costs are presented at the acquisition cost, less accumulated amortization and accumulated impairment losses. Capitalized development costs are amortized using the straight-line method over the estimated useful life and amortization expenses are included in cost of goods and selling and administrative expenses. The expenditure on research and development, which does not meet conditions noted above, is expensed through profit or loss when it is incurred.

The estimated useful life and amortization method for intangible assets with finite useful lives are reviewed at the end of each reporting period. For intangible assets with indefinite useful life, assessment is revisited each period, with the effect of any changes in estimate being accounted for as a change in accounting estimate.

2.12 Investment Property

Investment property is property held to earn rentals or for capital appreciation or both. An investment property is measured initially at its cost, including transaction cost incurred in acquiring the asset. An investment property is measured after initial measurement at depreciated cost (less any accumulated impairment losses). After recognition as an asset, investment property is carried at cost less accumulated depreciation and impairment losses. The Group depreciates investment properties, except for land, using the straight-line method over their useful lives of 40 years.

The estimated useful lives, residual values and depreciation method are reviewed at the end of each reporting period, with the effect of any changes in estimate being accounted for as a change in accounting estimate.

2.13 Borrowing Costs

Borrowing costs that are directly attributable to the acquisition, construction or production of a qualifying asset are capitalized during the period of time that is required to complete and prepare the asset for its intended use. Other borrowing costs are expensed in the period in which they are incurred.

2.14 Impairment of Non-financial Assets

Goodwill and intangible assets that have an indefinite useful life are not subject to amortization and are tested annually for impairment. Other assets are tested for impairment whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. An impairment loss is recognized for the amount by which the asset's carrying amount exceeds its recoverable amount. The recoverable amount is the higher of an asset's fair value less costs of disposal and value in use. For the purposes of impairment test, assets are grouped at the lowest levels which separately generates identifiable cash flows(cash-generating units). Non-financial assets other than goodwill that suffered an impairment are reviewed for possible reversal of the impairment at the end of each reporting period.

2.15 Trade and Other Payables

These amounts represent liabilities for goods and services provided to the Group prior to the end of reporting period which are unpaid. The amounts are unsecured and are usually paid within 30 days of recognition. Trade and other payables are presented as current liabilities, unless payment is not due within 12 months after the reporting period. They are recognized initially at their fair value and subsequently measured at amortized cost using the effective interest method.

2.16 Borrowings

Borrowings are measured initially at fair value, net of transaction costs and subsequently at amortized cost using the effective interest method, with interest expense being recognized on an effective yield basis. The difference between the amount received and the redemption amount is amortized using the effective interest method and recognized in profit or loss. Borrowings are classified as non-current liabilities when the Group has an unconditional right to defer settlement of the liability for at least 12 months after the end of the reporting period. Otherwise, borrowings are classified as current liabilities.

2.17 Post-employment benefits

The Group operates both defined contribution and defined benefit pension plans.

A defined benefit plan is a pension plan that is not a defined contribution plan. Generally, post-employment benefits are payable after the completion of employment, and the benefit amount depended on the employee’s age, periods of service or salary levels. The liability recognized in the statement of financial position in respect of defined benefit pension plans is the present value of the defined benefit obligation at the end of the reporting period less the fair value of plan assets. The defined benefit obligation is calculated annually by independent actuaries using the projected unit credit method. The present value of the defined benefit obligation is determined by discounting the estimated future cash outflows using interest rates of high-quality corporate bonds that are denominated in the currency in which the benefits will be paid, and that have terms approximating to the terms of the related obligation. Remeasurement gains and losses arising from experience adjustments and changes in actuarial assumptions are recognized in the period in which they occur, directly in other comprehensive income. Changes in the present value of the defined benefit obligation resulting from plan amendments or curtailments are recognized immediately in profit or loss as past service costs.

Contributions to defined contribution plans are recognized as an expense when employees have rendered service that entitles them to the contributions.

2.18 Provisions and Contingent Liability

Provisions are recognized when 1) the Group has a present obligation (legal or constructive) as a result of a past event, 2) it is probable that the Group will be required to settle the obligation 3) and a reliable estimate can be made for the amount of the obligation. The amount of the provision is measured as present value of the prospective cash flows estimated to settle the present obligation when the difference between the face value and present value is material. At the end of each reporting period, the remaining provision balance is reviewed and assessed to determine whether the current best estimate is being recognized. The increase in provision due to passage of time is recognized as interest expense. If the existence of an obligation to transfer economic benefit is no longer probable, the related provision is reversed during the period. When some or all of the economic benefits required to settle a provision are expected to be recovered from a third party, a receivable is recognized as an asset if it is virtually certain that reimbursement will be received and the amount of the receivable can be measured reliably. In this case, profit from reimbursement is offset against the expense incurred in the recognition of provision through profit or loss.

2.19 Derivative Instruments

Derivatives are initially recognized at fair value on the date when a derivative contract is entered into and are subsequently remeasured at their fair value at the end of each reporting period. Changes in the fair value of any derivative instrument that does not qualify for hedge accounting are recognized immediately in profit or loss.

The effective portion of changes in the fair value of derivatives that are designated and qualify as cash flow hedges is recognized in other comprehensive income. The gain or loss relating to the ineffective portion is recognized immediately in profit or loss.

2.20 Dividend

Dividend payable is recognized as liability when declaration of the dividend is approved at the shareholders' meeting.

2.21 Share-based Payment Arrangement

The Group recognizes share options granted to employees at the fair value at the grant date. The fair value determined at the grant date of the share option is expensed on a straight-line basis over the vesting period. The Group determines fair value of share option using the Black-Scholes model.

2.22 Revenue Recognition

From January 1, 2018, the Group has applied Korean IFRS 1115 *Revenue from Contracts with Customers.* In accordance with K-IFRS 1115, the Group recognizes revenue from all types of the contracts by using the five-step revenue recognition model. The five-step revenue recognition model is as follows:

- Identify contracts with customers
- Identify the separate performance obligation

- Determine the transaction price of the contract
- Allocate the transaction price to each of the separate performance obligations, and
- Recognize the revenue as each performance obligation is satisfied.

(1) Identify the separate performance obligation

The Group generally separates contracts to recognize revenue from service rendered, apart from sales of goods or products. The Group determines standard warranty coverage periods per product and country considering warranty periods required by law and others when entering into contracts with customers for the sales of products. If the Group provides an extended warranty beyond the standard warranty coverage period or a customer has the option to purchase an additional warranty separately, the warranty is considered as a separate performance obligation when revenue is recognized.

(2) Performance obligation recognized at once

Revenue on sales of goods is recognized when the products have been delivered to the customer. Delivery does not occur until the products have been shipped to the specified location, the risks of obsolescence and loss have been transferred to the customer, and the customer has accepted the products in accordance with the sales contract or the acceptance provisions have lapsed or the Group has objective evidences that all criteria for acceptance have been satisfied.

(3) Sales with a right of return

In accordance with K-IFRS 1115, the Group estimates an amount of variable consideration by using the expected value which the Group expects to better predict the amount of consideration. The Group recognize revenue with transaction price including variable consideration only to the extent that it is highly probable that a significant reversal in the amount of cumulative revenue recognized will not occur when the refund period has lapsed. The refund liability is measured at the amount of consideration received for which the Group does not expect to be entitled.

2.23 Government Grants

For the purpose of acquisition of certain assets, government grants related to assets are accounted for as a deduction from related assets on the date that the related assets are received.

If a government grant that will be received is not subject to specific conditions, government grants related to primary operating activity are recognized in operating income; otherwise, those are recognized in other non-operating income. Meanwhile, for those recognized in the other non-operating income, expenses incurred related to the government grants is to be offset before they are recognized in profit or loss.

2.24 Current and Deferred Tax

The tax expense for the period consists of current and deferred tax. Current and deferred tax is recognized in profit or loss, except to the extent that it relates to items recognized in other comprehensive income or directly in equity. In this case, the tax is also recognized in other comprehensive income or directly in equity, respectively.

Income tax expense is the sum of corporate tax for each fiscal year and tax added to corporate tax under corporate income tax law and other law, including the amount of income taxes or tax refunds for the prior periods recognized in the current period. The Group's liability for current tax is calculated using tax rates that have been enacted or substantively enacted by the end of the reporting period. Deferred tax is recognized on temporary differences between the carrying amounts of assets and liabilities in the consolidated financial statements and the corresponding tax bases used in the computation of taxable income. However, deferred tax assets and liabilities are not recognized if the temporary difference arises from the initial recognition (other than in a business combination) of other assets and liabilities in a transaction that affects neither the taxable income nor the accounting income.

Deferred tax assets and liabilities are measured at the tax rates that are expected to apply in the period in which the liability is settled or the asset is realized, based on tax rates and tax laws that have been enacted or will substantively be enacted by the end of the reporting period.

The Group recognizes a deferred tax liability all taxable temporary differences associated with investments in subsidiaries, associates, and interests in joint arrangements, except to the extent that the Group is able to control the timing of the reversal of the temporary difference and it is probable that the temporary difference will not reverse in the foreseeable future. In addition, The Group recognizes a deferred tax asset for all deductible temporary differences arising from such investments to the extent that it is probable the temporary difference will reverse in the foreseeable future and taxable profit will be available against which the temporary difference can be utilized.

The carrying amount of deferred tax assets is reviewed at the end of each reporting period and it is reduced to the extent that it is no longer probable that sufficient taxable income will be available to allow all or part of the asset to be recovered.

2.25 Earnings per Share

Basic earnings per common share are computed by dividing net income attributable to owners of the Group by the weighted-average number of common shares outstanding during the period. Diluted earnings per common share are computed by dividing diluted net income attributable to the owners of the Group, which is adjusted by adding back the after-tax amount of expenses related to dilutive potential ordinary shares, by weighted-average number of common shares and dilutive potential ordinary shares outstanding during the period. Anti-dilutive potential ordinary shares are disregarded in the calculation of diluted earnings per share.

2.26 Assets Held for sale

Non-current assets (or disposal group) are classified as held for sale when their carrying amount will be recovered principally through a sale transaction rather than through continuing use and a sale is considered highly probable. The assets are measured at the lower amount between their carrying amount and the fair value less costs to sell.

Non-current assets that are classified either as held for sale or as a part of a disposal group classified as held for sale are not depreciated (or amortized). If the fair value, less costs to sell, of the non-current assets, or disposal groups, held for sale decreases, impairment loss is recognized immediately through profit or loss. When it increases subsequently, the gain is recognized at the amount not exceeding the accumulated impairment loss.

2.27 Lease

A lease is an agreement, whereby the lessor conveys to the lessee, in return for a payment or series of payments, the right to use an asset for an agreed period of time. Leases in which a significant portion of the risks and rewards of ownership are not transferred to the Group are classified as operating leases. Payments made under operating leases are charge to profit or loss on a straight-line basis over the period of lease.

Leases where the Group, as lessee, has substantially all the risks and rewards of ownership are classified as finance leases. Finance leases are capitalized at the lease's inception at the fair value of the leased property or, if lower, the present value of the minimum lease payments. The corresponding rental obligations, net of finance charges, are included in other short-term and long-term payables.

If the Group is a lessor, a lease is classified as a finance lease if it transfers substantially all the risks and rewards incidental to ownership at the inception of the lease. A lease other than a finance lease is classified as an operating lease. Lease income from operating leases is recognized in income on a straight-line basis over the lease term. Initial direct costs incurred by the lessor in negotiating and arranging an operating lease is added to the carrying amount of the leased asset and recognized as an expense over the lease term on the same basis as the lease income.

2.28 Segment Reporting

Information of each operating segment is reported in a manner consistent with the internal business segment reporting provided to the chief operating decision-maker. The chief operating decision-maker is responsible for allocating resources and assessing performance of the operating segments.

2.29 Accounting Treatment Related to the Emission Rights Cap and Trade Scheme

The Group classifies the emission rights as intangible assets. The allowance received free of charge from the government are measured at zero, while those purchased are measured at acquisition cost. Also, if the emission rights granted free of charge by the government in relation to certain implementation year are sufficient to fulfill the obligation under the emission liability of current period, the emission liability is measured as zero. However, if there is a shortage, Emissions obligations are measured as the sum of the carrying amount of the allocated allowances that will be the best estimate of expenditure required to settle the obligation at the end of reporting period for any excess emission.

2.30 Approval of Issuance of the Financial Statements

The consolidated financial statements 2018 were approved for issue by the Board of Directors on February 12, 2019 and are subject to change with the approval of shareholders at their Annual General Meeting on March 27, 2019.

3. Critical Accounting Estimates and Assumptions

The preparation of financial statements requires the Group to make estimates and assumptions concerning the future. Management also needs to exercise judgement in applying the Group's accounting policies. 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. As the resulting accounting estimates will, by definition, seldom equal the related actual results, it can contain a significant risk of causing a material adjustment.

The estimates and assumptions that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year are discussed below. Additional information of significant judgement and assumptions of certain items are included in relevant notes.

(1) Provisions for product warranty

The Group provides warranty for products when the related revenue is recognized. At the end of each reporting period, provisions are recorded at the best estimated costs to settle current and future warranty obligations. The Group continuously introduces new products using advanced complex technology, and accordingly, these estimates may change in future due to additional provisions required under local legislation and practice.

(2) Impairment of goodwill

The Group performs test for goodwill impairment testing annually. Recoverable amount of cash-generating units is based on calculation of value in use. The value-in-use calculation requires accounting estimates.

(3) Allowance for doubtful accounts

In order to calculate the impairment of receivables, the management of the Group estimates an expected bad debt considering the aging of receivables, past experience of bad debt and economic and industrial factors.

(4) Impairment of capitalized development cost

The Group performs an assessment for impairment of capitalized development costs at the end of each reporting period by reviewing project's business forecast, technical feasibility and future economic benefit. The assessment on indication of impairment or calculation of recoverable amount of capitalized development costs involves management's estimates and judgments.

(5) Revenue recognition – Deductions from revenue

The Group offers its customers a variety of promotion and incentive programs and related costs are recognized as deductions from the revenue. Any unsettled amounts are recognized on an accrual basis. These liabilities related to revenue deductions are estimated based on historical experience and judgement of management when the related revenue is recognized. The Group's revenue is affected by these estimated revenue deductions.

4. Financial Risk Management

The purpose of the Group's financial risk management is to improve financial structure and efficiency of fund management to create stable and sustainable management performance even under various financial risks such as market risk, credit risk and liquidity risk.

Financial risk management activities are mainly managed by the finance department, and, in close cooperation with the relevant departments, the department is engaged in activities such as identification, valuation and hedging of financial risks, and focusing on minimizing the impact of financial risks through regular monitoring.

(1) Market Risk

1) Foreign exchange risk

The Group is exposed to foreign currency risk as it makes international transactions in foreign currencies. Foreign currency risk arises from forecast transactions, recognized assets and liabilities and net investments in foreign operations.

Foreign currency risk is managed by the Group's policy on foreign currencies. The Group's basis for foreign currency management is to reduce the volatility of profit or loss. The Group reduces exposure to foreign currency risk by matching the inflow and the outflow of foreign currencies (natural hedge), and manages foreign currency risk by using currency derivatives, such as currency forwards, for the remaining exposures.

The Group's monetary assets and liabilities denominated in foreign currencies and exposed to foreign currency risk as at December 31, 2018 and 2017, are as follows:

Financial risk management activities are mainly managed by the finance department, and, in close cooperation with the relevant departments, the department is engaged in activities such as identification, valuation and hedging of financial risks, and focusing on minimizing the impact of financial risks through regular monitoring.

(in millions of Korean won)

	2018				
	USD	EUR	CNY	Others [1]	Total
Financial assets	₩ 619,712	₩ 175,157	₩ 129,577	₩ 68,330	₩ 992,776
Financial liabilities	(1,071,849)	(231,222)	(26,993)	(70,916)	(1,400,980)
Net assets (liabilities)	₩ (452,137)	₩ (56,065)	₩ 102,584	₩ (2,586)	₩ (408,204)

	2017				
	USD	EUR	CNY	Others [1]	Total
Financial assets	₩ 1,234,931	₩ 218,587	₩ 104,650	₩ 227,695	₩ 1,785,863
Financial liabilities	(1,484,636)	(379,034)	(6,527)	(222,132)	(2,092,329)
Net assets (liabilities)	₩ (249,705)	₩ (160,447)	₩ 98,123	₩ 5,563	₩ (306,466)

[1] Others are assets and liabilities denominated in foreign currencies other than USD, EUR and CNY.

A sensitivity analysis on the Group's net income before income tax expense, assuming a 10% increase and decrease in functional currency exchange rates (functional currency per foreign currency) of the respective entity holding the assets and liabilities, for the years ended December 31, 2018 and 2017, is as follows:

(in millions of Korean won)	2018		2017	
	10% increase in foreign exchange currency rate	**10% decrease in foreign exchange currency rate**	**10% increase in foreign exchange currency rate**	**10% decrease in foreign exchange currency rate**
Profit before income tax	₩ (40,820)	₩ 40,820	₩ (30,647)	₩ 30,647

2) Interest rate risk

The Group's interest rate risk is related to borrowings and bank deposits with floating interest rates, and the related interest income and expense are exposed to interest rate risk. The Group is exposed to interest rate risk mainly due to its borrowing with floating interest rates. Borrowings and bank deposits with fixed interest rates do not have influence on current profit or loss and equity due to the changes in market interest rates.

To manage the Group's interest rate risk in advance, the Group tries to minimize external borrowings by using internal funds, reducing borrowings with high interest rates, improving the structure of long-term and short-term borrowings, maintaining the appropriate balance between borrowings with floating interest rate, and fixed interest rate and regularly monitoring domestic and international interest rate changes with action plans.

Financial instruments with floating interest rates exposed to interest rate risk as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	2018	2017
Financial liabilities	₩ 809,474	₩ 1,290,729

The table below summarizes the impact of increases/decreases of interest rate on the Group's profit (loss) before income tax. The analysis is based on the assumption that the interest rate has increased/decreased by 100 basis points with all other variables held constant.

(in millions of Korean won)	2018		2017	
	100 bp increase	**100 bp decrease**	**100 bp increase**	**100 bp decrease**
Income (expense) before income tax expense	₩ (8,095)	₩ 8,095	₩ (12,907)	₩ 12,907

3) Price risk

The Group is exposed to equity securities price risk arises from investments held by the Group that are classified either as at fair value through other comprehensive income or at fair value through profit or loss in the consolidated statement of financial position.

(2) Credit Risk

Credit risk arises during the normal course of transactions and investing activities where customers or other parties are unable to comply with contractual obligations. The Group sets out and monitors credit limits for its customers and counterparts on a periodic basis considering financial conditions, historical experiences and other factors.

Credit risk arises from cash and cash equivalents, derivatives and deposits with banks and financial institutions, as well as credit exposures to major customers, including receivables and definite term contracts.

Main objectives of credit risk management are to efficiently manage credit risk based on the Group's credit policies, to promptly support decision-making processes and to minimize financial losses through safeguarding receivables. Where default is expected for receivables that represents impairment indicators or are past due at the end of reporting period, the Group assesses related credit risk and reflects it on allowances in its consolidated statement of financial position.

- Exposure to credit risk

Maximum exposures of financial assets of the Group exposed to credit risk as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		December 31, 2018	December 31, 2017
Cash and cash equivalents		₩ 1,053,016	₩ 943,481
Short-term and long-term financial instrument		262,288	160,177
Trade and other receivables		1,353,419	1,197,047
Long-term trade and other receivables		10,891	16,150
Deposits		33,626	38,382
Derivative assets		16,953	6,256
Financial Assets at Amortized Cost	Short-term and long-term financial instrument(excluding equity securities)	1,899	1,894
	Total	₩ 2,732,092	₩ 2,363,387

Aging analysis of the Group's receivables as at December 31, 2018 and 2017, is as follows:

(in millions of Korean won)	December 31, 2018						
	Individually impaired receivables	Receivables assessed for impairment on a collective basis					
		Within due	0–3 months	3–6 months	6–12 months	Over 12 months	Total
Trade receivables	₩ 417,644	₩ 1,105,808	₩ 58,048	₩ 8,380	₩ 5,884	₩ 28,633	₩ 1,624,397
Other receivables	39,070	45,930	31,561	12	925	17,838	135,336
Accrued income	-	6,333	-	-	-	-	6,333
Short-term loans	14,841	282	-	-	-	-	15,123
Long-term trade receivables	-	10,998	-	-	-	-	10,998

Long-term other receivables	5,704	96	-	-	-	-	5,800
Long-term loans	-	171	-	-	-	-	171
Total	₩ 477,259	₩ 1,169,618	₩ 89,609	₩ 8,392	₩ 6,809	₩ 46,471	₩ 1,798,158
loss allowance provision for trade receivables	₩ (325,131)	₩ (4,926)	₩ (913)	₩ (1,064)	₩ (1,333)	₩ (21,176)	₩ (354,543)

(in millions of Korean won)	December 31, 2017						
	Individually impaired receivables	Receivables assessed for impairment on a collective basis					
		Within due	0–3 months	3–6 months	6–12 months	Over 12 months	Total
Trade receivables	₩ 479,511	₩ 913,895	₩ 58,429	₩ 10,951	₩ 8,196	₩ 36,207	₩ 1,507,189
Other receivables	39,933	26,596	17,695	3,867	2,770	65,183	156,044
Accrued income	-	5,786	-	-	-	-	5,786
Short-term loans	14,922	334	-	-	-	-	15,256
Long-term trade receivables	-	14,879	-	-	-	-	14,879
Long-term other receivables	6,404	1,264	-	-	-	-	7,668
Long-term loans	-	169	-	-	-	-	169
Total	₩ 540,770	₩ 962,923	₩ 76,124	₩ 14,818	₩ 10,966	₩ 101,390	₩ 1,706,991

Receivables with specific impairment indicators such as insolvency and bankruptcy are individually assessed using appropriate allowance rates. A group of financial assets with similar credit risk natures that are not individually significant is assessed on a collective basis based on aging analysis and the Group's historical experience on collection.

(3) Liquidity Risk

Liquidity risk represents the risk that the Group may encounter difficulties in fulfilling its obligations to repay financial liabilities or in being able to have additional funding for its normal business operations due to liquidity shortage.

The Group prepares cash flow budgets for a three-month period as well as annual fiscal year to forecast cash flows from operating, investing and financing activities. Through these forecasts, the Group secures and maintains an appropriate level of liquidity volume and accordingly manages liquidity risk in advance.

Details of the Group's liquidity risk analysis as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	December 31, 2018					
		Nominal cash flows				
	Book amount	Total	Less than 1 year	Less than 2 year	Less than 5 year	More than 5 years
Financial liabilities	₩ 5,922,667	₩ 6,549,047	₩ 3,588,096	₩ 1,177,870	₩ 755,676	₩ 1,027,405

(in millions of Korean won)	December 31, 2017					
		Nominal cash flows				
	Book amount	Total	Less than 1 year	Less than 2 year	Less than 5 year	More than 5 years
Financial liabilities	₩ 5,957,263	₩ 6,733,627	₩ 3,604,932	₩ 686,887	₩ 1,109,629	₩ 1,332,179

(4) Capital Risk

The Group's objectives when 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.

In order to maintain or adjust the capital structure, the Group may adjust the amount of dividends paid to shareholders, return capital to shareholders, issue new shares or sell assets to reduce debt. 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.

Gearing ratios as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	December 31, 2018	December 31, 2017
Debt	₩ 7,208,352	₩ 7,102,929
Equity	3,820,815	3,173,162
Debt-to-equity ratio	188.66%	223.84%

5. Restricted Financial Assets

Details of restricted financial instruments as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	December 31, 2018	December 31, 2017	Description
Short-term financial instruments	₩ 219,974	₩ 65,459	Pledged for borrowings and others
Long-term financial instruments	11	11	Bank transaction deposits and others
Total	₩ 219,985	₩ 65,470	

6. Short-term and Long-term Investment Securities

(1) Short-term and long-term investment securities as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		December 31, 2018
Short-term Investment securities:		
Financial Assets at Amortized Cost	₩	1,808
Financial assets at fair value through profit or loss		12,480
Subtotal	₩	14,288
Long-term Investment securities:		
Financial Assets at Amortized Cost	₩	90
Financial assets at fair value through other comprehensive income		91,972
Financial assets at fair value through profit or loss		6,946
Subtotal	₩	99,008

(in millions of Korean won)		December 31, 2017
Short-term Investment securities:		
Financial assets at fair value through profit or loss	₩	34,182
Long-term Investment securities:		
Available-for-sale financial assets	₩	91,793
Held-to-maturity financial assets		1,894
Subtotal	₩	93,687

(2) Short-term and long-term investment securities comprise the following investments at December 31, 2018 and 2017:

(in millions of Korean won)		December 31, 2018
Current Financial Assets at Amortized Cost:		
Government bonds and public bonds	₩	8
Debt Securities		1,800
Subtotal	₩	1,808
Non-current Financial Assets at Amortized Cost:		
Government bonds and public bonds	₩	90
Non-current Financial assets at fair value through other comprehensive income:		
Investments in non-listed company	₩	937
Equity instruments		91,035
Subtotal	₩	91,972
Current Financial assets at fair value through profit or loss:		
Financial assets held for trading	₩	12,480
Non-current Financial assets at fair value through profit or loss:		
Beneficiary certificates	₩	2,252
Investments in funds		4,694
Subtotal	₩	6,946

(3) Available-for-sale financial assets as at December 31, 2017, are as follows:

(in millions of Korean won)		December 31, 2017
Non-current Available-for-sale finacial assets:		
Investments in non-listed company	₩	937
Beneficiary certificates		87,310
Investments in funds		3,546
Total	₩	91,793

(4) Change in financial assets at fair value for the year ended December 31, 2018, is as follows:

(in millions of Korean won)	2018						
	Beginning balance	Changes in accounting policy	Acquisition	Disposal	Valuation	Others	Ending balance
Financial assets at fair value through other comprehensive income	₩ -	₩ 88,247	₩ -	₩ (32)	₩ 3,388	₩ 369	₩ 91,972
Financial assets at fair value through profit or loss	-	37,729	3,389	(21,582)	(109)	-	19,427
Total	₩ -	₩ 125,976	₩ 3,389	₩ (21,614)	₩ 3,279	₩ 369	₩ 111,399

(5) Change in unrealized gain (loss) on available-for-sale financial assets for the year ended December 31, 2017, is as follows:

(in millions of Korean won)	2017			
	Beginning balance	Valuation	Reclassification to profit or loss	Ending balance
Beneficiary certificates	₩ 9,869	₩ 19,158	₩ (26,035)	₩ 2,992
Income tax effect	(3,221)	(3,827)	6,300	(748)
Total	₩ 6,648	₩ 15,331	₩ (19,735)	₩ 2,244

7. Trade and Other Receivables

(1) Trade and other receivables as at December 31, 2018 and 2017, consist of the following:

(in millions of Korean won)	December 31, 2018		
	Gross amount[1]	Provision for impairment	Carrying amount
Current:			
Trade receivables	₩ 1,604,706	₩ (354,543)	₩ 1,250,163
Other receivables	135,336	(38,695)	96,641
Accrued income	6,333	-	6,333
Short-term loans	15,123	(14,841)	282
Total	₩ 1,761,498	₩ (408,079)	₩ 1,353,419

Non-current:						
Long-term trade receivables	₩	10,679	₩	-	₩	10,679
Long-term loans		171		-		171
Long-term other receivables		5,495		(5,454)		41
Total	₩	16,345	₩	(5,454)	₩	10,891

(in millions of Korean won)			December 31, 2017			
	Gross amount[1]		Provision for impairment		Carrying amount	
Current:						
Trade receivables	₩	1,494,188	₩	(402,432)	₩	1,091,756
Other receivables		156,044		(56,873)		99,171
Accrued income		5,786		-		5,786
Short-term loans		15,256		(14,922)		334
Total	₩	1,671,274	₩	(474,227)	₩	1,197,047
Non-current:						
Long-term trade receivables	₩	14,879	₩	-	₩	14,879
Long-term loans		169		-		169
Long-term other receivables		6,778		(5,676)		1,102
Total	₩	21,826	₩	(5,676)	₩	16,150

[1] The Group recognizes the transfer of trade receivable as collateralized borrowing for those that do not meet the requirements for the elimination of financial instruments (Note 16).

(2) Changes in provision for impairment of loans and receivables for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	2018											
	Beginning balance (IAS 39)		Adjustments to retained earnings at beginning[1]		Beginning balance after adjustment (IFRS 9)		Provision for (reversal of) allowance		Others[2]		Ending balance	
Trade receivables	₩	402,432	₩	1,265	₩	403,697	₩	3,514	₩	(52,668)	₩	354,543
Other receivables		56,873		6		56,879		(1,974)		(16,210)		38,695
Short-term loans		14,922		-		14,922		-		(81)		14,841
Long-term other receivables		5,676		-		5,676		(222)		-		5,454
Total	₩	479,903	₩	1,271	₩	481,174	₩	1,318	₩	(68,959)	₩	413,533

[1] For receivables which the impairment indications are individually identifiable, allowance for doubtful accounts are recognized by the specific identification method. For aggregate receivables, not individually significant but classified by similar nature, the Group applies the simplified approach to measuring expected credit losses which uses a lifetime expected loss allowance. To measure the expected credit losses, trade and other receivables have been grouped based on the shared credit risk characteristics and the days past due. Expected credit losses include forward looking. The provisions for impaired receivables and loans are included in selling and administrative expenses and other non-operating expenses in the consolidated statement of profit or loss.
[2] Includes gain or loss arising from changes in foreign exchange rates.

(in millions of Korean won)	2017			
	Beginning balance	Provision for (reversal of) allowance	Others[1]	Ending balance
Trade receivables	₩ 427,410	₩ (17,375)	₩ (7,603)	₩ 402,432
Other receivables	88,155	(409)	(30,873)	56,873
Short-term loans	15,798	-	(876)	14,922
Long-term other receivables	6,004	(328)	-	5,676
Total	₩ 537,367	₩ (18,112)	₩ (39,352)	₩ 479,903

[1] Includes gain or loss arising from changes in foreign exchange rates.

In the prior year, the impairment of trade and other receivables was assessed based on the incurred loss model. For receivables which the impairment indications are individually identifiable, allowance for doubtful accounts are recognized by the specific identification method. For aggregate receivables, not individually significant but classified by similar nature, the allowance for doubtful accounts is estimated by the aging analysis method considering the past experience rate.

8. Inventories

Inventories as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	December 31, 2018			December 31, 2017		
	Acquisition cost	Valuation allowance	Carrying amount	Acquisition cost	Valuation allowance	Carrying amount
Merchandise	₩ 261,845	₩ (20,560)	₩ 241,285	₩ 229,763	₩ (24,465)	₩ 205,298
Finished goods	550,914	(26,451)	524,463	465,249	(29,107)	436,142
Semi-finished goods	40,867	(81)	40,786	45,953	(25)	45,928
Work in progress	59,908	(11)	59,897	42,193	(32)	42,161
Raw materials	427,645	(22,413)	405,232	355,065	(18,931)	336,134
Supplies	2,068	(95)	1,973	2,196	(180)	2,016
Materials in transit	250,728	-	250,728	187,285	-	187,285
Total	₩ 1,593,975	₩ (69,611)	₩ 1,524,364	₩ 1,327,704	₩ (72,740)	₩ 1,254,964

Inventories recognized as cost of sales during the year ended December 31, 2018, amounted to ₩ 5,545,152 million (2017: ₩ 4,699,431 million). Reversal of loss on valuation of inventories deducted from cost of sales amounted to ₩ 3,129 million for the same period (2017: ₩ 3,763 million).

9. Derivative Instruments

(1) Details of derivative instruments are as follows:

Purpose	Type of derivative instruments	Description
Cash flow hedge	Foreign currency forward	A contract to avoid cash flow risk arising from forecasted sales in foreign currencies
	Foreign currency swap	A contract to pay fixed interest rate in Korean Won and receive fixed interest rate in foreign currency on future interest and principal payment date to avoid the risk of cash flow fluctuations due to exchange rate fluctuations
	Interest rate swap	A contract to pay fixed interest rate in foreign currency and receive variable interest rate (linked to Libor) in foreign currency on future interest payment date to avoid the risk of cash flow fluctuations due to changes in interest rate (Libor) fluctuations
Purpose of sale	Foreign currency forward	Foreign currency forwards to avoid risk of cash flow fluctuations
	Foreign currency swap	Foreign currency swap to avoid risk of cash flow fluctuations

(2) Details of valuation of derivative instruments as at December 31, 2018 and 2017, are as follows:

(in thousands of foreign currencies and millions of Korean won)

	2018						
	Buy		Sell		Derivative assets (liabilities)	Valuation gain (loss)	Other comprehensive income (loss) [1]
	Currency	Amount	Currency	Amount			
Foreign currency forward	KRW	135,071	USD	120,000	₩ 1,127	₩ -	₩ 1,127
	JPY	4,056,000	KRW	40,343	1,026	-	1,026
	EUR	12,470	GBP	11,164	127	-	82
	Subtotal				₩ 2,280	₩ -	₩ 2,235
Foreign currency swap	USD	600,000	KRW	677,910	₩ (14,254)	₩ -	₩ (9,233)
	EUR	85,070	USD	100,000	2,345	6,221	-
	Subtotal				₩ (11,909)	₩ 6,221	₩ (9,233)
Interest rate swap	USD	600,000	USD	600,000	₩ 10,153	₩ -	₩ 4,636
	Subtotal				₩ 10,153	₩ -	₩ 4,636
	Total				₩ 524	₩ 6,221	₩ (2,362)

[1] The amounts are not adjusted for deferred income tax effect.

(in thousands of foreign currencies and millions of Korean won)

	2017						
	Buy		Sell		Derivative assets (liabilities)	Valuation gain (loss)	Other comprehensive income (loss) [1]
	Currency	Amount	Currency	Amount			
Foreign currency forward	JPY	4,056,000	KRW	40,096	₩ (1,266)	₩ -	₩ (1,266)
	USD	36,000	EUR	30,387	(568)	(2,390)	-
	EUR	34,153	GBP	30,496	(62)	-	(57)
	USD	15,228	CZK	330,060	(370)	-	(466)
	Subtotal				₩ (2,266)	₩ (2,390)	₩ (1,789)
Foreign currency swap	USD	600,000	KRW	677,910	₩ (36,473)	₩ -	₩ (2,323)
	EUR	85,070	USD	100,000	(3,558)	(3,755)	-

		Subtotal			₩	(40,031)	₩	(3,755)	₩	(2,323)
Interest rate swap	USD	600,000	USD	600,000	₩	2,817	₩	-	₩	903
		Subtotal			₩	2,817	₩	-	₩	903
		Total			₩	(39,480)	₩	(6,145)	₩	(3,209)

[1] The amounts are not adjusted for deferred income tax effect.

Derivative instruments are classified as non-current assets (liabilities) if their remaining maturities exceed 12 months from the end of the reporting period; otherwise, they are classified as current assets (liabilities).

Gain or loss relating to the ineffective portion is recognized in profit or loss in applying cash flow hedge.

10. Financial Instruments by Category

(1) Fair Value of financial assets and liabilities by category as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	December 31, 2018					
Financial assets	**Financial assets at Amortized Cost**	**Financial assets at Fair Value through Other Comprehensive Income**	**Financial assets at Fair Value through Profit or Loss**	**Other Financial assets[1]**	**Total**	**Fair Value**
Cash and Cash Equivalents	₩ 1,053,016	₩ -	₩ -	₩ -	₩ 1,053,016	₩ 1,053,016
Short-term financial instruments	261,439	-	-	-	261,439	261,439
Short-term investment securities	1,808	-	12,480	-	14,288	14,288
Trade and other receivables	1,315,840	37,579	-	-	1,353,419	1,353,419
Derivative assets	-	-	2,972	13,981	16,953	16,953
Long-term financial assets	848	-	-	-	848	848
Long -term investment securities	91	91,972	6,946	-	99,009	99,009
Long-term trade and other receivables	10,891	-	-	-	10,891	10,891
Other non-current assets	33,627	-	-	-	33,627	33,627
Total	₩ 2,677,560	₩ 129,551	₩ 22,398	₩ 13,981	₩ 2,843,490	₩ 2,843,490

[1] Other financial assets include derivatives designated as hedging instruments, which are not subject to financial instruments by category.

(in millions of Korean won)	December 31, 2018				
Financial liabilities	**Financial liabilities at Amortized Cost**	**Financial liabilities at Fair Value through Profit or Loss**	**Other Financial liabilities[1]**	**Total**	**Fair Value**
Trade and other payables	₩ 1,613,824	₩ -	₩ -	₩ 1,613,824	₩ 1,613,824
Borrowings and bonds	4,268,809	-	-	4,268,809	4,268,809
Derivative liabilities	-	626	15,803	16,429	16,429

Other current liabilities	37,056	-	-	37,056	37,056
Other non-current liabilities	41,251	-	-	41,251	41,251
Financial guarantee liabilities	1,820	-	-	1,820	1,820
Total	₩ 5,962,760	₩ 626	₩ 15,803	₩ 5,979,189	₩ 5,979,189

[1] Other financial liabilities include derivatives designated as hedging instruments, which are not subject to financial instruments by category.

(in millions of Korean won)	December 31, 2017					
Financial assets	**Financial assets at fair value through profit or loss**	**Loans and receivables**	**Available-for-sale financial assets**	**Held-to-maturity financial assets**	**Derivatives designated as hedging instruments**	**Carrying amount**
Cash and Cash Equivalents	₩ -	₩ 943,481	₩ -	₩ -	₩ -	₩ 943,481
Short-term financial instruments	-	160,167	-	-	-	160,167
Short-term investment securities	34,182	-	-	-	-	34,182
Trade and other receivables	-	1,197,047	-	-	-	1,197,047
Derivative assets	1,678	-	-	-	4,578	6,256
Long-term financial assets	-	11	-	-	-	11
Long -term investment securities	-	-	91,793	1,894	-	93,687
Long-term trade and other receivables	-	16,150	-	-	-	16,150
Other non-current assets	-	38,382	-	-	-	38,382
Total	₩ 35,860	₩ 2,355,238	₩ 91,793	₩ 1,894	₩ 4,578	₩ 2,489,363

(in millions of Korean won)	December 31, 2017			
Financial liabilities	**Financial liabilities at fair value through profit or loss**	**Financial liabilities at amortized cost**	**Derivatives designated as hedging instruments**	**Carrying amount**
Trade and other payables	₩ -	₩ 1,281,736	₩ -	₩ 1,281,736
Borrowings and bonds	-	4,649,001	-	4,649,001
Derivative liabilities	5,803	-	39,933	45,736
Other current liabilities	-	23,722	-	23,722
Other non-current liabilities	-	42,379	-	42,379
Financial guarantee liabilities	-	1,585	-	1,585
Total	₩ 5,803	₩ 5,998,423	₩ 39,933	₩ 6,044,159

(2) Fair value hierarchy classifications of the financial instruments that are measured at fair value as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	December 31, 2018							
	Level 1 [1]		Level 2 [1]		Level 3 [1]		Total	
Financial assets at Fair Value:								
Financial assets at Fair Value through Other Comprehensive Income	₩	-	₩	37,579	₩	91,972	₩	129,551
Financial assets at Fair Value through Profit or Loss		12,480		2,972		6,946		22,398
Other Financial assets		-		13,981		-		13,981
Total	₩	12,480	₩	54,532	₩	98,918	₩	165,930
Financial liabilities at Fair Value:								
Financial liabilities at Fair Value through Profit or Loss	₩	-	₩	(626)	₩	-	₩	(626)
Other Financial liabilities		-		(15,803)		-		(15,803)
Total	₩	-	₩	(16,429)	₩	-	₩	(16,429)

(in millions of Korean won)	December 31, 2017							
	Level 1 [1]		Level 2 [1]		Level 3 [1]		Total	
Financial assets:								
Financial assets at fair value through profit or loss	₩	34,182	₩	1,678	₩	-	₩	35,860
Available-for-sale financial assets		32		-		87,278		87,310
Hedge derivatives		-		4,578		-		4,578
Total	₩	34,214	₩	6,256	₩	87,278	₩	127,748
Financial liabilities:								
Financial liabilities at fair value through profit or loss	₩	-	₩	(5,803)	₩	-	₩	(5,803)
Hedge derivatives		-		(39,933)		-		(39,933)
Total	₩	-	₩	(45,736)	₩	-	₩	(45,736)

[1] Financial instruments that are measured at fair value are categorized by the fair value hierarchy levels, and the defined levels are as follows:

The above table does not include financial assets and liabilities for which the carrying amount does not significantly differ from the fair value.

The defined levels of the above fair value hierarchy classifications of the financial instruments that are measured at fair value, are as follows:

Classification	Description
Level 1	Quoted prices (unadjusted) in active markets for identical assets or liabilities
Level 2	All inputs other than quoted prices included in level 1 that are observable (either directly that is, prices, or indirectly that is, derived from prices) for the asset or liability
Level 3	Unobservable inputs for the asset or liability

The fair value of financial instruments traded in active markets is based on quoted market prices at the reporting date. These instruments are included in level 1. Instruments included in level 1 comprise primarily marketable equity investments classified as available for sale.

The fair value of financial instruments that are not traded in an active market is determined by using valuation techniques. The Group uses various valuation techniques and makes judgments based on current market conditions. These valuation techniques maximize the use of observable market data where it is available 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.

If one or more of the significant inputs is not based on observable market data, the instrument is included in Level 3.

The valuation technique used to measure Level 3 fair value as at December 31, 2018 is the option pricing model, and significant non-observable input variables are interest rate volatility and stock price volatility.

(3) Valuation technique and inputs used in the fair value measurements for hedge derivatives (categorized within Level 2 of the fair value hierarchy) as at December 31, 2018, are as follows:

Valuation technique	Observable Inputs	Description
Present value technique	Forward exchange rate	Based on forward exchange rate disclosed on the market of which remaining period to the maturity equals to that of the forward contract. If there is not any forward exchange rate disclosed under the same conditions stated above, it is calculated by using interpolation method.
	Discount rate	Measured based on the yield curve derived from the market rates disclosed at the end of the reporting period.

(4) Valuation technique and inputs used in the fair value measurements for major financial instruments categorized within Level 3 of the fair value hierarchy as at December 31, 2018, are as follows:

(in millions of Korean won)

Classification	Fair Value	Valuation technique	Inputs	Range of inputs (weighted average)
RCPS	91,035	Option pricing model	Stock price	-10%~10%(0%)
			Stock price volatility	-5%~5%(0%)

Changes in level 3 for recurring fair value measurements for the years ended December 31, 2018, are as follows:

(in millions of Korean won)

	Beginning balance	Effects of Changes in accounting policy	Total Comprehensive Income		Purchases (Issues)	Sales (Settlements)	Others[1]	Ending balance
			Profit or Loss	Other Comprehensive Income				
Financial assets at Fair Value through Other Comprehensive Income	₩ -	₩ 88,215	₩ -	₩ 3,387	₩ –	₩ -	₩ 370	₩ 91,972
Financial assets at Fair Value through Profit or Loss	-	3,546	11	-	3,389	-	-	6,946
Total	₩ -	₩ 91,761	₩ 11	₩ 3,387	₩ 3,389	₩ -	₩ 370	₩ 98,918

[1] Changes due to business combination and exchange differences.

(5) Sensitivity analysis for Recurring Fair Value Measurements Categorized as 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 significant financial instrument for the years ended December 31, 2018, are as follows:

(in millions of Korean won)	2018			
	Favorable changes		Unfavorable changes	
	Profit or Loss	Other Comprehensive Income	Profit or Loss	Other Comprehensive Income
RCPS [1]	₩ -	₩ 21	₩ -	₩ (3)

[1] Changes in their fair value are calculated by increasing or decreasing the correlation between stock price (-10~10%) and discount rate or volatility (-5~5%) and discount rate, which are significant inputs.

(6) Net gains or losses on each category of financial instruments for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	2018						
	Profit or Loss						Other comprehensive income[1]
	Interest income (expense)	Dividend income	Loss on valuation	Impairment reversal	Gain (loss) on disposal	Other	
Financial assets:							
Financial Assets at Amortized Cost	₩ 14,872	₩ -	₩ -	₩ (1,318)	₩ (11,703)	₩ -	₩ -
Financial assets at fair value through other comprehensive income	-	3,181	-	-	-	-	412
Financial assets at fair value through profit or loss	-	1,085	(112)	-	1,227	-	-
Total	₩ 14,872	₩ 4,266	₩ (112)	₩ (1,318)	₩ (10,477)	₩ -	₩ 412
Financial liabilities:							
Financial liabilities at amortized cost	₩ (196,306)	₩ -	₩ -	₩ -	₩ (1,985)	₩ (9,337)	₩ -

[1] The amounts are not adjusted for deferred income tax effect.

in millions of Korean won)	2017						
	Profit or Loss						Other comprehensive income[1]
	Interest income (expense)	Dividend income	Loss on valuation	Impairment reversal	Gain (loss) on disposal	Other	
Financial assets:							
Cash and cash equivalents	₩ 4,980	₩ -	₩ -	₩ -	₩ -	₩ -	₩ -
Financial assets at fair value through profit or loss	-	-	(7,271)	-	(817)	-	-
Loans and receivables	5,419	-	-	18,124	(13,407)	-	-
Available-for-sale financial assets	-	2,109	-	-	25,178	-	(6,877)
Held-to-maturity financial assets	360	-	(464)	-	-	-	-
Total	₩ 10,759	₩ 2,109	₩ (7,735)	₩ 18,124	₩ 10,954	₩ -	₩ (6,877)
Financial liabilities:							
Financial liabilities at amortized cost	₩ (199,358)	₩ -	₩ -	₩ -	₩ (21,538)	₩ (9,775)	₩ -

[1] The amounts are not adjusted for deferred income tax effect.

Among the financial instruments above, the gain of ₩ 847 million from derivatives designated as a cash flow hedge was recognized as other comprehensive income for the year ended December 31, 2018 (2017: loss of ₩ 5,855 million)(Note 9).

In addition, foreign exchange differences, either realized or not, related to foreign currency transactions (other than derivative contracts) mostly resulted from loans and receivables and financial liabilities measured at amortized cost.

11. Interests in Associates and Joint ventures

(1) Set out below are the associates and joint ventures of the Group as at December 31 2018 that are material to the Group.

Name of entity	Type of business	Location	Date of financial statements
Associates:			
Doosan Cuvex Co., Ltd.	Operation of resort and golf club	Korea	December 31
DBC Co., Ltd.	Property leasing	Korea	December 31
Potenit Co., Ltd. [1]	Manufacturing	Korea	December 31
Joint ventures:			
Doosan PSI LLC	Manufacturing and Sales	USA	December 31
Doosan Infracore Liaoning Machinery Sales Co., Ltd.	Sales	China	December 31
Tianjin Lovol Doosan Engine Co., Ltd. [2]	Manufacturing and Sales	China	December 31

[1] For the year ended December 31, 2018, the Group acquired 27.8% of ownership interest in Potenit Co., Ltd. for ₩ 5,333 million. In addition, the Group has a call option to acquire an additional 34.6% interest of Potenit Co., Ltd. exercisable from two to five years after the acquisition date.

[2] For the year ended December 31, 2018, the Group acquired 50.0% of ownership interest in Tianjin Lovol Doosan Engine Co., Ltd. for ₩ 12,727 million.

(2) Details of investments in associates and joint ventures as at December 31, 2018 and 2017, are summarized as follows:

Name of entity	Percentage of ownership (%)	Acquisition cost		Carrying amount		Proportionate share of net assets	
		2018	2017	2018	2017	2018	2017
Associates:							
Doosan Cuvex Co., Ltd.	28.64	₩ 32,068	₩ 32,068	₩ 29,127	₩ 29,367	₩ 27,826	₩ 28,056
DBC Co., Ltd.	23.20	24,592	61,016	24,142	60,971	24,142	60,971
Potenit Co., Ltd.	27.80	5,333	-	4,779	-	(861)	-
Subtotal		₩ 61,993	₩ 93,084	₩ 58,048	₩ 90,338	₩ 51,107	₩ 89,036
Joint ventures:							
Doosan PSI LLC	50.00	₩ 1,108	₩ 1,108	₩ 1,337	₩ 1,091	₩ 1,337	₩ 1,091
Doosan Infracore Liaoning Machinery Sales Co., Ltd.	50.00	12,727	-	8,235	-	11,066	-
Tianjin Lovol Doosan Engine Co., Ltd.	43.00	718	718	292	411	450	411
Subtotal		14,553	1,826	9,864	1,502	12,853	1,502
Total		₩ 76,546	₩ 94,910	₩ 67,912	₩ 91,840	₩ 63,960	₩ 90,538

(3) Changes in investment in associates and joint ventures for the years ended December 31, 2018, are as follows:

(in millions of Korean won)	2018					
Name of entity	Beginning balance	Acquisition	Share of profit (loss)	Share of associates' changes in retained earnings	Others	Ending balance
Doosan Cuvex Co., Ltd.	₩ 29,367	₩ -	₩ (123)	₩ (117)	₩ -	₩ 29,127
DBC Co., Ltd. [1]	60,971	-	(405)	-	(36,424)	24,142
Doosan PSI LLC	1,091	-	196	-	50	1,337
Doosan Infracore Liaoning Machinery Sales Co., Ltd	410	-	(119)	-	1	292
Tianjin Lovol Doosan Engine Co., Ltd.	-	12,727	(3,998)	-	(494)	8,235
Potenit Co., Ltd.	-	5,333	(553)	-	(1)	4,779
Total	₩ 91,839	₩ 18,060	₩ (5,002)	₩ (117)	₩ (36,868)	₩ 67,912

[1] Investment of ₩36,424 million was collected due to the equal reduction of capital for the years ended December 31, 2018

(in millions of Korean won)	2017						
Name of entity	**Beginning balance**	**Acquisition**	**Share of profit (loss)**	**Share of associates' other changes in net assets**	**Share of associates' changes in retained earnings**	**Others**	**Ending balance**
Doosan Cuvex Co., Ltd.	₩ 27,707	₩ 4,486	₩ (3,211)	₩ 456	₩ (71)	₩ -	₩ 29,367
DBC Co., Ltd.	-	61,016	(45)	-	-	-	60,971
Doosan PSI LLC	1,189	-	39	-	-	(137)	1,091
Doosan Infracore Liaoning Machinery Sales Co., Ltd	134	363	(78)	-	-	(9)	410
Total	₩ 29,030	₩ 65,865	₩ (3,295)	₩ 456	₩ (71)	₩ (146)	₩ 91,839

(4) The tables below provide summarized financial information for investment in associates and joint ventures.

(in millions of Korean won)	2018				
Name of entity	**Total assets**	**Total liabilities**	**Sales**	**Profit (loss) for the year**	**Total comprehensive income**
Doosan Cuvex Co., Ltd.	₩ 213,382	₩ 100,557	₩ 66,051	₩ 499	₩ 91
DBC Co., Ltd.	282,276	178,214	-	(1,778)	(1,778)
Doosan PSI LLC	8,695	6,021	16,091	387	387
Doosan Infracore Liaoning Machinery Sales Co., Ltd.	1,826	780	15,415	(194)	(194)
Tianjin Lovol Doosan Engine Co., Ltd	22,353	223	-	(2,334)	(2,334)
Potenit Co., Ltd.	8,478	11,575	813	(1,901)	(1,901)

(in millions of Korean won)	2017				
Name of entity	**Total assets**	**Total liabilities**	**Sales**	**Profit (loss) for the year**	**Total comprehensive income**
Doosan Cuvex Co., Ltd.	₩ 215,456	₩ 102,572	₩ 37,672	₩ (1,002)	₩ 149
DBC Co., Ltd.	262,805	-	-	(195)	(195)
Doosan PSI LLC	10,165	7,980	10,160	82	82
Doosan Infracore Liaoning Machinery Sales Co., Ltd.	1,913	671	12,311	(4)	(4)

(5) The tables below provide a reconciliation of the summarized financial information presented to the carrying amount of its interest in the joint venture or associate.

(in millions of Korean won)	2018					
				Adjustments		
	Net assets at the end of the year (a)	Group's share in % (b)	Group's share in KRW(a*b)	Basis differences	Intergroup transaction and others	Book amount
Doosan Cuvex Co., Ltd. [1]	₩ 112,825	28.64	₩ 27,826	₩ 1,301	₩ -	₩ 29,127
DBC Co., Ltd.	104,062	23.20	24,142	-	-	24,142
Doosan PSI LLC	2,674	50.00	1,337	-	-	1,337
Doosan Infracore Liaoning Machinery Sales Co., Ltd.	1,046	43.00	450	-	(158)	292
Tianjin Lovol Doosan Engine Co., Ltd	22,131	50.00	11,066	-	(2,831)	8,235
Potenit Co., Ltd.	(3,097)	27.80	(861)	5,640	-	4,779

[1] Interests of preferred shares are not included.

12. Property, Plant and Equipment

(1) Changes in property, plant and equipment for the years ended December 31, 2018 and 2017, are as follows:

in millions of Korean won	2018								
	Land	Buildings	Structures	Machinery	Vehicles	Tools	Equipment	Construction in progress	Total
Opening net book amount	₩ 817,287	₩ 408,408	₩ 34,890	₩ 403,713	₩ 2,651	₩ 53,084	₩ 9,824	₩ 57,047	₩ 1,786,904
Acquisitions / Capital expenditure	4,555	12,141	1,472	25,012	1,913	25,824	5,869	93,167	169,953
Transfers	(5,492)	5,558	758	35,678	440	(125)	603	(45,777)	(8,357)
Disposals	(21,758)	(3,578)	(35)	(1,877)	(617)	(685)	(239)	(377)	(29,166)
Depreciation	-	(18,570)	(3,092)	(93,139)	(1,019)	(22,244)	(4,094)	-	(142,158)
Impairment loss	-	(1,233)	(360)	(461)	-	-	-	-	(2,054)
Reversal of Impairment loss	-	-	-	-	-	18	-	-	18
Others	(418)	3,275	(54)	2,082	(36)	2	26	2,616	7,493
Closing net book amount	₩ 794,174	₩ 406,001	₩ 33,579	₩ 371,008	₩ 3,332	₩ 55,874	₩ 11,989	₩ 106,676	₩ 1,782,633
Acquisition cost	₩ 536,688	₩ 677,672	₩ 84,762	₩ 1,080,020	₩ 13,623	₩ 255,583	₩ 75,407	₩ 106,676	₩ 2,830,431
Accumulated depreciation	-	(216,459)	(44,671)	(687,871)	(9,736)	(191,230)	(61,648)	-	(1,211,615)
Accumulated impairment losses	(5,821)	(51,078)	(6,512)	(17,427)	(555)	(8,479)	(1,770)	-	(91,642)
Accumulated gain on revaluation	263,307	-	-	-	-	-	-	-	263,307
Government grants	-	(4,134)	-	(3,714)	-	-	-	-	(7,848)

in millions of Korean won	2017								
	Land	Buildings	Structures	Machinery	Vehicles	Tools	Equipment	Construction in progress	Total
Opening net book amount	₩ 775,658	₩ 431,440	₩ 38,487	₩ 439,541	₩ 2,442	₩ 51,960	₩ 9,876	₩ 73,696	₩ 1,823,100
Acquisitions / Capital expenditure	5,495	6,274	642	13,493	2,002	16,707	4,412	63,259	112,284
Revaluation	45,372	-	-	-	-	-	-	-	45,372
Transfers	2,084	5,457	108	47,509	32	8	68	(57,229)	(1,963)
Disposals	(845)	(3,644)	(275)	(2,299)	(490)	(59)	(266)	(20,688)	(28,566)
Depreciation	-	(18,291)	(3,395)	(94,086)	(1,346)	(19,829)	(4,122)	-	(141,069)
(Reversal of) Impairment loss	(6,994)	-	-	10,872	93	4,550	157	-	8,678
Others	(3,483)	(12,828)	(677)	(11,317)	(82)	(253)	(301)	(1,991)	(30,932)
Closing net book amount	₩ 817,287	₩ 408,408	₩ 34,890	₩ 403,713	₩ 2,651	₩ 53,084	₩ 9,824	₩ 57,047	₩ 1,786,904
Acquisition cost	₩ 552,238	₩ 689,583	₩ 82,769	₩ 1,066,283	₩ 12,984	₩ 240,140	₩ 74,300	₩ 57,047	₩ 2,775,344
Accumulated depreciation	-	(215,886)	(41,677)	(640,918)	(9,698)	(177,641)	(62,162)	-	(1,147,982)
Accumulated impairment losses	(6,089)	(61,022)	(6,202)	(18,285)	(635)	(9,415)	(2,314)	-	(103,962)
Accumulated gain on revaluation	271,138	-	-	-	-	-	-	-	271,138
Government grants	-	(4,267)	-	(3,367)	-	-	-	-	(7,634)

Land, after initial recognition, is measured using a revaluation model. As at December 31, 2018, the carrying amount of land would be ₩ 536,688 million if measured based on a cost model.

Certain land, buildings and machinery are pledged as collaterals as at December 31, 2018 in connection with the borrowings from Korea Development Bank, etc.

(2) The Group revalued its land assets as follows:

For the year ended December 31, 2013, the Group initially remeasured all land assets using fair value at the date of the revaluation. As at December 31, 2018, the fair values of land assets are determined from appraisal that is undertaken by independently qualified valuators, KYUNGIL APPRAISAL CO., LTD. (“KYUNGIL”) and others on November 30, 2017. KYUNGIL and others are members of Korea Association of Property Appraisers and comprise certified professionals that have a significant amount of industry experience.

Fair value of a land is determined by reference to Officially Assessed Reference Land Price (“OARLP”), announced by the Ministry of Land, Infrastructure, and Transport, and recent market transactions of similar and recently sold parcels nearby the subject land in order to derive an indication of the most probable sales price (or value) of the land.

(3) Fair value measurements of land asset by fair value hierarchy level as at December 31, 2018, are as follows:

(in millions of Korean won)

Type	Level 1	Level 2	Level 3	Total
Land	₩ -	₩ -	₩ 794,174	₩ 794,174

(4) Valuation methodologies and inputs used for fair value measurements of land assets are as follows:

Valuation methodology	Significant inputs that are not based on observable market data (unobservable inputs)	Correlation between unobservable inputs and fair value arguments
Officially Assessed Reference Land Price	Fluctuation rate of land price and others	Fair value increases (decreases) if rate of land price increases (decreases)
OARLP of similar parcels nearby the subject land, reflating corrections necessary for differences between the subject and the comparable	Parcel conditions and others	Fair value increases (decrease) if corrections of parcel conditions and others increase (decrease)
	Land conditions affecting the sales price and others	Fair value increases (decreases) if correction of land conditions affecting the sales price increases (decreases)

(5) The effect of applying revaluation model to land for the year ended December 31, 2017, is as follows:

(in millions of Korean won)

Beginning balance	Acquisitions	Revaluation	Impairment loss	Disposals	Others	Ending balance
₩ 775,658	₩ 5,495	₩ 45,372	₩ (6,994)	₩ (845)	₩ (1,399)	₩ 817,287

(6) Borrowing costs added to the cost of property, plant and equipment for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	2018	2017
Borrowing costs added to the cost of property, plant and equipment	₩ 832	₩ 716
Interest rate (%)	4.19%	4.10%

(7) Classification of depreciation expenses for the years ended December 31, 2018 and 2017, is as follows:

(in millions of Korean won)	2018	2017
Cost of sales	₩ 109,979	₩ 111,498
Selling and administrative expenses	13,405	10,466
Research and development expenses, etc.	18,774	19,105
Total	₩ 142,158	₩ 141,069

13. Intangible Assets

(1) Changes in intangible assets for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)

	2018					
	Goodwill	Industrial rights	Development costs	Emission Rights	Other Intangible Assets	Total
Beginning balance	₩ 2,796,421	₩ 1,063,092	₩ 220,543	₩ -	₩ 89,226	₩ 4,169,282
Additions – internal development	-	-	90,915	-	-	90,915
Acquisitions	-	1	-	2,200	16,488	18,689
Transfers	-	537	184	-	6,464	7,185
Disposals	-	-	-	-	(178)	(178)
Amortization	-	(848)	(66,158)	-	(30,932)	(97,938)
Impairment loss	-	-	(15,810)	-	(307)	(16,117)
Others	123,691	28,951	3,381	-	795	156,818
Ending balance	₩ 2,920,112	₩ 1,091,733	₩ 233,055	₩ 2,200	₩ 81,556	₩ 4,328,656
Acquisition cost	₩ 2,954,622	₩ 1,257,146	₩ 823,367	₩ 2,200	₩ 431,492	₩ 5,468,827
Accumulated amortization	-	(165,413)	(494,694)	-	(320,222)	(980,329)
Accumulated impairment loss	(34,510)	-	(95,618)	-	(29,714)	(159,842)

(in millions of Korean won)

	2017				
	Goodwill	Industrial rights	Development costs	Other Intangible Assets	Total
Beginning balance	₩ 2,948,134	₩ 1,158,270	₩ 236,435	₩ 97,859	₩ 4,440,698
Additions – internal development	-	-	58,785	-	58,785
Acquisitions	-	-	-	18,676	18,676
Transfers	-	634	4,546	5,997	11,177
Disposals	-	-	-	(1,176)	(1,176)
Amortization	-	(13,778)	(69,301)	(30,341)	(113,420)
Impairment loss	-	-	-	(458)	(458)
Reversal of Impairment loss	-	-	-	1,867	1,867
Others	(151,713)	(82,034)	(9,922)	(3,198)	(246,867)
Ending balance	₩ 2,796,421	₩ 1,063,092	₩ 220,543	₩ 89,226	₩ 4,169,282
Acquisition cost	₩ 2,831,294	₩ 1,226,270	₩ 723,908	₩ 418,684	₩ 5,200,156
Accumulated amortization	-	(163,178)	(423,556)	(298,346)	(885,080)
Accumulated impairment loss	(34,873)	-	(79,809)	(31,112)	(145,794)

The aggregated carrying amount of goodwill and others with indefinite useful lives in other intangible assets item is ₩ 4,018,278 million and ₩ 3,864,933 million as at December 31, 2018 and 2017, respectively.

(2) Emission Rights

Changes in emission rights for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	2018						2017	
	1st		2nd		Total		1st	
	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
Beginning balance	145,810	₩ -	-	₩ -	145,810	₩ -	110,207	₩ -
Allocation with nil consideration (allocation cancellation)	(988)	-	72,062	-	71,074	-	132,974	-
Purchases	-	-	100,000	2,200	100,000	2,200	-	-
Sales	(109,549)	-	-	-	(109,549)	-	-	-
Surrendered to the government[1]	(35,273)	-	(53,377)	-	(88,650)	-	(97,371)	-
Ending balance	-	₩ -	118,685	₩ 2,200	118,685	₩ 2,200	145,810	₩ -

[1] The quantity of surrendered to the government for the year ended December 31, 2018 is an estimation, which will be settled in 2019.

(3) Carrying amount and remaining amortization period of each significant development project as at December 31, 2018, is as follows:

(in millions of Korean won)

Name of development asset	Carrying amount	Remaining amortization period [1]
Development project for Stage 5	₩ 38,150	-
Development project for Gen 6 Loaders	22,155	-
Development project for vehicle engines	8,055	-
Development project for electronic generator engine	5,241	-
Development project for large-sized excavator(DX800)	4,102	41 months

[1] Remaining amortization period is presented only when amortization was begun. Otherwise, remaining amortization period is presented as “-”.

(4) Impairment losses on intangible assets for the year ended December 31, 2018, is as follows:

(in millions of Korean won)

Related account	Separate asset	Acquisition cost	Impairment loss		Carrying amount	Recoverable amount valuation method
			2018	Accumulated		
Development costs	Development of next-generation tank engines [1]	₩ 9,889	₩ 9,889	₩ 9,889	₩ -	Value in use
	Development of Tier3 engine for vessel [2]	3,663	3,663	3,663	-	

	Development of DV32 engine for generator[2]	521	521	521	-	
	Development of DL06 engine[3]	3,564	1,738	1,738	1,826	
Other Intangible assets	Membership [4]	22,907	306	13,105	9,802	Fair value
		₩ 40,544	₩ 16,117	₩ 28,916	₩ 11,628	

[1] The total carrying amount was recognized as impairment loss due to the uncertainty over the juncture of mass-production caused by the delay in implementation of the government project.
[2] The total carrying amount was recognized as impairment loss due to the decision to suspend the development project.
[3] Certain part of the carrying amount was recognized as impairment loss due to the decrease in value-in-use resulting from the shrunk quantity compared to the estimation made at the time of development.
[4] Recoverable amount was estimated to reflect the fair value of individual assets.

(5) Classification of Impairment losses for the years ended December 31, 2018 and 2017, is as follows:

(in millions of Korean won)		**2018**		**2017**
Non-operating expenses	₩	16,117	₩	458
Non-operating income		-		1,867

(6) Borrowing costs added to the cost of intangible assets for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		**2018**		**2017**
Borrowing costs added to the cost of intangible assets	₩	2,308	₩	1,349
Interest rate (%)		4.19		4.10

(7) Classification of amortization expenses for the years ended December 31, 2018 and 2017, is as follows:

(in millions of Korean won)		**2018**		**2017**
Cost of sales	₩	67,204	₩	68,115
Selling and administrative expenses		30,505		44,987
Research and development expenses, etc.		229		318
Total	₩	97,938	₩	113,420

(8) The Group recognized total research and development costs of ₩ 152,876 million (2017: ₩ 143,428 million) as expenses in ‘Selling and administration expenses’.

(9) Impairment test of goodwill

The table below summarizes goodwill allocation for each operating segment.

(in millions of Korean won)

Classification	Doosan Bobcat Inc. and subsidiaries		Doosan Infracore Norway AS		Total	
Goodwill	₩	2,917,423	₩	2,689	₩	2,920,112

The Group uses cash flow projections based on financial budgets approved by the directors covering five-year periods for a value-in-use calculation. The financial budgets are determined based on historical result and expectation of market growth. The assumptions for the calculation of value-in-use, as at December 31, 2018, are as follows:

Classification	Doosan Bobcat Inc. and subsidiaries	Doosan Infracore Norway AS
Growth rate	1.50%	1.50%
Discount rate	9.63%	9.70%

Cash flows beyond that five-year periods have been extrapolated using the fifth-year cash flow. The growth rate does not exceed long-term average growth rate of market, and the discount rates used reflect relevant risks specific to the cash-generating units.

The Group calculated recoverable amount for each cash-generating unit based on value-in-use, and concluded that there was no impairment loss to recognize for the year ended December 31, 2018, since the total carrying amount did not exceed the recoverable amount.

14. Investment Properties

Changes in investment properties for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	2018						2017					
	Land		Building		Total		Land		Building		Total	
Beginning balance	₩	18,246	₩	2,364	₩	20,610	₩	47,550	₩	3,826	₩	51,376
Transfers		5,985		430		6,415		(2,225)		2,225		-
Disposals		-		-		-		(11,731)		(3,334)		(15,065)
Depreciation		-		(159)		(159)		-		(291)		(291)
Impairment loss		(504)		-		(504)		(15,121)		-		(15,121)
Others		(54)		-		(54)		(227)		(62)		(289)
Ending balance	₩	23,673	₩	2,635	₩	26,308	₩	18,246	₩	2,364	₩	20,610
Acquisition cost	₩	38,694	₩	5,972	₩	44,666	₩	33,085	₩	5,542	₩	38,627
Accumulated depreciation		-		(2,263)		(2,263)		-		(2,104)		(2,104)
Accumulated impairment losses		(15,021)		(1,074)		(16,095)		(14,839)		(1,074)		(15,913)

Fair value of land in Investment properties as at December 31, 2018, is ₩ 23,673 million (2017: ₩ 18,246 million). Meanwhile, during the year, rental income from investment property is ₩ 257 million (2017: ₩ 759 million).

15. Trade and Other Payables

Trade and other payables as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		**2018**		**2017**
Current :				
Trade payables	₩	1,037,815	₩	857,644
Other payables		293,403		220,559
Accrued expenses		282,606		203,533
Total	₩	1,613,824	₩	1,281,736
Non-current :				
Other payables	₩	1,157	₩	1,219

16. Borrowings and Bonds

(1) Details of carrying amount of bonds as at December 31, 2018 and 2017, are as follows:

(in thousands of foreign currencies and millions of Korean won)

Category	**Annual interest rate (%) as at December 31, 2018**		**2018**		**2017**
Public bonds	2.375~5.865	₩	757,860	₩	1,002,724
Private bonds	4.50~6.03		232,000		195,000
Bond with warrants	2.00		494,561		495,714
Subtotal		₩	1,484,421	₩	1,693,438
Less: present value of discount			(6,639)		(10,549)
Less: present value of discount on bonds with warrants			(6,235)		(7,730)
Less: Redemption Premium on bonds with warrants			76,249		76,427
Adjustment on bonds with warrants			(98,396)		(121,988)
Subtotal		₩	1,449,400	₩	1,629,598
Less: current portion(including present value of discount)			(505,339)		(474,642)
Total		₩	944,061	₩	1,154,956

(2) Details of carrying amount of long-term and short-term borrowings as at December 31, 2018 and 2017, are as follows:

1) Short-term borrowings

(in thousands of foreign currencies and millions of Korean won)

Category	Creditor	Annual interest rate (%) as at December 31, 2018		2018		2017
Borrowings in Korean Won	Korea Exim Bank and others	3.95~4.40	₩	593,500	₩	988,200
Borrowings in foreign currencies	Korea Development Bank and others	4.79~5.96		241,074		307,262
Usance	Shinhan Bank and others	0.30~3.26		89,936		83,534
Transferred receivables [1]	KEB Hana Bank and others	-		13,090		30,291
Total			₩	937,600	₩	1,409,287

[1] Financial liabilities related to transferred trade receivables that do not meet the derecognition criteria amounted to ₩ 13,090 million and ₩ 30,291 million as at December 31, 2018 and 2017, respectively. Trade receivables are pledged as collaterals for these liabilities

2) Long-term borrowings

(in thousands of foreign currencies and millions of Korean won)

Category	Creditor	Annual interest rate (%) as at December 31, 2018		2018		2017
Borrowings in Korean Won	Korea Development Bank and others	3.99~4.40	₩	380,000	₩	38,333
Borrowings in foreign currencies	Korea Exim Bank	3M Libor+2.76	USD	117,600	USD	147,000
	The Export-Import bank of China	5.00	USD	89,000		-
	Korea Exim Bank	5.00	USD	20,000		-
	Korea Exim Bank	2.33	EUR	38,000		-
	US multiple institutions of investors and banks	3M Libor+2.00	USD	971,463	USD	1,234,913
	BNP Paribas	2.3~2.75	USD	15,232	USD	19,094
	Innovasjon Norge	3.15	NOK	17,387	NOK	21,367
	Bank of New York	8.00	USD	4,250	USD	4,250
	Cinda Financial Leasing Co., Ltd	5.46~5.70	CNY	228,343	CNY	75,557
	Industrial and Commercial Bank of China	4.75	CNY	301	CNY	14,974
	China Railway Construction Financial Leasing Co., Ltd.	4.57~4.99	CNY	243,652	CNY	348,827
	Bank of Tianjin Financial Leasing Co., Ltd.	5.23	CNY	143,805		-
	Minsheng Financial Leasing Co., Ltd.	-		-	CNY	7,188
	Subtotal		EUR	38,000		-

(in thousands of foreign currencies and millions of Korean won)

Category	Creditor	Annual interest rate (%) as at December 31, 2018	2018		2017	
			USD	1,217,545	USD	1,405,257
			CNY	616,101	CNY	446,546
			NOK	17,387	NOK	21,367
	Korean won equivalent		₩	1,892,341	₩	1,619,700
	Less: present value of discount			(10,532)		(9,584)
	Subtotal		₩	1,881,809	₩	1,610,116
	Less: current portion			(173,048)		(96,310)
	Total		₩	1,708,761	₩	1,513,806

(3) Detailed terms of bonds with warrants as at December 31, 2018 are as follows:

1) Details of changes and issuance conditions of bonds with warrants issued by the Group as at December 31, 2018 are as follows:

Date of issue	Maturity date	Coupon rate(%)	YTM(%)	Exercisable period	Exercise price	Issuing price
2017-08-01	2022-08-01	2.00%	4.75%	From one month after date of issue to one month before maturity	₩ 8,030 per share	₩ 500,000 million

① Early redemption clause

The early redemption right is exercisable as a whole or in part against the par value of bond with stock warrants at the interest payment date in 3 years after the date of issuance of bonds.

② Maturity redemption

The coupon rate for the bond is 2.0% and for bonds not converted until maturity, 115.4175% of the principal amount will be paid on August 1, 2022 with a yield to maturity rate of 4.75% compounded quarterly.

③ Calculation of the exercise price

The exercise price will be adjusted when there is an increase in paid-in capital through issuance of shares at a price lower than the market price, stock dividends, or capitalization of reserves, before exercising the stock warrants or when there is an issuance of stock purchase warrants or debt securities with warrants. The exercise price of stock warrants was adjusted to ₩7,620 from October 31, 2018.

2) Details of bonds with warrants as at December 31, 2018 are as follows:

(in millions of Korean won)

Type		Beginning balance		Exercise/Amortization		Ending balance
Bonds with warrants	₩	495,714	₩	(1,153)	₩	494,561
Redemption Premium on bonds with warrants		76,427		(178)		76,249
Present value of discount		(7,730)		1,495		(6,235)
Stock warrants adjustment		(121,988)		23,592		(98,396)
Carrying amount	₩	442,423	₩	23,756	₩	466,179
Compensation for stock warrants(other capital surplus)	₩	41,596	₩	(115)	₩	41,481

Due to the exertion of stock warrant, As at December 31, 2018, 1.13% of the outstanding balance of 31st warrant were exercised and 1.09% of the principal amount of the bonds was paid. The cumulative number of shares issued as a result of the exertion of stock warrants for 31st warrants is 702,763.

17. Net Defined Benefit Liabilities

(1) Details of net defined benefit liabilities recognized in the statements of financial position as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		2018		2017
Present value of funded defined benefit obligations	₩	973,888	₩	1,022,237
Fair value of plan assets [1]		(567,782)		(570,379)
Net defined benefit liabilities	₩	406,106	₩	451,858

[1] The contributions to the National Pension Fund of ₩ 148 million are included in the fair value of plan assets as at December 31, 2018 (2017: ₩ 153 million).

(2) Profit and loss recognized for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		2018		2017
Current service cost	₩	36,308	₩	33,866
Past service cost and (gains or) losses on settlements		(6,669)		(2,027)
Net interest cost		17,514		21,533
Total	₩	47,153	₩	53,372

(3) Classification of post-employment benefits for the years ended December 31, 2018 and 2017, is as follows:

(in millions of Korean won)		2018		2017
Cost of sales	₩	23,377	₩	28,194
Selling and administrative expenses		18,918		20,546
Research and development expenses, etc.		4,858		4,632
Total	₩	47,153	₩	53,372

(4) Changes in the defined benefit obligations for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		2018		2017
Beginning balance	₩	1,022,237	₩	1,056,809
Current service cost		36,308		33,866
Past service cost and gains or losses on settlements		(6,669)		(2,027)
Transfer in		1,854		1,520
Transfer out		(620)		(1,077)
Interest expense		34,117		36,788
Remeasurements:				
Actuarial loss from change in demographic assumptions		(17,437)		5,304
Actuarial loss from change in financial assumptions		(82,853)		42,429
Actuarial loss (gain) from others		2,599		8,903
Contributions from employees		2,509		2,723
Payments from plans		(51,319)		(60,227)
Exchange differences		33,162		(102,774)
Ending balance	₩	973,888	₩	1,022,237

(5) Changes in the fair value of plan assets for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		2018		2017
Beginning balance	₩	570,379	₩	546,708
Expected return on plan assets		16,603		15,256
Transfer in		913		758
Transfer out		(383)		(568)
Remeasurements:		(47,920)		46,945
Contributions from employees		22		25
Contributions from employers		43,580		51,690
Payments from plans:		(32,163)		(38,859)

(in millions of Korean won)		2018		2017
Exchange differences		16,751		(51,576)
Ending balance	₩	567,782	₩	570,379

Actual gain or loss on plan assets is recognized as ₩ 31,317 million (loss) and ₩ 62,201 million (gain) for the years ended December 31, 2018 and 2017, respectively. The Group plans to contribute ₩ 68,763 million to the defined benefit plans in 2019.

(6) The significant actuarial assumptions as at December 31, 2018 and 2017, are as follows:

(in percentage, %)	2018	2017
Discount rate	2.00 ~ 4.30	1.90 ~ 3.70
Salary growth rate	2.10 ~ 4.80	2.40 ~ 4.80

(7) Plan assets as at December 31, 2018 and 2017, consist of:

(in millions of Korean won)		2018		2017
Time deposits	₩	128,674	₩	113,497
Equity instruments		135,883		164,258
Debt instruments		272,559		266,193
Others		30,666		26,431
Total	₩	567,782	₩	570,379

The expected return on plan assets is determined by considering the expected return applicable to the assets held by the Group in accordance with its current investment strategy. Expected rate of return on debt securities is based on total redemption yield at the end of the reporting period. For equity securities and investment of other assets, expected return reflects long-term experience of actual rate of return in the market.

(8) The sensitivity of the defined benefit obligation to changes in the principal assumptions is:

(in millions of Korean won)	2018			2017		
		Amount	Rate		Amount	Rate
Discount rate:						
1% increase	₩	(110,326)	(11.33%)	₩	(123,261)	(12.06%)
1% decrease		137,391	14.11%		158,645	15.52%
Salary increase rate:						
1% increase		25,127	2.58%		21,888	2.14%
1% decrease		(22,303)	(2.29%)		(19,514)	(1.91%)

(9) The weighted average maturity of the defined benefit obligation is 12.72 years.

18. Provisions

Changes in provision, for the year ended December 31, 2018, nd 2017, are as follows:

(in millions of Korean won)	2018						
	Beginning balance	Increases	Decreases	Others	Ending balance	Less: current portion	Non-current portion
Product warranties	₩ 165,715	₩ 142,715	₩ (92,710)	₩ (18,228)	₩ 197,492	₩ (177,115)	₩ 20,377
Returned goods [1]	5,336	-	(5,427)	91	-	-	-
Others	5,593	5,543	(9,060)	(124)	1,952	(1,952)	-
Total	₩ 176,644	₩ 148,258	₩ (107,197)	₩ (18,261)	₩ 199,444	₩ (179,067)	₩ 20,377

[1] According to the previous accounting standard, the Group recognized the provision for returns by measuring net amounts based on the gross profit. The Group recognizes total expected amounts to refund as the contract liability (refund liability) when return has occurred in Korean IFRS 1115.

(in millions of Korean won)	2017						
	Beginning balance	Increases	Decreases	Others	Ending balance	Less: current portion	Non-current portion
Product warranties	₩ 138,855	₩ 302,082	₩ (259,062)	₩ (16,160)	₩ 165,715	₩ (156,131)	₩ 9,584
Returned goods	2,361	1,272	(906)	2,609	5,336	(5,336)	-
Others	31,736	4,903	(27,964)	(3,082)	5,593	(5,593)	-
Total	₩ 172,952	₩ 308,257	₩ (287,932)	₩ (16,633)	₩ 176,644	₩ (167,060)	₩ 9,584

The Group recognizes provision by estimating expected expenses in relation to product warranty, exchange or refund, maintenance services and others that considered of warranty period and historical experience. Meanwhile, the Group recognizes provisions as other liabilities for pending litigations amounting to ₩ 10,152 million which includes ₩ 4,229 million that quoted in the ordinary wages litigation.

19. Share Capital and Capital Surplus

Changes in share capital and Capital Surplus for the year ended December 31, 2018, are as follows:

(in millions of Korean won)

Date	Description	Number of common stocks issued	Share capital	Capital Surplus	Consideration for Stock Warrants	Other capital surplus
2018.01.01	Beginning balance	208,000,119	₩ 1,040,001	₩ 148,138	₩ 41,596	₩ 21,812
2018.01.31	Exercise of stock warrants	142,562	712	444	(103)	-
2018.02.19	Cancellation of share options	-	-	-	-	207
2018.02.28	Exercise of stock warrants	3,011	15	-	(2)	-
2018.03.20	Cancellation of share options	-	-	-	-	650
2018.03.31	Cancellation of share options	-	-	-	-	261
2018.03.31	Exercise of stock warrants	1,007	5	1	(1)	-
2018.04.30	Exercise of stock warrants	899	5	-	(1)	-
2018.05.31	Exercise of stock warrants	5,455	28	14	(4)	-
2018.06.30	Exercise of stock warrants	664	3	-	-	-
2018.07.31	Exercise of stock warrants	149	1	-	-	-
2018.08.31	Exercise of stock warrants	2,841	13	6	(3)	-
2018.09.30	Exercise of stock warrants	354	2	-	-	-
2018.10.31	Exercise of stock warrants	149	1	-	-	-
2018.11.30	Exercise of stock warrants	578	3	-	(1)	-
2018.12.31	Exercise of stock warrants	289	1	-	-	-
2018.12.31	Ending balance	208,158,077	₩ 1,040,790	₩ 148,603	₩ 41,481	₩ 22,930

The Parent Company's total number of authorized shares is 400,000,000 shares and the total number of ordinary shares issued is 208,158,077 shares (2017: 208,000,119 shares) with a par value of ₩ 5,000 per share. As at December 31, 2018, the number of non-voting shares under the Commercial Law is 505 shares (2017: 505 shares).

20. Other Components of Equity

(1) Other components of equity as at December 31, 2018 and 2017, consist of:

(in millions of Korean won)		2018		2017
Treasury share	₩	(2)	₩	(2)
Loss on disposal of treasury share		(7,909)		(7,909)
Share options		1,926		3,044
Other capital adjustments		(123,326)		(103,590)
Total	₩	(129,311)	₩	(108,457)

(2) Share-based Payments

The Group granted share options number of times to its directors. Methods to grant share options, issuance of new shares, issuance of treasury shares or cash settlement, are decided by the Board of Directors at their meeting to be held on stock exercise date. These share options carry a two-year service vesting condition, subsequent to the resolution made at the shareholders' meeting. The number of granted options as at December 31, 2018, is as follows:

(in Korean won except for share data)

Date of grant	Description	Number of granted options	Exercisable period	Exercisable price	Expected fair value at the date of grant
2009.03.27	5th grant	7,750	2012.03.27~2019.03.26	15,600	7,674
2010.03.26	6th grant	25,470	2013.03.26~2020.03.25	19,400	10,543
2011.03.25	7th grant	14,100	2014.03.25~2021.03.24	30,700	16,800
2012.03.30	8th grant	40,600	2015.03.30~2022.03.29	22,300	11,951
2013.03.29	9th grant	39,800	2016.03.29~2023.03.28	15,700	8,477
2014.03.21	10th grant	83,600	2017.03.21~2024.03.20	13,600	6,436
	Total	211,320			

Changes in share option for the year ended December 31, 2018, are as follows:

	Number of common stocks to be issued (in shares)			Valuation amount (in millions of Korean won)					
	Beginning balance	Forfeited	Ending balance		Beginning balance		Increasse(Decreases)		Ending balance
4th grant	41,400	(41,400)	-	₩	651	₩	(651)	₩	-
5th grant	12,050	(4,300)	7,750		93		(33)		60
6th grant	33,170	(7,700)	25,470		350		(81)		269
7th grant	18,000	(3,900)	14,100		302		(66)		236
8th grant	49,300	(8,700)	40,600		589		(104)		485
9th grant	52,000	(12,200)	39,800		441		(103)		338
10th grant	96,100	(12,500)	83,600		618		(80)		538
Total	302,020	(90,700)	211,320	₩	3,044	₩	(1,118)	₩	1,926

There is no expense recognized due to share option granted in prior year. In addition, there are no compensation cost to be recognized for the year ended December 31, 2018, and for prospective period.

The Group calculated the compensation costs by applying fair value approach. Assumptions used in determining fair value of share options are as follows:

	Risk-free interest rate [1]	**Expected exercisable period**	**Expected volatility**	**Expected dividend yield ratio**
5th grant	4.74%	6.5 years	59.76%	1.67%
6th grant	4.53%	6.5 years	58.82%	1.34%
7th grant	4.19%	6.5 years	58.01%	1.07%
8th grant	3.80%	6.5 years	57.96%	0.44%
9th grant	2.57%	6.5 years	54.12%	0.21%
10th grant	3.27%	6.5 years	42.29%	0.00%

[1] Risk-free interest rate is based on 5-year and 10-year treasury bond yield rate.

21. Accumulated Other Comprehensive Income

(1) Changes in accumulated other comprehensive income for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won):	**2018**					
	Gain on valuation of financial assets at fair value through other comprehensive income	**Share of other comprehensive income of associates**	**Exchange differences**	**Cash flow hedges**	**Revaluation reserves of property, plant and equipment**	**Total**
Beginning balance	₩ 2,244	₩ 428	₩ (500,942)	₩ (4,206)	₩ 168,425	₩ (334,051)
Increase	296	-	79,550	-	-	79,846
Decrease	-	-	-	(229)	(2,371)	(2,600)
Ending balance	₩ 2,540	₩ 428	₩ (421,392)	₩ (4,435)	₩ 166,054	₩ (256,805)

(in millions of Korean won):	**2017**					
	Changes in the fair value of available-for-sale financial assets	**Share of other comprehensive income of associates**	**Exchange differences**	**Cash flow hedges**	**Revaluation reserves of property, plant and equipment**	**Total**
Beginning balance	₩ 6,648	₩ 59	₩ (415,688)	₩ 660	₩ 137,950	₩ (270,371)
Increase	-	369	-	-	30,475	30,844

Decrease		(4,404)		-		(85,254)		(4,866)		-	(94,524)
Ending balance	₩	2,244	₩	428	₩	(500,942)	₩	(4,206)	₩	168,425	₩ (334,051)

(2) Income tax effects directly recognized in accumulated other comprehensive income (loss) as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		2018				
Description		**Before tax**		**Deferred tax assets (liabilities)**		**After tax**
Gain on valuation of financial assets at fair value through other comprehensive income	₩	3,384	₩	(844)	₩	2,540
Share of other comprehensive income of associates		428		-		428
Exchange differences		(421,392)		-		(421,392)
Unrealized loss on valuation of derivatives		(2,362)		(2,073)		(4,435)
Gain on revaluation of property, plant and equipment		259,677		(93,623)		166,054
Total	₩	(160,265)	₩	(96,540)	₩	(256,805)

(in millions of Korean won)		2017				
Description		**Before tax**		**Deferred tax assets (liabilities)**		**After tax**
Gain on valuation of financial assets at fair value through other comprehensive income	₩	2,992	₩	(748)	₩	2,244
Share of other comprehensive income of associates		428		-		428
Exchange differences		(500,942)		-		(500,942)
Unrealized loss on valuation of derivatives		(3,209)		(997)		(4,206)
Gain on revaluation of property, plant and equipment		261,727		(93,302)		168,425
Total	₩	(239,004)	₩	(95,047)	₩	(334,051)

22. Retained Earnings

(1) Retained earnings as at December 31, 2018 and 2017, consist of:

(in millions of Korean won)		2018		2017
Retained earnings before appropriation	₩	1,049,189	₩	784,702

(2) The appropriation of retained earnings for the years ended December 31, 2018 and 2017, is as follows:

(in millions of Korean won)		2018		2017
1. Unappropriated retained earnings carried over from prior year	₩	784,702	₩	578,246
2. Changes in accounting policy		(899)		-
3. Unappropriated retained earnings carried over from prior year – after changes		783,803		578,246
4. Profit (loss) for the year		246,410		148,594
5. Revaluation and disposal of property, plant and equipment		5,373		-
6. Remeasurements of net defined benefit liabilities		13,693		(5,908)
7. Dividends		-		(18,366)
8. Change in retained earnings of equity method investment securities		(105)		(64)
9. Transfer from capital surplus		-		82,200
10. Valuation of equity instruments at fair value		15		-
11. Unappropriated retained earnings to be carried forward	₩	1,049,189	₩	784,702

23. Segment Information

The Group's operating segments are as follows:

Business segment	Main products
Engines ("EG")	Engine of the commercial cars and buses; engine parts
Construction Equipment ("CE")	Crawler excavator, excavator parts and others
Construction Equipment ("Bobcat")	Compact (Skid Steer Loader, Compact Track Loader, Mini Excavator), Heavy Excavator, and Portable Power

(1) Profit or loss by each segment for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	2018			
	Total segment revenue	**Inter-segment revenue**	**Revenue from external customers**	**Operating profit (loss)**
EG	₩ 1,030,974	₩ (498,624)	₩ 532,350	₩ 105,660
CE	5,253,655	(1,998,716)	3,254,939	283,417
Bobcat	3,970,766	(27,947)	3,942,819	459,050
Subtotal	10,255,395	(2,525,287)	7,730,108	848,127
Consolidation adjustments	(2,525,287)	2,525,287	-	-
Total	₩ 7,730,108	₩ -	₩ 7,730,108	₩ 848,127

(in millions of Korean won)	2017			
	Total segment revenue	**Inter-segment revenue**	**Revenue from external customers**	**Operating profit (loss)**
EG	₩ 884,026	₩ (382,234)	₩ 501,792	₩ 75,837
CE	4,562,564	(1,879,086)	2,683,478	190,417
Bobcat	3,389,209	(6,582)	3,382,627	394,515
Subtotal	8,835,799	(2,267,902)	6,567,897	660,769
Consolidation adjustments	(2,267,902)	2,267,902	-	-
Total	₩ 6,567,897	₩ -	₩ 6,567,897	₩ 660,769

(2) Segment assets at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	**2018**	**2017**
EG	₩ 796,026	₩ 831,553
CE	3,985,651	3,574,722
Bobcat	6,446,324	6,183,837
Other	(198,834)	(314,022)
Total	₩ 11,029,167	₩ 10,276,090

(3) Segment liabilities as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		2018		2017
EG	₩	664,460	₩	741,907
CE		3,203,140		2,916,600
Bobcat		2,706,721		2,756,294
Other		634,031		688,128
Total	₩	7,208,352	₩	7,102,929

(4) The sales information by locational segment for the years ended December 31, 2018 and 2017, is as follows:

(in millions of Korean won)	Total revenue			
		2018		2017
Asia Pacific & Emerging Market	₩	1,914,516	₩	1,786,523
China		1,353,639		947,803
Europe		1,290,358		1,112,949
North America & Oceania		3,171,595		2,720,622
Total	₩	7,730,108	₩	6,567,897

24. Revenue

The Group has recognized the following amounts relating to revenue in the statement of profit or loss:

(in millions of Korean won)		2018
1. Revenue from contracts with customers		
Type of revenue:		
- Revenue of manufactured products / merchandise	₩	7,630,668
- Other revenue		49,605
Subtotal	₩	7,680,273
Timing of revenue recognition:		
- At a point in time	₩	7,552,474
- Over time		127,799
Subtotal	₩	7,680,273
2. Revenue from other sources		
- Rental income	₩	51,581
- profit or loss from hedge		(1,746)
Subtotal	₩	49,835
Total	₩	7,730,108

(in millions of Korean won)		**2017**
1. Sales of goods		
- Manufactured products	₩	5,943,769
- Merchandise		485,240
2. Others		138,888
Total	₩	6,567,897

(2) Assets and Liabilities related to Contracts with Customers

As explained in Note 2, the Group has applied Korean IFRS 1115 *Revenue from Contracts with Customers* from January 1, 2018. See Note 36 for the impact of the changes in accounting policies on the classification of financial assets and financial statements. The Group has recognized the following assets and liabilities related to contracts with customers:

(in millions of Korean won)		**2018**
Contract assets - shipping•insurance service	₩	4,481
Total contract assets	₩	4,481
Contract liabilities – return liabilities	₩	21,833
Contract liabilities – product warranties		84,629
Contract liabilities – shipping•insurance service		4,481
Contract liabilities – dealer incentives, etc.		266,582
Total contract liabilities	₩	377,525

25. Breakdown of Expenses by Nature

Breakdown of Expenses by Nature for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		**2018**		**2017**
Purchases of inventories (raw materials and merchandise)	₩	4,244,171	₩	3,287,138
Changes in inventories		(273,853)		(87,168)
Employee benefits expenses		765,983		732,798
Depreciation and amortization		240,255		254,780
Other expenses		1,905,424		1,719,580
Total	₩	6,881,980	₩	5,907,128

26. Selling and Administrative Expenses

Selling and administrative expenses for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		**2018**		**2017**
Salaries	₩	248,394	₩	243,572
Post-employment benefits		20,318		21,936
Employee benefits		55,377		53,593
Printing		1,765		1,092
Freight and custody		2,863		1,668
Communications		7,595		9,859
Utilities		4,684		4,820
Maintenance		3,263		3,348
Insurance		15,419		16,785
Depreciation		13,489		10,543
Amortization		30,505		44,987
Research and development		152,876		143,428
Advertising expenses		58,518		46,536
Sales commission		75,021		67,768
Taxes and dues		10,897		12,284
Travel expenses		35,265		33,083
Commission expenses		132,139		135,827
Education and training expenses		4,872		5,613
Bad debt expenses (reversal)		3,514		(17,375)
Others		68,960		42,762
Total	₩	945,734	₩	882,129

27. Finance Income and Expenses

Finance income and Expenses for the years ended December 31, 2018 and 2017, are summarized as follows:

(in millions of Korean won)		**2018**		**2017**
Finance income:				
Interest income	₩	14,872	₩	10,759
Gain on dividends		4,266		2,109
Gain on foreign currency transactions		43,974		58,400
Gain on foreign currency translations		29,117		224,019
Gain on derivative transactions		5,164		1,355
Gain on valuation of derivatives		6,221		-
Financial guarantee income		639		24
Subtotal (A)	₩	104,253	₩	296,666
Finance expenses:				
Interest expenses	₩	(196,306)	₩	(199,358)
Loss on foreign currency transactions		(38,855)		(60,473)
Loss on foreign currency translations		(55,503)		(144,144)
Loss on derivative transactions		-		(13,080)
Loss on valuation of derivatives		-		(6,145)
Loss on repayment of borrowings		(298)		(884)
Loss on repayment of bonds		(1,686)		(20,654)
Financial guarantee expenses		(9,975)		(9,800)
Other finance expenses		(716)		(1,197)
Subtotal (B)	₩	(303,339)	₩	(455,735)
Net finance expenses (C=A+B)	₩	(199,086)	₩	(159,069)

28. Other non-operating Income and Expenses

Other non-operating income and expenses for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		**2018**		**2017**
Other non-operating income:				
Rental income	₩	39	₩	33
Gain on disposal of short-term investment securities		1,227		-
Gain on valuation of short-term investment securities		8		-
Gain on disposal of long-term investment securities		197		25,374
Gain on disposal of property, plant and equipment		713		2,188
Reversal of impairment loss on property, plant and equipment		18		15,672
Gain on disposal of intangible assets		65		71
Reversal of impairment loss on intangible assets		-		1,867
Gain on disposal of investment properties		-		189
Gain on debt exemption		-		537
Gain on disposal of other non-current assets		588		25
Gain on revaluation of land		-		6
Others		33,229		18,191
Subtotal	₩	36,084	₩	64,153
Other non-operating expenses:				
Loss on disposal of trade receivables	₩	(11,900)	₩	(13,407)
Loss on disposal of short-term investment securities		-		(817)
Loss on valuation of short-term investment securities		(120)		(7,271)
Loss on valuation of long-term investment securities		-		(464)
Reversal of impairment loss on other receivables		2,195		749
Loss on disposal of property, plant and equipment		(4,590)		(2,550)
Loss on disposal of intangible assets		-		(20)
Loss on disposal of investment properties		-		(2,166)
Impairment loss on property, plant and equipment		(2,054)		(5,179)
Impairment loss on intangible assets		(16,117)		(458)
Impairment loss on investment properties		(504)		(15,121)
Donations		(10,840)		(8,848)
Others		(19,767)		(17,380)
Subtotal	₩	(63,697)	₩	(72,932)
Total	₩	(27,613)	₩	(8,779)

29. Income Tax Expense

(1) Income tax expense for the years ended December 31, 2018 and 2017, consists of

(in millions of Korean won)		2018		2017
Current tax:	₩	64,223	₩	54,574
Deferred tax		156,051		130,150
Total income tax expense	₩	220,274	₩	184,724
Deferred tax charged directly to equity		1,983		8,260
Income tax expense	₩	222,257	₩	192,984

(2) The Group offsets deferred tax assets and deferred tax liabilities if the Group has a legally enforceable right to set off current tax assets against current tax liabilities and the deferred tax assets and the deferred tax liabilities relate to income taxes levied by the same taxation authority. Changes in deferred tax assets and liabilities for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		2018				
		Beginning		Increases(Decreases)		Ending
Advances from government	₩	1,391	₩	(161)	₩	1,230
Allowance for doubtful accounts		114,549		(33,954)		80,595
Provision for product warranties		22,573		2,195		24,768
Net defined benefit liabilities		109,457		(12,489)		96,968
Investment in associates		(19,112)		(83)		(19,195)
Provision for temporary depreciation		(3,734)		19		(3,715)
Reserve for research and development		(8,874)		8,874		-
Gain on revaluation of land		(121,319)		3,028		(118,291)
Derivative assets		868		845		1,713
Net loss carryforwards		7,411		2,677		10,088
Others		54,325		(127,002)		(72,677)
Total	₩	157,535	₩	(156,051)	₩	1,484

(in millions of Korean won)		2017				
		Beginning		Increases(Decreases)		Ending
Advances from government	₩	1,537	₩	(146)	₩	1,391
Allowance for doubtful accounts		88,558		25,991		114,549
Provision for product warranties		26,474		(3,901)		22,573
Net defined benefit liabilities		147,228		(37,771)		109,457
Investment in associates		659		(19,771)		(19,112)
Provision for temporary depreciation		(3,734)		-		(3,734)
Reserve for research and development		(27,427)		18,553		(8,874)
Gain on revaluation of land		(119,959)		(1,360)		(121,319)
Derivative assets		(366)		1,234		868
Net loss carryforwards		5,511		1,900		7,411
Others		169,204		(114,879)		54,325
Total	₩	287,685	₩	(130,150)	₩	157,535

(3) Temporary differences which have not been recognized as deferred tax assets as at December 31, 2018 and 2017, are as follows (except for investments in subsidiaries and associates):

(in millions of Korean won)		2018		2017
Tax loss carryforwards	₩	1,491,960	₩	1,523,956
Deductible temporary differences		229,095		110,654
Tax credits carryover		19,189		29,284

The probability of deferred tax assets being realized depends on the Group's ability to generate taxable income in future years, the economic situation and industry forecast. The Group periodically reviews such matters.

(4) Temporary differences from investments in subsidiaries, joint ventures and associates, which are not recognized as deferred tax assets (liabilities) are as follows:

(in millions of Korean won)		2018		2017
Subsidiaries	₩	(262,828)	₩	(63,360)

(5) The tax on the Group's profit before tax differs from the theoretical amount that would arise using the weighted average tax rate applicable to profits of the consolidated entities as follows:

(in millions of Korean won)		2018		2017
Profit before income tax expense	₩	616,426	₩	489,627
Tax at domestic tax rates applicable to profits in the respective countries	₩	162,491	₩	194,107
Adjustment:				
Non-temporary difference		9,253		2,409
Effect of change in recognition of deferred income tax		(6,939)		101,977
Tax credits		(9,012)		(9,181)
Additional income tax and tax refund for prior periods		(7,949)		1,124
Others		74,413		(97,452)
Income tax expense	₩	222,257	₩	192,984
Average effective tax rate (Income tax expense / Profit before income tax)		36.1%		39.4%

30. Earnings per Share

(1) Basic earnings per share

Basic earnings per share is calculated by dividing the profit attributable to owners of the Group by the weighted average number of ordinary shares outstanding during the financial year excluding treasury shares.

Basic earnings per share attributable to owners of the Group for the years ended December 31, 2018 and 2017, are computed as follows:

(in millions of Korean won, shares)		2018		2017
Profit attributable to the ordinary equity holders of the Parent Company	₩	246,410	₩	130,228
Weighted average number of ordinary shares outstanding [1]		208,143,428		207,541,601
Basic earnings per share	₩	1,184	₩	627

[1] The Weighted average number of ordinary shares outstanding is calculated as follows:

	2018	2017
Ordinary shares at the beginning	207,999,614	207,454,809
Exercise of stock warrants	143,814	86,792
Weighted average number of ordinary shares outstanding	208,143,428	207,541,601

(2) Diluted earnings per share

Diluted earnings per share for the years ended December 31, 2018 and 2017, are computed as follows. There is no item related to dilution for the year ended December 31, 2017.

(in millions of Korean won, shares)		2018		2017
Profit attributable to ordinary shares before adjustment	₩	246,410	₩	130,228
Adjustment:		-		-
Profit attributable to ordinary shares after adjustment		246,410		130,228
Weighted average number of ordinary shares outstanding after adjustment		220,950,731		209,948,297
Diluted earnings per share	₩	1,115	₩	620

The details of weighted-average number of ordinary shares outstanding after adjustment used to calculate diluted earnings per share are as follows:

	2018	2017
Ordinary shares at the beginning	208,143,428	207,541,601
Exercise of stock warrants	12,807,303	2,406,696
Weighted average number of Ordinary shares outstanding	220,950,731	209,948,297

Stock options that could be used to dilute basic earnings per share in the future, which were not considered in the calculation of diluted earnings per share due to an anti-dilutive effect for the years ended December 31, 2018 and 2017, are as follows

(in shares)	2018	2017
Stock options	211,320	302,020

31. Dividends

The Group did not pay any dividends for the year ended December 31, 2018

32. Commitments and Contingencies

(1) Pending litigations

As at December 31, 2018, the Group is involved in pending lawsuits as a defendant with total claims amounting to ₩ 735,894 million. The outcome of the lawsuit and its effects cannot be reasonably estimated as at December 31, 2018.

In 2011, an external investor acquired 20% of interest in Doosan Infracore China Co., Ltd., a subsidiary of the Parent Company, for ₩ 380 billion. According to the shareholders' agreement entered into with the Parent Company, both parties have the right to request the counterparty to jointly sell their respective shares to a third party. Although, in principal, the Parent Company has to jointly sell its stake in case the external investor request for such sale, the Parent Company also has the right to purchase the external investor's share first at the price proposed by the external investor.

In 2014, the external investor requested for due diligence information to initiate its sale of shares. However, as the potential buyer was not confirmed yet, the Parent Company could not provide such information which included confidential proprietary information. The external investor filed a claim to the Seoul Central District Court to obtain the due diligence information but it was dismissed on March 2, 2015 based on the ruling that the Parent Company was not obligated to provide such information to the external investor.

In November 2015, the external investor filed a lawsuit claiming partial payment of stock purchase price (i.e. ₩ 10 billion among ₩ 709.3 billion) contending that a share purchase agreement shall be deemed to be executed following the Group's purported failure to cooperate with the external investor's request for due diligence information. The external investor's claim was dismissed at the first ruling on January 12, 2017 stating that the Group did not breach its obligation to cooperate with the external investor's sale of its shares. However, on February 21, 2018 the Seoul High Court overturned the 1st ruling and recognized the Parent Company's breach of duty and ruled the Company to pay the claim amount of ₩ 10 billion.

The Parent Company appealed against the 2nd ruling and took it to the Supreme Court on February 26, 2018. The Seoul High Court, on February 28 2018, ruled that the Group's application for suspension of enforcement was valid and suspended the 2nd ruling's court order of payment.

Even supposing that the Supreme Court ordered in the final ruling that the Group pay the litigation amount and acquire the external investor's stake, that assumption does not sufficiently allow the Group to produce reliable estimation for the prospective losses as at December 31, 2018.

Meanwhile, an external investor filed an additional lawsuit about the remaining stock purchase price as at March 2018 (the aggregate amount of ₩ 705.1 billion) and the lawsuit is pending as at December 31, 2018.

As a preservation procedure of the ongoing lawsuit, the Group pledged 8,288,196 ordinary shares of Doosan Bobcat Inc., to the external investor and payed an extra payment of ₩ 10 billion, according to the court's recommendation to settle which was issued by Seoul Central District Court on July 2018. If the Group wins the case at the Supreme Court, the pledge as collateral will be terminated and the external investor will be obliged to repay the extra payment to the Group.

(2) As at December 31, 2018, the Group has entered into bank overdraft agreements amounting to ₩ 3,295,968 million with various financial institutions.

(3) Financial covenant

As at December 31, 2018, the Group issued 28th and 32nd series bonds denominated in USD 300 million, respectively. In accordance with the agreement for issuing the 28th and 32nd series bonds, an early redemption clause exists for when and if the Group's guarantor, the Korea Development Bank, becomes privatized. In addition, the Group has pledged its 11,178,538 and 10,882,765 shares of Doosan Bobcat Inc. as collaterals and, if the price falls below par, additional shares or deposits equivalent to the difference should be secured. Meanwhile, as at December 31, 2018, the Group pledged its time deposits amounting to ₩ 48,343 million to Korea Development Bank and others as collaterals in relation to 32nd series bonds.

The Group has pledged 16,341,780 shares of Doosan Bobcat Inc. as collateral for borrowings of ₩ 350,000 million from the Korea Development Bank and 8 other financial institutions. In relation to the borrowings, if the ratio does not meet the certain collateral limit predetermined in the agreement, additional shares or deposits must be secured as collaterals. Also, in case the Group receives a credit rating equal to or lower than BB0 from more than one of the domestic credit rating agencies, NICE Investors Service Co., Ltd., Korea Investor Service Inc., and Korea Ratings Corporation, it will be a trigger for the financial institutions to collect the loans before the maturity.

The Group has pledged 3,980,000 shares of Doosan Bobcat Inc. as collateral for borrowings of ₩ 10,000 million from Standard Chartered Bank Korea Ltd. In relation to the borrowings, if the ratio does not meet the certain collateral limit predetermined in the agreement, either shares or deposits must be additionally secured as collaterals or some loans must be redeemed early.

(4) The financial liabilities related to the transferred receivables that the Group continues to recognize because the Group substantially retains all of the risks and rewards of ownership as at December 31, 2018, amount to ₩ 13,090 million.

(5) As at December 31, 2018, guarantees provided by the Group for third parties are as follows:

(in thousands of foreign currencies and millions of Korean won)

Guarantor	Beneficiary	Guaranteed amount		Korean won equivalent	
Doosan Infracore China Co., Ltd.	End User	CNY	357,620	₩	58,206
Clark Equipment Co. and others	End User	USD	109,784		122,750
Doosan Bobcat EMEA s.r.o. and others	End User	USD	676		756
Doosan Bobcat Korea Co., Ltd.	End User	USD	4,560		5,099
Total				₩	186,811

Meanwhile, as at December 31, 2018, the Group entered into agreements with the Korea Development Bank for the guarantees of 28th and 32nd foreign currency-denominated bonds of USD 300,000 thousand respectively. In addition, the company entered into agreements with various banks for performance guarantees of USD 204 thousand regarding exports and imports, and with Seoul Guarantee Insurance Company and Machinery Financial Cooperative for performance and payment guarantees of ₩ 53,309 million in total. Regarding guarantees provided by Machinery Financial Cooperative, equity investment of ₩ 200 million in Machinery Financial Cooperative is also pledged as a collateral.

(6) Operating lease

Total minimum lease payments in relation to non-cancellable operating leases that are payable as at December 31, 2018 are as follows:

(in millions of Korean won)	Less than 1 year		1-5 years		More than 5 years		Total	
Minimum lease payments	₩	13,873	₩	25,555	₩	3,349	₩	42,777

(7) Other commitments and contingencies

The Group entered into a lease contract of the Doosan Bundang Center (tentative) with the DBC Co., Ltd. for 15 years from the lease start date.

The Group entered into a contract of share transfer and development services of intellectual property for the product development of Compact Tractor with the DAEDONG INDUSTRIAL CO., LTD. The contract amounts to ₩ 4,252 million.

The Group entered into an investment contracts with Nautilus Venture Partners Fund II, L.P. and ICONIQ Strategic Partners IV-B, LP. The contracts amount to USD 10,000 thousand and USD 3,000 thousand, respectively.

33. Pledged Assets

(1) The Group's assets pledged as collaterals for long-term and short-term borrowings as at December 31, 2018, are as follows:

Pledger	Collateralized asset	Amount of Borrowings		Collateralized amount	
Korea Development Bank	Land, buildings and machinery[1]	KRW	238,000	KRW	371,112
		USD	19,000	USD	95,025
		EUR	1,036	DM	84,000
		JPY	240,911		
Korea Exim Bank	Inventories	KRW	80,000	KRW	195,000
Ubest 4th Co.,Ltd	Land and buildings, etc.	KRW	80,000	KRW	96,000

[1] The Parent Company's rights to property and inventory insurance benefits are pledged as collaterals to the Korea Development Bank.

The Parent Company has pledged the total shares of both of its subsidiaries, Doosan Infracore North America LLC and Doosan Infracore Norway AS, as collaterals to Korea Exim Bank for borrowings of USD 117,600 thousand.

(2) The Group's subsidiary, Clark Equipment Co., repaid the borrowings, borrowed on May 28, 2014 in conjunction with Doosan Holdings Europe Ltd., in full, and entered into a new borrowing of USD 1,345,000 thousand and a limit loan agreement of USD 150,000 thousand, on May 18, 2017. The Group has pledged total shares of Clark Equipment Co., Doosan Bobcat EMEA s.r.o., and Doosan Bobcat Singapore Pte. Ltd., as collaterals for the borrowing and loan commitment, and the balance of the related borrowings at the end of the reporting period is USD 971,463 thousand.

(3) The Group's associate, DBC Co., Ltd. has entered to a PF loan agreement amounting to 375,000 million for construction of the Doosan Bundang Center. In relation to the borrowings, the Group has pledged 491,840 shares of DBC Co, Ltd. held by the Group as a collateral (secured amount ₩24,592 million).

34. Related Party Transactions

The Group's related party disclosures for the years ended December 31, 2018 and 2017, are as follows:

(1) Nature of relationship

Relationship	Name
Ultimate parent	Doosan Corporation
Next most senior parent	Doosan Heavy Industries and Construction Co., Ltd.
Joint ventures and associates	Doosan Cuvex Co., Ltd., DBC Co., Ltd., Doosan PSI LLC, Doosan Infracore Liaoning Machinery Sales Co., Ltd., Tianjin Lovol Doosan Engine Co., Ltd., and others
Other related parties[1 2]	Doosan Construction & Engineering Co., Ltd., Oricom Inc., Doosan Bears Inc., Neoplux Co., Ltd. and others

[1] Other related parties include entities which belong to a large enterprise group in accordance with the Monopoly Regulation and Fair Trade Act, although the entities are not the related party of the Group in accordance with Korean IFRS 1024.

[2] For the year ended December 31, 2018, Doosan Engine Co., Ltd. is excluded as a related party.

(2) Significant transactions with related parties for the years ended December 31, 2018 and 2017, are as follows

(in millions of Korean won)	2018					
Relationship	**Sales**	**Disposal of property, plant and equipment and intangible assets**	**Other income**	**Purchases**	**Acquisition of property, plant and equipment and intangible assets**	**Other expenses**
Ultimate parent	₩ 61,884	₩ 70	₩ -	₩ 87,891	₩ 3,570	₩ 50,394
Next most senior parent	769	-	-	-	136	4
Joint ventures and associates	43	-	6,148	118	-	9,022
Others	609	-	4,094	3,157	2,150	85,453
Total	₩ 63,305	₩ 70	₩ 10,242	₩ 91,166	₩ 5,856	₩ 144,873

(in millions of Korean won)	2017					
Relationship	**Sales**	**Disposal of property, plant and equipment and intangible assets**	**Other income**	**Purchases**	**Acquisition of property, plant and equipment and intangible assets**	**Other expenses**
Ultimate parent	₩ 59,404	₩ -	₩ 60	₩ 69,516	₩ 2,832	₩ 70,868
Next most senior parent	788	592	-	-	-	-
Joint ventures and associates	7	18,547	-	4	-	2,518
Others	408	199	2,290	179	1,099	86,354
Total	₩ 60,607	₩ 19,338	₩ 2,350	₩ 69,699	₩ 3,931	₩ 159,740

(3) Outstanding balances of significant receivables and payables for related parties as at December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	2018							
Relationship	**Trade receivables**		**Other receivables**		**Trade payables**		**Other payables**	
Ultimate parent	₩	4,139	₩	4,751	₩	7,950	₩	7,746
Next most senior parent		-		72		-		482
Joint ventures and associates		-		4,317		92		399
Others		23		32,119		2,392		5,659
Total	₩	4,162	₩	41,259	₩	10,434	₩	14,286

(in millions of Korean won)	2017							
Relationship	**Trade receivables**		**Other receivables**		**Trade payables**		**Other payables**	
Ultimate parent	₩	19,543	₩	1,029	₩	6,941	₩	9,382
Next most senior parent		-		72		-		2,148
Joint ventures and associates		-		4,147		15		361
Others		-		35,798		5,685		7,692
Total	₩	19,543	₩	41,046	₩	12,641	₩	19,583

(4) Fund transactions (including equity transactions) with related parties for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		2018							
		Equity transactions				**Dividends**			
		Contribution		**Capital reduction**		**Income**		**Payment**	
Next most-senior parent	Doosan Heavy Industries and Construction Co., Ltd.	₩	-	₩	-	₩	3,108	₩	4,231
Associate and joint ventures	Tianjin Lovol Doosan Engine Co., Ltd.		12,727		-		-		-
	Potenit Co., Ltd.		5,333		-		-		-
	DBC Co., Ltd.		-		36,424		-		-
Others	Doosan Engine Co., Ltd.		-		-		-		8,462
	Total	₩	18,060	₩	36,424	₩	3,108	₩	12,693

(in millions of Korean won)		2017			
		Contribution		Dividends	
		Capital increase	Investment	Income	Payment
Next most-senior parent	Doosan Heavy Industries and Construction Co., Ltd.	₩ -	₩ -	₩ 2,109	₩ -
Associate and joint ventures	Doosan Infracore Liaoning Machinery Sales Co., Ltd	-	363	-	-
	DBC Co., Ltd.	-	61,016	-	-
	Doosan Cuvex Co., Ltd.	-	4,486	-	-
Others	Doosan Engine Co., Ltd.	-	-	-	7,405
	Total	₩ -	₩ 65,865	₩ 2,109	₩ 7,405

(5) Details of payment guarantees and collaterals provided by the Group for the financial supports to the related parties as at December 31, 2018, are described in Note 33.

(6) The Group defines key management personnel including registered officer and non-registered officer who have the authority and responsibility for planning, operation and control. Compensation to the key management personnel of the Group for the years ended December 31, 2018 and 2017, is as follows:

(in millions of Korean won)	2018	2017
Employee benefits	₩ 23,879	₩ 22,049
Post-employment benefits	1,179	1,009
Total	₩ 25,058	₩ 23,058

35. Consolidated Statements of Cash Flows

(1) Details of adjustments, and changes in operating assets and liabilities in the consolidated statement of cash flows for the years ended December 31, 2018 and 2017, are as follows

(in millions of Korean won)	2018	2017
Adjustments:		
1. Income tax expense	₩ 222,257	₩ 192,984
2. Finance income	(31,596)	(99,304)
3. Finance expenses	224,398	289,759
4. Post-employment benefits (defined benefit plan)	47,154	53,372
5. Depreciation	142,317	141,360
6. Amortization	97,938	113,420
7. Gain on disposal of property, plant and equipment	(713)	(2,188)
8. Gain on disposal of intangible assets	(65)	(71)
9. Gain on disposal of investment properties	-	(189)
10. Loss on disposal of property, plant and equipment	4,590	2,550
11. Loss on disposal of intangible assets	-	20

(in millions of Korean won)		**2018**		**2017**
12. Loss on disposal of investment properties		-		2,166
13. Reversal of impairment loss on property, plant and equipment		(18)		(15,672)
14. Reversal of impairment loss on intangible assets		-		(1,867)
15. Impairment loss on property, plant and equipment		2,054		5,179
16. Impairment loss on intangible assets		16,117		458
17. Impairment loss on investment properties		504		15,121
18. Loss on valuation of short-term investment securities		120		7,271
19. Loss on valuation of long-term investment securities		-		464
20. Loss on equity method investments		5,002		3,295
21. Dividend income		(4,266)		(2,109)
22. Others		5,374		(22,191)
Total	₩	731,167	₩	683,828

(in millions of Korean won)		**2018**		**2017**
Changes in operating assets and liabilities:				
1. Changes in trade receivables	₩	(84,096)	₩	(384,316)
2. Changes in other receivables		7,946		22,872
3. Changes in derivative assets		(2,389)		(12,816)
4. Changes in inventories		(252,531)		(142,171)
5. Changes in other current assets		(48,183)		(29,111)
6. Changes in other non-current assets		2,420		35,294
7. Changes in trade payables		116,879		417,616
8. Changes in other payables		157,364		43,330
9. Changes in derivative liabilities		(29,306)		9,123
10. Changes in provisions		3,954		(19,907)
11. Changes in other current liabilities		91,883		29,466
12. Payment of defined benefit obligations(defined benefit plan)		(48,810)		(57,504)
13. Transferred out to affiliates		704		253
14. Changes in plan assets		(11,439)		(12,856)
15. Changes in other non-current liabilities		13,555		16,996
Total	₩	(82,049)	₩	(83,731)

(2) Significant non-cash transactions for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)		**2018**		**2017**
Other payables related to property, plant and equipment acquisition	₩	19,131	₩	(21,914)

(3) Changes in liabilities arising from financial activities for the years ended December 31, 2018 and 2017, are as follows:

(in millions of Korean won)	2018					
	Beginning balance	Cash flows	Non-cash variances			Ending balance
			Changes in exchange rates	Changes in fair value	Others	
Short-term borrowings	₩ 1,409,287	₩ (478,613)	₩ 6,926	₩ -	₩ -	₩ 937,600
Long-term borrowings (including current portion of long-term borrowings)	1,610,116	207,196	59,880	2,633	1,985	1,881,810
Bonds (including current portion of bonds)	1,187,175	(238,264)	28,020	4,658	1,632	983,221
Bonds with warrants	442,423	85	-	1,495	22,176	466,179
Liabilities to avoid risks arising from bonds	33,656	-	(28,020)	4,597	(8,477)	1,756
Total	₩ 4,682,657	₩ (509,596)	₩ 66,806	₩ 13,383	₩ 17,316	₩ 4,270,566

(in millions of Korean won)	2017					
	Beginning balance	Cash flows	Non-cash variances			Ending balance
			Changes in exchange rates	Changes in fair value	Others	
Short-term borrowings	₩ 952,164	₩ 472,436	₩ (15,313)	₩ -	₩ -	₩ 1,409,287
Long-term borrowings (including current portion of long-term borrowings)	1,991,636	(206,845)	(200,272)	4,059	21,538	1,610,116
Bonds (including current portion of bonds)	1,479,383	(241,284)	(54,540)	4,868	(1,252)	1,187,175
Bonds with warrants	-	491,667	-	663	(49,907)	442,423
Liabilities to avoid risks arising from bonds	-	-	35,070	1,420	(2,834)	33,656
Total	₩ 4,423,183	₩ 515,974	₩ (235,055)	₩ 11,010	₩ (32,455)	₩ 4,682,657

36. Changes in Accounting Policies

(1) Adoption of Korean IFRS 1109 *Financial Instruments*

As explained in Note 2, Group has applied Korean IFRS 1109 *Financial Instruments* on January 1, 2018, the date of initial application. In accordance with the transitional provisions in Korean IFRS 1109, comparative figures for prior reporting period have not been. The impacts of the changes in accounting policies from the application of Korean IFRS 1109 on the financial statements are as follows:

(in millions of Korean won)

Beginning balance of retained earnings – Korean IFRS 1039	₩	784,702
Increase of provision for allowance on trade receivables		(899)
Beginning balance of retained earnings – Korean IFRS 1109	₩	783,803

1) *Classification and Measurement of Financial Instruments*

① Reclassifications of financial instruments on adoption of Korean IFRS 1109

On the date of initial application, January 1, 2018, the financial instruments of the Group with any reclassifications noted, were as follows:

(in millions of Korean won)	2018					
	Measurement category		Carrying amount			
	Korean IFRS 1039	Korean IFRS 1109	Korean IFRS 1039		Korean IFRS 1109	
Financial assets						
Cash and cash equivalents	Loans and receivables	Financial assets at Amortized Cost	₩	1,053,016	₩	1,053,016
Short-term financial instruments	Loans and receivables	Financial assets at Amortized Cost		261,439		261,439
Short-term investment securities	Financial assets at Amortized Cost	Financial assets at Amortized Cost		1,808		1,808
	Financial assets at Fair Value through Profit or Loss	Financial assets at Fair Value through Profit or Loss		12,480		12,480
Trade and other receivables	Loans and receivables	Financial assets at Amortized Cost		1,353,419		1,315,840
		Financial assets at Fair Value through Other Comprehensive Income		-		37,579
Long-term financial assets	Loans and receivables	Financial assets at Amortized Cost		848		848
Long -term investment securities	Available-for-sale financial assets	Financial assets at Fair Value through Other Comprehensive Income		98,918		91,972
		Financial assets at Fair Value through Profit or Loss				6,946
	Held-to-maturity financial assets	Financial assets at Amortized Cost		91		91
Other non-current assets receivables	Loans and receivables	Financial assets at Amortized Cost		10,891		10,891
Other non-current assets	Loans and receivables	Financial assets at Amortized Cost		33,627		33,627
Derivative assets	Financial assets at Fair Value through Profit or Loss	Financial assets at Fair Value through Profit or Loss		2,972		2,972
	Hedge derivatives	Other Financial assets		13,981		13,981
	Total		₩	2,843,490	₩	2,843,490
Financial liabilities						
Trade and other payables	Financial liabilities at Amortized Cost	Financial liabilities at Amortized Cost	₩	1,613,824	₩	1,613,824
Borrowings and bonds	Financial liabilities at Amortized Cost	Financial liabilities at Amortized Cost		4,268,809		4,268,809
Other current liabilities	Financial liabilities at Amortized Cost	Financial liabilities at Amortized Cost		37,056		37,056
Other non-current liabilities	Financial liabilities at Amortized Cost	Financial liabilities at Amortized Cost		41,251		41,251

Financial guarantee liabilities	Financial liabilities at Amortized Cost	Financial liabilities at Amortized Cost		1,820		1,820
Derivative liabilities	Financial liabilities at Fair Value through Profit or Loss	Financial liabilities at Fair Value through Profit or Loss		626		626
	Hedge derivatives	Other Financial liabilities		15,803		15,803
	Total		₩	5,979,189	₩	5,979,189

(in millions of Korean won)	2017					
	Measurement category		**Carrying amount**			
	Korean IFRS 1039	**Korean IFRS 1109**	**Korean IFRS 1039**		**Korean IFRS 1109**	
Financial assets						
Cash and cash equivalents	Loans and receivables	Financial assets at Amortized Cost	₩	943,481	₩	943,481
Short-term financial instruments	Loans and receivables	Financial assets at Amortized Cost		160,167		160,167
Short-term investment securities	Financial assets at Fair Value through Profit or Loss	Financial assets at Fair Value through Profit or Loss		34,182		34,182
Trade and other receivables	Loans and receivables	Financial assets at Amortized Cost		1,197,047		1,197,047
Long-term financial assets	Loans and receivables	Financial assets at Amortized Cost		11		11
Long -term investment securities	Available-for-sale financial assets	Financial assets at Fair Value through Other Comprehensive Income		91,793		88,247
		Financial assets at Fair Value through Profit or Loss				3,546
	Held-to-maturity financial assets	Financial assets at Amortized Cost		1,894		1,894
Other non-current assets receivables	Loans and receivables	Financial assets at Amortized Cost		16,150		16,150
Other non-current assets	Loans and receivables	Financial assets at Amortized Cost		38,382		38,382
Derivative assets	Financial assets at Fair Value through Profit or Loss	Financial assets at Fair Value through Profit or Loss		1,678		1,678
	Hedge derivatives	Other Financial assets		4,578		4,578
	Total		₩	2,489,363	₩	2,489,363
Financial liabilities						
Trade and other payables	Financial liabilities at Amortized Cost	Financial liabilities at Amortized Cost	₩	1,281,736	₩	1,281,736
Borrowings and bonds	Financial liabilities at Amortized Cost	Financial liabilities at Amortized Cost		4,649,001		4,649,001
Other current liabilities	Financial liabilities at Amortized Cost	Financial liabilities at Amortized Cost		23,722		23,722
Other non-current liabilities	Financial liabilities at Amortized Cost	Financial liabilities at Amortized Cost		42,379		42,379
Financial guarantee liabilities	Financial liabilities at Amortized Cost	Financial liabilities at Amortized Cost		1,585		1,585
Derivative liabilities	Financial liabilities at Fair Value through Profit or Loss	Financial liabilities at Fair Value through Profit or Loss		5,803		5,803
	Hedge derivatives	Other Financial liabilities		39,933		39,933
	Total		₩	6,044,159	₩	6,044,159

2) Impairment of Financial Assets

The Group has four types of financial assets subject to Korean IFRS 1109's new expected credit loss model:

- trade receivables for sales of inventory
- debt investments carried at fair value through other comprehensive income, and
- debt investments carried at amortized cost

Upon adoption of Korean IFRS 1109, accounting policies for recognition of impairment have changed. The impact of the change in impairment methodology on the Group's beginning balance of retained earnings is disclosed in the table on 1) above.

(2) Adoption of Korean IFRS 1115 *Revenue from Contracts with Customers*

As explained in Note 2, the Group has applied Korean IFRS 1115 *Revenue from contracts with customers* from January 1, 2018. In accordance with the transitional provisions in Korean IFRS 1115, comparative figures have not been restated. The impacts of the changes in accounting policies from the application of Korean IFRS 1115 on the financial statements are as follows.

The impacts on Consolidated Statements of Financial Position at December 31, 2018

(in millions of Korean won)		Amount before application of Korean IFRS 1115	Adjustments	Korean IFRS 1115
Assets				
Return Assets	1	₩ -	₩ 12,682	₩ 12,682
Prepaid expenses – shipping•insurance service	2	-	4,481	4,481
Total assets		11,012,004	17,163	11,029,167
Liabilities				
Return liabilities	1	-	21,833	21,833
Provision – refund	1	9,151	(9,151)	-
Unearned Revenues – shipping•insurance service	2	-	4,481	4,481
Total liabilities		7,191,189	17,163	7,208,352
Equity				
Total equity		3,820,815	-	3,820,815

The impacts on Consolidated Statements of Comprehensive Income for Year Ended December 31, 2018

(in millions of Korean won)		**Amount before application of Korean IFRS 1115**	**Adjustments**	**Korean IFRS 1115**
Revenue	2	₩ 7,734,589	₩ (4,481)	₩ 7,730,108
Cost of Sales	2	(5,940,727)	4,481	(5,936,246)
Profit for the year		394,170	-	394,170
Total comprehensive income for the year		567,079	-	567,079

The impacts on Consolidated Statements of Cash Flows for Year Ended December 31, 2018

(in millions of Korean won)	**Amount before application of Korean IFRS 1115**	**Adjustments**	**Korean IFRS 1115**
Profit for the year	₩ 394,170	₩ -	₩ 394,170
Adjustments	731,167	-	731,167
Changes in operating assets and liabilities:	(82,049)	-	(82,049)
Return Assets	-	12,682	12,682
Prepaid expenses – shipping•insurance service	-	4,481	4,481
Return liabilities	-	21,833	21,833
Provision – refund	9,151	(9,151)	-
Unearned Revenues – shipping•insurance service	-	4,481	4,481
Cash flows from operating activities	837,778	-	837,778

Cash flows from operating activities under Korean IFRS 1115 is equal to cash flows under the previous accounting standard.

[1] Accounting for sales with a right of return

According to the previous accounting standard, the Group recognized the provision for returns by measuring net amounts based on the gross profit. The Group recognizes total expected amounts to refund as the contract liability (refund liability) when return has occurred in Korean IFRS 1115.

[2] Transportation and insurance services

According to the previous accounting standard, the Group recognized revenue without distinguishing the performance obligation of the transportation and insurance services separately. However, under the revised Korean IFRS 1115, the Group recognizes separate service income from those services provided after the control of the goods are transferred.