

Doosan Corporation and its subsidiaries
Notes to the consolidated financial statements
December 31, 2019 and 2018

1. General

1.1 The Parent company information

Doosan Corporation (the "Company") was incorporated on December 18, 1933, under the name of Sohwa-Kirin Beer, Ltd. to manufacture and sell beer. The Company has changed its name to Dongyang Beer, Ltd. in February 1948 and again to OB Beer, Ltd. in February 1996 and finally to Doosan Corporation on September 1, 1998. The consolidated financial statements of the Company and its subsidiaries (collectively, the "Group") have been prepared based on Korean International Financial Reporting Standards ("KIFRS") 1110 *Consolidated Financial Statements*.

Since June 1973, the Group's shares have been listed in the Korea Exchange. After several capital issues, the Group's share capital as of December 31, 2019 is ₩123,738 million, including ₩24,447 million of preferred shares.

The Group's ordinary shares as of December 31, 2019 are owned as follows:

	Number of ordinary shares owned	Ownership percentage (%)
Related parties	7,805,623	47.24
Treasury stocks	3,000,866	18.16
Others	5,717,346	34.60
	<u>16,523,835</u>	<u>100.00</u>

Meanwhile, 35.9% of preferred shares are owned by the largest shareholder and others and 51.6% of preferred shares are owned by others.

1.2 Consolidated subsidiaries information

Details of the subsidiaries as of December 31, 2019 and 2018 are as follows:

Subsidiary	Type of business	Location	Ownership ratio of the Group (%)(*1)		Ownership ratio of non-controlling interests (%)(*1)		Financial closing date
			2019	2018	2019	2018	
Oricom Inc.	Advertising	Korea	64.3	65.5	35.7	34.5	December 31
Hancomm Inc.	Advertising	Korea	100	100	35.7	34.5	December 31
Doosanbears Inc	Sports	Korea	100	100	-	-	December 31
DLI Corporation	Education	Korea	100	100	-	-	December 31
Doosan Robotics Inc.	Software development and supply	Korea	100	100	-	-	December 31
Doosan Mecatec Co., Ltd.	Manufacturing	Korea	100	100	-	-	December 31
Doosan Mobility Innovation Inc	R&D and manufacturing service	Korea	100	100	-	-	December 31
Doosan Logistics Solution Co., Ltd.		Korea	100	-	-	-	December 31
Doosan Electro-Materials Singapore Pte Ltd.	Wholesale and retail	Singapore	100	100	-	-	December 31
Doosan Hong Kong Ltd.	Wholesale and retail	China	100	100	-	-	December 31
Doosan Electro-Materials (Shen Zhen) Limited.	Wholesale and retail	China	100	100	-	-	December 31
Doosan Shanghai Chemical Materials Co., Ltd.	Wholesale and retail	China	100	100	-	-	December 31
Doosan Electro-Materials (Changshu) Co., Ltd.	Manufacturing	China	100	100	-	-	December 31
Doosan Second Real Estate Securitization Specialty Ltd. (*2)	Specialized in securitization	Korea	-	-	-	-	December 31
Doosan Digital Innovation America, LLC(*4)	IT service	USA	100	100	-	-	December 31
Doosan Digital Innovation China, LLC(*5)	IT service	China	100	100	-	-	December 31
Doosan Mottrol (Jiangyin) Co., Ltd.	Manufacturing	China	100	100	-	-	December 31

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1.2 Consolidated subsidiaries information (cont'd)

Subsidiary	Type of business	Location	Ownership ratio of the Group (%)(*1)		Ownership ratio of non-controlling interests (%)(*1)		Financial closing date
			2019	2018	2019	2018	
Doosan Digital Innovation Europe Limited(*6)	IT service	UK	100	100	-	-	December 31
Doosan Industrial Vehicle Europe N.A.	Wholesale and retail	Belgium	100	100	-	-	December 31
Doosan Industrial Vehicle U.K. Ltd.	Wholesale and retail	UK	100	100	-	-	December 31
Doosan Logistics Europe GmbH	Manufacturing	Germany	100	100	-	-	December 31
Doosan Industrial Vehicle America Corp.	Wholesale and retail	USA	100	100	-	-	December 31
Doosan Material Handling Solutions LLC.	Forklift rental and sales	USA	100	100	-	-	December 31
Doosan Industrial Vehicle Yantai Co., Ltd.	Manufacturing	China	100	100	-	-	December 31
Genesis Forklift Trucks Limited	Manufacturing	UK	100	100	-	-	December 31
Rushlift Holdings Ltd.	Holding company	UK	100	100	-	-	December 31
Doosan Materials Handling UK Ltd.	Holding company	UK	100	100	-	-	December 31
Rushlift Ltd.	Forklift rental and sales	UK	100	100	-	-	December 31
Doosan Electro-Materials America, LLC	Marketing	USA	100	100	-	-	December 31
Doosan Fuel Cell America, Inc.	Manufacturing	USA	100	100	-	-	December 31
Doosan Energy Solutions America, Inc.,	Electric power generation and sales	USA	100	100	-	-	December 31
DESA Service, LLC	Power production and sales	USA	100	-	-	-	December 31
Neoplux Co.,Ltd.	Finance	Korea	97.1	97.1	2.9	2.9	December 31
DBC Co., Ltd	Real estate development	Korea	100	100	46.7	58.8	December 31
Doosan Mobility Innovation(Shenzhen) Co. Ltd.	Wholesale and retail	China	100	-	-	-	December 31
Sunny Russel 8th Co., Ltd.(*2)	Specialized in securitization	Korea	-	-	-	-	December 31
D-Pay 1st Co., Ltd.(*2)	Specialized in securitization	Korea	-	-	-	-	December 31
Doosan Heavy Industries & Construction Co., Ltd (*DHC")(*3)	Other engine and turbine manufacture	Korea	34.4	34.6	65.6	65.4	December 31
Doosan Heavy Industries Vietnam Co., Ltd.	Other engine and turbine manufacture	Vietnam	100	100	66.5	68.2	December 31
Doosan HF Controls Corp.	Manufacturing	USA	100	100	65.6	65.4	December 31
Doosan HF Controls Asia Co., Ltd.	Manufacturing	Korea	100	100	65.6	65.4	December 31
PT. Doosan Heavy Industries Indonesia	Manufacturing	Indonesia	55	55	81.1	81	December 31
Doosan Heavy Industries Malaysia Sdn. Bhd	Dormant corporation	Malaysia	100	100	65.6	65.4	December 31
Doosan Heavy Industries Japan Corp.	Wholesale and retail	Japan	100	100	65.6	65.4	December 31
S.C. Doosan IMGB S.A.	Manufacturing	Romania	99.9	99.9	65.7	65.4	December 31
Doosan Enpure Ltd.	Engineering and service	UK	100	100	65.6	65.4	December 31
Doosan Power Systems India Private Ltd.	Engineering and service	India	100	100	65.6	65.4	March 31
Doosan Heavy Industries Muscat LLC.	Manufacturing	Oman	70	70	75.9	75.8	December 31
Doosan Power Systems Arabia Company Limited	Manufacturing service	Saudi Arabia	51	51	82.5	82.4	December 31
Azul Torre Construction Corporation(*3)	Manufacturing	Philippines	40	40	86.3	86.2	December 31
Doosan Heavy Industries America Holdings Inc.	Holding company	USA	100	100	65.6	65.4	December 31

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Subsidiary	Type of business	Location	Ownership ratio of the Group (%)(*1)		Ownership ratio of non-controlling interests (%)(*1)		Financial closing date
			2019	2018	2019	2018	
Doosan Heavy Industries America LLC	Wholesale and retail	USA	100	100	65.6	65.4	December 31
Doosan ATS America, LLC	Engineering and service	USA	100	100	65.6	65.4	December 31
Doosan Power Service America, LLC	Engineering and service	USA	100	100	65.6	65.4	December 31
Doosan Turbomachinery Services Holding, Inc.	Holding company	USA	95.9	95.9	67	66.8	December 31
Doosan Turbomachinery Services Inc.	Manufacturing	USA	100	100	65.6	66.8	December 31
Doosan GridTech Inc.	Software and systems engineering	USA	100	100	65.6	65.4	December 31
Doosan GridTech LLC	Software and systems engineering	USA	100	100	65.6	65.4	December 31
Doosan GridTech CA LLC	Software and systems engineering	USA	100	100	65.6	65.4	December 31
Doosan GridTech EPC LLC	Software and systems engineering	USA	100	100	65.6	65.4	December 31
Doosan GridTech C&I LLC	Software and systems engineering	USA	100	-	65.6	-	December 31
Continuity Energy LLC	Software and systems engineering	USA	100	-	65.6	-	December 31
Doosan Skoda Power s.r.o	Manufacturing	Czech	100	100	65.6	65.4	December 31
Skoda Power Private Ltd.	Engineering	India	100	100	65.6	65.4	March 31
Doosan Power Systems Pension Trustee Co., Ltd.	Specialized service	UK	100	100	65.6	65.4	December 31
Doosan Power Systems Overseas Investments Ltd.	Holding company	UK	100	100	65.6	65.4	December 31
Doosan Babcock Ltd.	Engineering and service	UK	100	100	65.6	65.4	December 31
Doosan Power Systems Europe Limited GmbH	Engineering and service	Germany	100	100	65.6	65.4	December 31
Doosan Power Systems Americas LLC	Engineering and service, Wholesale and retail	USA	100	100	65.6	65.4	December 31
Doosan Lentjes UK Limited	Specialized service	UK	100	100	66	65.7	December 31
Doosan Lentjes GmbH	Engineering and service	Germany	100	100	65.6	65.4	December 31
Doosan Power Systems S.A.	Holding company	Luxembourg	100	100	65.6	65.4	December 31
Doosan Babcock Energy Technologies (Shanghai) Ltd.	Dormant corporation	China	100	100	65.6	65.4	December 31
Doosan Babcock Energy Services (Overseas) Ltd.	Engineering and service	UK	100	100	65.6	65.4	December 31
Doosan Babcock Energy Polska Sp z o.o.	Engineering and service	Poland	98.9	98.9	66	65.8	December 31
Doosan Babcock Energy Germany GmbH	Engineering and service	Germany	100	100	65.6	65.4	December 31
Doosan Lentjes Czech s.r.o	Specialized service	Czech	100	100	66	65.7	December 31
Doosan Power Systems(Scotland) Ltd. Partnership	Real estate	UK	100	100	65.6	65.4	December 31
Doosan Babcock General Maintenance Services LLC(*3)	Specialized service	UAE	49	49	83.2	83	December 31
Osungpower O&M	Engineering and service	Korea	100	100	65.6	65.4	December 31
KDPP 3rd Co., Ltd.(*2)	Specialized in securitization	Korea	-	-	-	-	December 31
KDPP 5th Co., Ltd.(*2)	Specialized in securitization	Korea	-	-	-	-	December 31
U BEST 5th Co., Ltd.(*2)	Specialized in securitization	Korea	-	-	-	-	December 31
Doosan Cuvex Co., Ltd	Golf and condominium	Korea	100	100	51.9	51.1	December 31
Doosan Infracore Co., Ltd. ("DI")(*3)	Manufacturing, sales	Korea	36.3	36.3	87.5	87.4	December 31
Doosan Infracore China Co., Ltd.	Manufacturing, sales	China	80	80	90	90	December 31

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Subsidiary	Type of business	Location	Ownership ratio of the Group (%)(*1)		Ownership ratio of non-controlling interests (%)(*1)		Financial closing date
			2019	2018	2019	2018	
Doosan Infracore (China) Investment Co., Ltd.	Holding company	China	100	100	87.5	87.4	December 31
Doosan Infracore North America LLC	Sales	USA	100	100	87.5	87.4	December 31
Doosan Infracore Japan Corp.	Purchases	Japan	100	100	87.5	87.4	December 31
Doosan (China) Financial Leasing Corp.	Finance	China	100	100	88.5	88.4	December 31
Doosan Bobcat Chile S.A.	Sales	Chile	100	100	87.5	87.4	December 31
Doosan Infracore (Shandong) Co., Ltd.	sales	China	100	100	89.2	89.1	December 31
Doosan Infracore Norway AS	Manufacturing, sales	Norway	100	100	87.5	87.4	December 31
Doosan Infracore South America Industria E Comercio De Maquinas De Construção LTDA	Sales	Brazil	100	100	87.4	87.4	December 31
Doosan Infracore Construction Equipment India Private Ltd.	Sales	India	100	100	87.5	87.4	March 31
D20 Capital, LLC(*7)	Financial investment	USA	100	-	87.5	-	December 31
Clue Insight Inc.	Software development and sales	USA	72	-	91	-	December 31
D20 Capital FUND I, L.P.(*3)	Financial investment	USA	-	-	100	-	December 31
Doosan Bobcat Global Collaboration Center, Inc.	Other service	USA	100	-	93.6	-	December 31
Doosan Bobcat Inc.	Holding company	Korea	51.1	51.1	93.6	93.6	December 31
Doosan Bobcat Singapore Pte. Ltd.	Holding company	Singapore	100	51.1	93.6	93.6	December 31
Doosan Bobcat Korea Co., Ltd.	Sales	Korea	100	100	93.6	93.6	December 31
Doosan Bobcat Chile Compact SpA	Sales	Chile	100	100	93.6	93.6	December 31
Doosan Bobcat India Private Ltd.	Manufacturing, sales	India	100	100	93.6	93.6	March 31
Bobcat Corp.	Sales	Japan	100	100	93.6	93.6	December 31
Doosan Bobcat Mexico S.A. de C.V.	Other service	Mexico	100	100	93.6	93.6	December 31
Doosan Bobcat China Co., Ltd.	Manufacturing, sales	China	100	100	93.6	93.6	December 31
Clark Equipment Co.	Manufacturing, sales	USA	100	100	93.6	93.6	December 31
Bobcat Equipment Ltd.	Sales	Canada	100	100	93.6	93.6	December 31
Doosan International Australia Pty Ltd.	Sales	Australia	100	100	93.6	93.6	December 31
Bobcat Bensheim GmbH.	Sales	Germany	100	100	93.6	93.6	December 31
Doosan Holdings France S.A.S.	Holding company	France	100	100	93.6	93.6	December 31
Doosan Infracore Europe B.V.	Sales	Netherlands	100	100	87.5	87.4	December 31
Doosan Infracore Czech Republic s.r.o.	Sales	Czech	100	-	87.5	-	December 31
CJSC Doosan International Russia	Sales	Russia	100	100	93.6	93.6	December 31
Doosan International UK Ltd.	Sales	UK	100	100	93.6	93.6	December 31
Doosan International South Africa Pty Ltd.	Sales	Republic of South Africa	100	100	93.6	93.6	December 31
Doosan Bobcat EMEA s.r.o.	Manufacturing, Sales	Czech	100	100	93.6	93.6	December 31
Bobcat France S.A.	Manufacturing	France	100	100	93.6	93.6	December 31
Geith International Ltd.	Sales	Ireland	100	100	93.6	93.6	December 31
Doosan Engineering & Construction Co., Ltd. ("DEC")	Construction	Korea	89	66.4	69.4	77	December 31
Valueworks Co., Ltd	Real estate	Korea	100	100	43.1	46.9	December 31
Doosan Heavy Industries Vietnam Haiphong Co., Ltd	Manufacturing	Vietnam	100	100	70.8	77	December 31

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Subsidiary	Type of business	Location	Ownership ratio of the Group (%)(*1)		Ownership ratio of non-controlling interests (%)(*1)		Financial closing date
			2019	2018	2019	2018	
Pinetree City 1st Co., Ltd.(*2)	Specialized in securitization	Korea	-	-	-	-	December 31
DMbest3rd co.,Ltd.(*2)	Specialized in securitization	Korea	-	-	-	-	December 31
Greatgm 4th Co.,Ltd.(*2)	Specialized in securitization	Korea	-	-	-	-	December 31
Newstartdm 7th Co.,Ltd.(*2)	Specialized in securitization	Korea	-	-	-	-	December 31
Doosan E&C 4th. Co.,(*2)	Specialized in securitization	Korea	-	-	-	-	December 31
Newstartdm 8th Co.,Ltd.(*2)	Specialized in securitization	Korea	-	-	-	-	December 31

(*1) The ownership interest held by the parent represents the aggregated total of ownership interests directly held by each entity within the Group. The ownership interest held by non-controlling interests represents the proportion of ownership interests that is not attributable, directly or indirectly, to the entities within the Group and it may differ from the aggregated total, less the effective ownership interest held by the Group.

(*2) Although the Group does not own the equity of the special-purpose company, the Group gets profits from its operation according to the agreement, with structured investment. As the Group has control to decide its operational activity, it also influences the profits significantly.

(*3) Potential voting rights held by the Group on the above subsidiaries for assessing whether or not it controls the subsidiaries are less than 50%, but the Group concluded that the Group has de facto control over the subsidiaries.

(*4) During the current year, 'Doosan Information and Communications America LLC' changed its name to 'Doosan Digital Innovation America LLC'.

(*5) During the current year, 'Doosan Information and Communications China Co., Ltd.' changed its name to 'Doosan Digital Innovation China LLC'.

(*6) During the current year, 'Doosan Information and Communications Europe Ltd.' changed its name to 'Doosan Digital Innovation Europe Limited'.

(*7) During the current year, 'Doosan Ventures LLC' changed its name to 'D20 Capital, LLC'.

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1.2.1 Changes in the scope of consolidation

Changes in the scope of consolidation for the year ended December 31, 2019 are as follows:

Subsidiary	Change	Description
D-Pay 1st Co.,Ltd.	Included	New borrowing
Doosan Logistics Solution Co., Ltd.	Included	Newly established
DESA Service, LLC	Included	Newly established
Doosan Mobility Innovation(Shenzhen) Co. Ltd.	Included	Newly established
U BEST 5th Co., Ltd.	Included	New borrowing
D20 Capital, LLC	Included	Newly established
Doosan Bobcat Global Collaboration Center, Inc.	Included	Newly established
Clue Insight Inc.	Included	Newly established
Doosan Infracore Czech Republic s.r.o.	Included	Newly established
D20 Capital FUND I, L.P.	Included	Newly established
Doosan GridTech C&I LLC	Included	Newly established
Continuity Energy LLC	Included	Newly established
KDPP 5th Co., Ltd	Included	Newly established
DS HWADO 1st. Co.,Ltd.	Included	New borrowing
Newstartdm 7th Co.,Ltd.	Included	New borrowing
Doosan E&C 4th. Co.,Ltd.	Included	New borrowing
Newstartdm 8th Co.,Ltd.	Included	New borrowing
Doosan Electro-Materials Luxembourg Sarl	Excluded	Spin off
Circuit Foil Luxembourg Sarl	Excluded	Spin off
Circuit Foil Asia Pacific (Zhangjiagang)	Excluded	Spin off
Circuit Foil Asia Pacific (Hong Kong)	Excluded	Spin off
Circuit Foil Trading Inc.	Excluded	Spin off
Doosan Corporation Europe Kft.	Excluded	Spin off
Doosan Energy Solution Kft.	Excluded	Spin off
New Star Power 1st Co., Ltd.	Excluded	Liquidation
New Star Power 2nd Co., Ltd.	Excluded	Liquidation
Happy Tomorrow 20th Co., Ltd.	Excluded	Liquidation
Happy Tomorrow 25th Co., Ltd.	Excluded	Liquidation
Happy Tomorrow 27th Co., Ltd.	Excluded	Liquidation
KDPP 4th Co., Ltd	Excluded	Liquidation
U BEST 4th Co., Ltd.	Excluded	Liquidation
FSS 8th CO., LTD	Excluded	Liquidation
AE & E Lentjes Belgie N.V.	Excluded	Liquidation
Doosan Techno Holding Co., Ltd.	Excluded	Liquidation
Doosan International Luxemburg S.a r.l.	Excluded	Liquidation
Doosan Infracore Europe S.A.	Excluded	Liquidation
Doosan Benelux SA.	Excluded	Liquidation
GMS 1st Co.,Ltd.	Excluded	Liquidation
Greatgm 6th. Co.,Ltd.	Excluded	Liquidation
Doosan E&C 3rd Co., Ltd	Excluded	Liquidation
DMbest 4th Co.,Ltd	Excluded	Liquidation
DS HWADO 1st. Co.,Ltd.	Excluded	Liquidation
Treasury stock trust	Excluded	Termination

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1.3 Condensed financial information of the Group's significant consolidated subsidiaries

Condensed financial information of the Group's significant consolidated subsidiaries (or intermediate parent) as of and for the year ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019				
	Assets	Liabilities	Sales	Profit (loss) for the year	Total comprehensive income (loss)
	₩	₩	₩	₩	₩
DHC	11,360,878	7,920,170	3,708,635	(495,191)	(546,471)
Doosan Heavy Industries Vietnam Co., Ltd.	449,480	328,217	384,782	61,026	61,026
Doosan Power Systems India Private Ltd.	781,789	688,851	701,513	(44,462)	(39,921)
Doosan Heavy Industries America Holdings Inc.	149,594	44,380	-	(1,625)	(1,625)
Doosan Power Systems Overseas Investments Ltd.	76,753	98,064	-	(3,370)	(3,370)
Doosan Babcock Ltd.	1,145,394	456,192	473,608	2,486	20,588
Doosan Power Systems S.A.	1,294,288	840,673	-	(34,347)	(49,361)
Doosan Cuvex Co., Ltd	220,792	103,295	68,412	934	6,358
DI	4,965,757	3,490,347	3,102,184	53,024	69,028
Doosan Infracore China Co., Ltd.	1,334,444	762,003	1,315,098	112,883	112,883
Doosan Infracore (China) Investment Co., Ltd.	221,149	5,449	11,674	1,690	1,690
Doosan Infracore North America LLC	310,758	231,261	267,184	14,686	12,045
Doosan (China) Financial Leasing Corp.	647,985	451,728	60,723	21,824	21,824
Doosan Infracore Europe B.V	284,038	273,958	553,556	4,175	4,161
Doosan Bobcat Co., Ltd. and its subsidiaries	6,704,236	2,725,170	4,509,550	272,116	218,514
DEC	2,328,740	1,810,267	1,729,861	(95,534)	(94,482)
Newstartdm 7th Co.,Ltd.	140,298	140,308	3,091	(11)	(11)
DMbest 3rd co.,Ltd	90,004	90,004	6,854	-	-
Newstartdm 8th Co.,Ltd.	122,002	122,002	-	-	-
Doosan E&C 4th Co., Ltd.	97,104	97,101	4,671	-	-
Valueworks Co., Ltd.	206,282	1,941	5,640	2,542	2,542
DBC Co., Ltd	322,297	219,050	-	(814)	(814)
Doosan Mecatec Co., Ltd.	427,951	224,357	311,753	14,890	16,023
Doosan Industrial Vehicle America Corp.	86,711	51,002	249,774	3,904	3,904
Doosan Industrial Vehicle U.K. Ltd.	107,258	105,822	47,618	335	335
Rushlift Ltd.	138,504	122,704	64,968	(741)	(741)
Doosan Mottrol (Jiangyin) Co., Ltd.	105,618	59,638	282,972	15,568	15,568
Doosan Electro-Materials (Changshu) Co., Ltd.	141,750	107,501	183,180	14,478	14,478
Doosan Fuel Cell America, Inc.	306,930	250,203	231,091	(14,893)	(14,893)
Oricom Inc.	140,917	69,645	113,009	3,283	3,536

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1.3 Condensed financial information of the Group's significant consolidated subsidiaries (cont'd)

	2018				
	Assets	Liabilities	Sales	Profit (loss) for the year	Total comprehensive income (loss)
	₩	₩	₩	₩	₩
DHC	11,342,250	7,401,593	4,101,664	(725,088)	(703,313)
Doosan Heavy Industries Vietnam Co., Ltd.	341,129	282,560	210,408	18,911	18,911
Doosan HF Controls Corp.	19,289	3,375	9,054	(168)	(168)
Doosan Heavy Industries Japan Corp.	16,040	12,775	1,987	94	94
S.C. Doosan IMGB S.A.	140,536	57,200	68,133	(5,238)	(5,238)
Doosan Enpure Ltd.	27,795	25,013	75,507	1,725	1,725
Doosan Power Systems India Private Ltd.	726,034	595,829	387,445	(29,128)	(29,185)
Doosan Heavy Industries Muscat LLC	23,303	26,682	21,532	(1,127)	(1,127)
Doosan Power Systems Arabia Company Limited	21,311	12,884	11,486	1,453	1,453
Doosan Heavy Industries America Holdings Inc.	124,595	21,430	-	401	401
Doosan Turbomachinery Services Inc.	30,302	14,729	40,911	1,070	1,070
Doosan Heavy Industries America LLC	14,105	7,668	2,751	393	393
Doosan GridTech Inc.	10,221	6,721	584	(8,333)	(8,333)
Doosan Skoda Power s.r.o	603,612	101,000	247,264	15,225	13,159
Doosan Power Systems Overseas Investments Ltd.	72,548	89,262	-	(3,553)	(3,553)
Doosan Babcock Ltd.	1,019,551	394,204	469,979	(1,171)	9,448
Doosan Power Systems Europe Limited GmbH	73,461	178,204	-	(22,130)	(22,130)
Doosan Lentjes GmbH	71,805	48,912	29,627	(12,042)	(10,962)
Doosan Power Systems S.A.	1,227,838	879,157	-	35,048	35,048
Doosan Babcock Energy Polska Sp z.o.o.	24,243	16,172	35,121	(53)	(59)
Doosan Power Systems (Scotland) Ltd. Partnership	30,912	1,704	-	1,779	1,779
Doosan Babcock General Maintenance Services LLC	26,730	58,402	45,026	(15,079)	(16,804)
Doosan Cuvex Co., Ltd	213,382	100,557	66,051	499	91
DBC Co., Ltd	282,276	178,214	-	(1,744)	(1,744)
DI	4,923,151	3,516,787	3,058,277	71,748	59,052
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
Doosan Infracore Europe B.V	281,619	275,760	501,261	6,093	6,127
Doosan Bobcat Co., Ltd. and its subsidiaries	6,446,324	2,706,721	3,970,766	264,497	282,749
DEC	2,336,841	2,015,019	1,504,060	(580,707)	(581,868)
Doosan Heavy Industries Vietnam Haiphong Co., Ltd.	40,191	7,521	38,317	1,944	1,944
Pinetree City 1st Co., Ltd.	56,955	56,958	2,403	7	7
DMbest3rd co.,ltd	70,013	70,013	3,417	-	-
DMbest4th co.,ltd	120,013	120,013	4,947	-	-

Doosan Corporation and its subsidiaries
Notes to the consolidated financial statements
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1.3 Condensed financial information of the Group's significant consolidated subsidiaries (cont'd)

	2018				
	Assets	Liabilities	Sales	Profit (loss) for the year	Total comprehensive income (loss)
GMS 1st Co., Ltd.	₩ 15,646	₩ 15,648	₩ 1,316	₩ (5)	₩ (5)
Doosan E&C 3rd Co., Ltd.	73,629	73,627	2,576	-	-
Greatgm 4th Co.,Ltd	99,005	100,006	1,976	(401)	(401)
Greatgm 6th Co.,	152,404	152,728	3,030	(1)	(1)
Valueworks Co., Ltd.	208,862	864	5,427	2,393	2,393
Oricom Inc.	155,006	85,148	106,964	6,026	5,556
Hancomm Inc.	58,623	40,582	76,585	3,259	2,811
Doosan Mecatec Co., Ltd.	328,425	125,854	205,473	5,503	4,603
Doosan Industrial Vehicle America Corp.	83,042	52,301	193,963	2,414	2,414
Doosan Industrial Vehicle U.K. Ltd.	87,969	86,946	45,569	(815)	(815)
Doosan Industrial Vehicle Europe N.A.	42,143	26,523	99,118	1,458	1,458
Doosan Industrial Vehicle Yantai Co., Ltd.	42,360	29,544	71,911	2,792	2,792
Rushlift Ltd.	114,312	97,834	65,388	1,100	1,100
Doosanbears, Inc.	59,297	51,529	49,519	171	165
Doosan Mottrol (Jiangyin) Co., Ltd.	94,324	61,935	280,587	10,138	10,138
Doosan Electro-Materials Singapore Pte. Ltd.	10,073	12,679	51,770	867	867
Doosan Electro-Materials (Changshu) Co., Ltd.	138,662	119,007	164,724	4,644	4,644
Doosan Electro-Materials Luxembourg Sarl	56,063	17,717	-	16,435	16,435
Doosan Fuel Cell America, Inc.	239,821	221,068	201,270	(31,059)	(31,059)
Circuit Foil Luxembourg Sarl	151,711	71,930	146,957	9,516	9,341
Neoplux Co.,Ltd.	81,283	15,305	22,219	8,452	6,595

1.4 Cash flows information

Summarized cash flows information of main subsidiaries for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019		
	DHC and its subsidiaries	DI and its subsidiaries	DEC and its subsidiaries
Cash flows from operating activities	₩ (50,120)	₩ 567,418	₩ (74,316)
Cash flows from investing activities	(429,446)	(339,375)	(9,200)
Cash flows from financing activities	190,509	(549,790)	24,301
Effect of exchange rate changes on cash and cash equivalents	16,640	24,904	202
Net increase (decrease) in cash and cash equivalent	(272,417)	(296,843)	(59,013)
Cash and cash equivalents, beginning of the year	917,443	1,053,016	99,095
Cash and cash equivalents, end of the year	₩ 645,026	₩ 756,173	₩ 40,082

	2018		
	DHC and its subsidiaries	DI and its subsidiaries	DEC and its subsidiaries
Cash flows from operating activities	₩ 94,422	₩ 837,778	₩ 94,499
Cash flows from investing activities	247,959	(312,848)	(120,283)
Cash flows from financing activities	(273,420)	(422,559)	13,874
Effect of exchange rate changes on cash and cash equivalents	10,652	7,164	179
Net increase (decrease) in cash and cash equivalent	79,613	109,535	(11,731)
Cash and cash equivalents, beginning of the year	843,604	943,481	110,826
Cash and cash equivalents, end of the year	₩ 923,217	₩ 1,053,016	₩ 99,095

Above financial information vested in non-controlling interests is based on consolidated financial information of intermediate controlling company. However, financial information of DHC and its subsidiaries does not include financial information of DI, DEC, DE and their subsidiaries, respectively.

1.4 Cash flows information (cont'd)

The ownership interest held by non-controlling interests and details of financial position, result of operation and dividends vested in non-controlling interests by each of the major subsidiaries as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019					
	DHC and its subsidiaries		DI and its subsidiaries		DEC and its subsidiaries	
Ownership interest held by non-controlling interests (%)		65.60%		87.50%		69.40%
Cumulative non-controlling interests	₩	1,010,523	₩	4,015,486	₩	192,651
Net income (loss) vested in non-controlling interests		(279,384)		357,177		(66,613)
Dividends paid to non-controlling interests(*1)		(14,390)		(53,980)		-
(*1) Oricom Inc. except for above subsidiaries paid dividends of ₩844 million vested in non-controlling interests.						

	2018					
	DHC and its subsidiaries		DI and its subsidiaries		DEC and its subsidiaries	
Ownership interest held by non-controlling interests (%)		65.4%		87.4%		77%
Cumulative non-controlling interests	₩	1,435,427	₩	3,556,607	₩	103,176
Net income (loss) vested in non-controlling interests		(148,454)		359,028		(437,598)
Dividends paid to non-controlling interests(*1)		(23,452)		(41,034)		-
(*1) Oricom Inc. except for above subsidiaries paid dividends of ₩844 million vested in non-controlling interests.						

Above financial information vested in non-controlling interests is based on consolidated financial information of intermediate controlling company. However, financial information of DHC and its subsidiaries does not include financial information of DI, DEC, DE and its subsidiaries, respectively.

2. Summary of significant accounting policies

2.1 Basis of preparation

The Group prepares statutory financial statements in Korean in accordance with KIFRS enacted by *the Act on External Audit of Stock Companies*. The accompanying consolidated financial statements have been translated into English from Korean financial statements. In the event of any differences in interpreting the financial statements or the independent auditor's report thereon, Korean version, which is used for regulatory reporting purposes, shall prevail.

Significant accounting policies applied in the preparation of the consolidated financial statements are described below. Significant accounting policies applied in the preparation of the consolidated financial statements for the year ended December 31, 2019 are the same as those adopted in the preparation of the consolidated financial statements for the year ended December 31, 2018, except for the effects related to the adoption of the standards or interpretations described below.

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

2.1.1 New and amended standards and interpretations

The Group applied KIFRS 1116 *Leases*. The nature and effect of the changes as a result of adoption of these new accounting standards are described below.

Several other amendments and interpretations apply for the first time in 2019, but do not have an impact on the consolidated financial statements of the Group. The Group has not early adopted any standards, interpretations or amendments that have been issued but are not yet effective.

KIFRS 1116 *Leases*

KIFRS 1116 supersedes KIFRS 1017 *Leases*, KIFRS 2104 *Determining whether an Arrangement contains a Lease*, KIFRS 2015 *Operating Leases-Incentives* and KIFRS 2027 *Evaluating the Substance of Transactions Involving the Legal Form of a Lease*. The standard sets out the principles for the recognition, measurement, presentation and disclosure of leases and requires lessees to recognize most leases on the financial statements.

Lessor accounting under KIFRS 1116 is substantially unchanged from KIFRS 1017. Lessors will continue to classify leases as either operating or finance leases using similar principles as in KIFRS 1017. Therefore, KIFRS 1116 does not have an impact for leases where the Group is the lessor. However, if the Group is intermediate lessor, it reassesses the classification of the operating leases or finance leases for the sub lease in accordance with KIFRS 1116.

The Group adopted KIFRS 1116 using the full retrospective method of adoption, with the date of initial application of January 1, 2019. In the full retrospective method of adoption, KIFRS 1116 is applied retrospectively to recognize the cumulative effect of initial application at the date of initial application. The Group elected to use the transition practical expedient to not reassess whether a contract is, or contains, a lease at January 1, 2019. Instead, the Group applied the standard only to contracts that were previously identified as leases applying KIFRS 1017 and KIFRS 2104 at the date of initial application. The Group also elected to use the recognition exemptions for lease contracts that, at the commencement date, have a lease term of 12 months or less and do not contain a purchase option (short-term leases), and lease contracts for which the underlying asset is of low value (low-value assets).

2.1.1 New and amended standards and interpretations (cont'd)

The effects of the initial application of KIFRS 1116 on the consolidated statements of financial position as of 1 January 2019 is as follows (Korean won in millions).

		Increase(decrease)
Assets		
Tangible assets	₩	292,112
Right-of-use assets		292,112
Land		18,858
Buildings and Structures		196,377
Machinery		20,633
Other tangible assets		56,244
Investment properties		27,729
Other receivables and other long-term receivables		15,348
Lease receivables		15,348
Other non-current assets		(27,879)
Total assets	₩	<u>307,310</u>
Liabilities		
Other liabilities (*1)	₩	(5,253)
Current lease liabilities		33,131
Long-term other liabilities (*1)		(7,195)
Non-current lease liabilities		302,395
Total liabilities	₩	<u>323,078</u>
Equity		
Retained-earnings		(3,714)
Non-controlling interests	₩	(12,054)
Total equity	₩	<u>(15,768)</u>

(*1) Decreases due to account reclassification to lease liabilities.

The Group has lease contracts for various items of lands, buildings, machineries, vehicle transportations and other office equipment. Before the adoption of KIFRS 1116, the Group classified each of its leases (as lessee) at the inception date as either a finance lease or an operating lease. Leases that are transferred most of the risks and rewards of ownership of the lease assets are classified as finance leases and other leases as operating lease. In the case of a finance lease, small amounts of the present value of the minimum lease payment measured at the lease agreement date and the fair value of the lease assets were recognized as financial lease assets and financial lease liabilities at the lease commencement date, respectively. The minimum lease fee paid per annum was divided into financial cost and lease liability repayment amount. In the operating lease, the lease fee was recognized as an expense in the income statement on a flat basis over the lease term.

Upon adoption of KIFRS 1116, the Group applied a single recognition and measurement approach for all leases for which it is the lessee, except for short-term leases and leases of low-value assets. For accounting policies beginning on 1 January 2019, see Note 2.10 Leases. The standard provides specific transition requirements and practical expedients, which have been applied by the Group.

▷ Lease previously classified as finance leases

The Group did not change the initial carrying amounts of recognized assets and liabilities at the date of initial application for leases previously classified as finance leases (i.e., the right-of-use assets and lease liabilities equal the lease assets and liabilities recognized under KIFRS 1017). The requirements of KIFRS 1116 were applied to these leases from 1 January 2019.

2.1.1 New and amended standards and interpretations (cont'd)

▷ Leases previously accounted for as operating leases

The Group recognized right-of-use assets and lease liabilities for those leases previously classified as operating leases, except for short-term leases and leases of low-value assets. The right-of-use assets for most leases were recognized based on the carrying amount as if the standard had always been applied, apart from the use of incremental borrowing rate at the date of initial application. In some leases, the right-of-use assets were recognized based on the amount equal to the lease liabilities, adjusted for any related prepaid and accrued lease payments previously recognized. Lease liabilities were recognized based on the present value of the remaining lease payments, discounted using the incremental borrowing rate at the date of initial application.

The Group also applied the available practical expedients wherein it:

- Used a single discount rate to a portfolio of leases with reasonably similar characteristics
- Relied on its assessment of whether leases are onerous immediately before the date of initial application
- Applied the short-term leases exemptions to leases with lease term that ends within 12 months of the date of initial application
- Excluded the initial direct costs from the measurement of the right-of-use asset at the date of initial application
- Used hindsight in determining the lease term where the contract contained options to extend or terminate the lease

The lease liabilities as at 1 January 2019 can be reconciled to the operating lease commitments as of 31 December 2018, as follows (Korean won in millions).

	Amount
Operating lease agreement as of December 31, 2018	₩ 362,193
Less: Contingency related to short-term leases and leases of low-value assets	(14,838)
	347,355
Weighted average incremental borrowing rate as at 1 January 2019	2.15%~15.36%
Discounted operating leases (excluding short-term leases and leases of low-value assets) as at 1 January 2019	310,630
Add: Commitments relating to leases previously classified as finance leases	12,448
Lease liabilities as at 1 January 2019	₩ 323,078

▷ Sub lease

The Group sign a contract for a sub lease on some building. The Group previously classified the sub lease and its upper lease contract as operating lease, but it removed license assets generated from upper lease and reclassified sub lease as finance lease and recognized lease receivables.

Amendments to KIFRS 2123 *Uncertainty over Income Tax Treatments*

The Interpretation addresses the accounting for income taxes when tax treatments involve uncertainty that affects the application of KIFRS 1012 Income Taxes. It does not apply to taxes or levies outside the scope of KIFRS 1012, nor does it specifically include requirements relating to interest and penalties associated with uncertain tax treatments. The Interpretation specifically addresses the following:

- Whether tax treatments should be considered collectively
- Assumptions for taxation authorities' examinations
- Determination of taxable profit (tax loss), tax bases, unused tax losses, unused tax credits and tax rates
- Effect of changes in facts and circumstances

The Group determines whether to consider each uncertain tax treatment separately or together with one or more other uncertain tax treatments and uses the approach that better predicts the resolution of the uncertainty.

The Group applies significant judgement in identifying uncertainties over income tax treatments. Since the Group operates in a complex multinational environment, it assessed whether the Interpretation had an impact on its consolidated financial statements.

2.1.1 New and amended standards and interpretations (cont'd)

Upon adoption of the Interpretation, the Group considered whether it has any uncertain tax positions, particularly those relating to transfer pricing. The Group's and the subsidiaries' tax filings in different jurisdictions include deductions related to transfer pricing and the taxation authorities may challenge those tax treatments. The Group determined, based on its tax compliance and transfer pricing study, that it is probable that its tax treatments (including those for the subsidiaries) will be accepted by the taxation authorities. The Interpretation did not have an impact on the consolidated financial statements of the Group.

Amendments to KIFRS 1109 *Financial Instruments: Prepayment Features with Negative Compensation*

Under KIFRS 1109, a debt instrument can be measured at amortized cost or at fair value through other comprehensive income, provided that the contractual cash flows are 'solely payments of principal and interest on the principal amount outstanding' (the SPPI criterion) and the instrument is held within the appropriate business model for that classification. The amendments to KIFRS 1109 clarify that a financial asset passes the SPPI criterion regardless of an event or circumstance that causes the early termination of the contract and irrespective of which party pays or receives reasonable compensation for the early termination of the contract.

These amendments had no impact on the consolidated financial statements of the Group.

Amendments to KIFRS 1019 *Employee Benefits: Plan Amendment, Curtailment or Settlement*

The amendments to KIFRS 1019 address the accounting when a plan amendment, curtailment or settlement occurs during a reporting period. The amendments specify that when a plan amendment, curtailment or settlement occurs during the annual reporting period, an entity is required to determine the current service cost for the remainder of the period after the plan amendment, curtailment or settlement, using the actuarial assumptions used to remeasure the net defined benefit liability (asset) reflecting the benefits offered under the plan and the plan assets after that event. An entity is also required to determine the net interest for the remainder of the period after the plan amendment, curtailment or settlement using the net defined benefit liability (asset) reflecting the benefits offered under the plan and the plan assets after that event, and the discount rate used to remeasure that net defined benefit liability (asset). These amendments had no impact on the consolidated financial statements of the Group.

Amendments to KIFRS 1028 *Investment in Associates and Joint Ventures: Long-term Investment in Associates and Joint Ventures*

The amendments clarify that an entity applies KIFRS 1109 to long-term interests in an associate or joint venture to which the equity method is not applied but that, in substance, form part of the net investment in the associate or joint venture (long-term interests). This clarification is relevant because it implies that the expected credit loss model in KIFRS 1109 applies to such long-term interests. The amendments also clarified that, in applying KIFRS 1109, an entity does not take account of any losses of the associate or joint venture, or any impairment losses on the net investment, recognized as adjustments to the net investment in the associate or joint venture that arise from applying KIFRS 1028 Investments in Associates and Joint Ventures. These amendments had no impact on the consolidated financial statements as the Group does not have long-term interests in its associate and joint venture. The Group recognized decreases of 6,877 and 16,790 million won in retained earnings and non-controlling interest, respectively, for 23,667 million of equity losses on investments on long-term loan which can be interpreted as associates' long-term investment equity in accordance with the transitional regulation of the amendments.

Annual Improvements 2015-2017 Cycle

KIFRS 1103 *Business Combinations*

The amendments clarify that, when an entity obtains control of a business that is a joint operation, it applies the requirements for a business combination achieved in stages, including remeasuring previously held interests in the assets and liabilities of the joint operation at fair value. In doing so, the acquirer remeasures its entire previously held interest in the joint operation. An entity applies those amendments to business combinations for which the acquisition date is on or after the beginning of the first annual reporting period beginning on or after January 1, 2019, with early application permitted. These amendments had no impact on the consolidated financial statements of the Group as there is no transaction where joint control is obtained.

2.1.1 New and amended standards and interpretations (cont'd)

KIFRS 1111 *Joint Arrangements*

An entity 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 as defined in KIFRS 1103. The amendments clarify that the previously held interests in that joint operation are not remeasured. An entity applies those amendments to transactions in which it obtains joint control on or after the beginning of the first annual reporting period beginning on or after January 1, 2019, with early application permitted. These amendments had no impact on the consolidated financial statements of the Group.

KIFRS 1012 *Income Taxes*

The amendments clarify that the income tax consequences of dividends are linked more directly to past transactions or events that generated distributable profits than to distributions to owners. Therefore, an entity recognizes the income tax consequences of dividends in profit or loss, other comprehensive income or equity according to where it originally recognized those past transactions or events. An entity applies the amendments for annual reporting periods beginning on or after January 1, 2019, with early application permitted. When the entity first applies those amendments, it applies them to the income tax consequences of dividends recognized on or after the beginning of the earliest comparative period. These amendments had no impact on the consolidated financial statements of the Group.

KIFRS 1023 *Borrowing Costs*

The amendments clarify that an entity treats as part of general borrowings any borrowing originally made to develop a qualifying asset when substantially all of the activities necessary to prepare that asset for its intended use or sale are complete. The entity applies the amendments to borrowing costs incurred on or after the beginning of the annual reporting period in which the entity first applies those amendments. An entity applies those amendments for annual reporting periods beginning on or after January 1, 2019, with early application permitted. These amendments had no impact on the consolidated financial statements of the Group.

2.1.2 Standards issued but not yet effective

The details of the Standard and Interpretation of International Financial Reporting Standards and Interpretations issued as of the date of approval of the issue of the Group's financial statements but not yet adopted by the Group are as follows:

Amendments to KIFRS 1103 *Business Combinations: Definition of a business*

In October 2018, the IASB issued amendments to the definition of a business in KIFRS 1103 Business Combinations to help entities determine whether an acquired set of activities and assets is a business or not. They clarify the minimum requirements for a business, remove the assessment of whether market participants are capable of replacing any missing elements, add guidance to help entities assess whether an acquired process is substantive, narrow the definitions of a business and of outputs, and introduce an optional fair value concentration test. New illustrative examples were provided along with the amendments. Since the amendments apply prospectively to transactions or other events that occur on or after the date of first application, the Group will not be affected by these amendments on the date of transition.

Amendments to KIFRS 1001 and KIFRS 1008: *Definition of Material*

In October 2018, the IASB issued amendments to KIFRS 1001 Presentation of Financial Statements and KIFRS 1008 Accounting Policies, Changes in Accounting Estimates and Errors to align the definition of 'material' across the standards and to clarify certain aspects of the definition. The new definition states that, 'Information is material if omitting, misstating or obscuring it could reasonably be expected to influence decisions that the primary users of general purpose financial statements make on the basis of those financial statements, which provide financial information about a specific reporting entity.' The amendments to the definition of material is not expected to have a significant impact on the Group's consolidated financial statements.

2.2 Basis of consolidation

The consolidated financial statements comprise the financial statements of the Group as of December 31, 2019. Control is achieved when the Group is exposed, or has rights, to variable returns from its involvement with the investee and has the ability to affect those returns through its power over the investee. Specifically, the Group controls an investee if, and only if, the Group has:

2.2 Basis of consolidation (cont'd)

- Power over the investee (i.e. existing rights that give it the current ability to direct the relevant activities of the investee)
- Exposure, or rights, to variable returns from its involvement with the investee, and
- The ability to use its power over the investee to affect its returns

When the Group has less than a majority of the voting or similar rights of an investee, the Group considers all relevant facts and circumstances in assessing whether it has power over an investee, including:

- The contractual arrangement with the other vote holders of the investee
- Rights arising from other contractual arrangements
- The Entity's voting rights and potential voting rights

The Group re-assesses whether or not it controls an investee if facts and circumstances indicate that there are changes to one or more of the three elements of control. Consolidation of a subsidiary begins when the Group obtains control over the subsidiary and ceases when the Group loses control of the subsidiary. Assets, liabilities, income and expenses of a subsidiary acquired or disposed of during the period are included in the consolidated statement of comprehensive income from the date the Group gains control until the date the Group ceases to control the subsidiary.

Profit or loss and each component of other comprehensive income (OCI) are attributed to the equity holders of the parent of the Group and to the non-controlling interests, even if this results in the non-controlling interests having a deficit balance. When necessary, adjustments are made to the financial statements of subsidiaries to bring their accounting policies into line with the Group's accounting policies. All intra-group assets and liabilities, equity, income, expenses and cash flows relating to transactions between members of the Group are eliminated in full on consolidation.

A change in the ownership interest of a subsidiary, without a loss of control, is accounted for as an equity transaction

If the Group loses control over a subsidiary, it derecognizes the related assets (including goodwill), liabilities, non-controlling interest and other components of equity while any resultant gain or loss is recognized in profit or loss. Any investment is recognized at fair value.

2.3 Business combinations

Acquisitions of subsidiaries and businesses are accounted for using the acquisition method. The cost of an acquisition is measured as the aggregate of the consideration transferred, which is measured at acquisition date fair value, and the amount of any non-controlling interests in the acquiree. For each business combination, the Group elects whether to measure the non-controlling interests in the acquiree at fair value or at the proportionate share of the acquiree's identifiable net assets. Acquisition-related costs are recognized in profit or loss as incurred.

Acquired assets, liabilities and contingent liabilities that are identifiable at the acquisition date are recognized at fair value on the acquisition date except for the following:

- Deferred tax assets and liabilities or assets related to employee benefit arrangements are recognized and measured in accordance with KIFRS 1012 *Income Taxes* and KIFRS 1019 *Employee Benefits*, respectively.
- Liabilities or equity instruments related to share-based payment arrangements of the acquiree or share-based payment arrangements of the Group entered into to replace share-based payment arrangements of the acquiree are measured in accordance with KIFRS 1102 *Share-based Payment* at the acquisition date.
- Non-current assets (or disposal groups) classified as held for sale in accordance with KIFRS 1105 *Non-current Assets Held for Sale and Discontinued Operations* are measured in accordance with KIFRS 1105.

Goodwill is measured as the excess of the sum of the consideration transferred, the amount of any non-controlling interests in the acquiree and the fair value of the acquirer's previously held equity interest in the acquire (if any) over the net of the acquisition-date amounts of the identifiable assets acquired and the liabilities assumed. If, after reassessment, the net of the acquisition-date amounts of the identifiable assets acquired and liabilities assumed exceeds the sum of the consideration transferred, the amount of any non-controlling interests in the acquire and the fair value of the acquirer's previously held interest in the acquire (if any), the excess is recognized immediately in profit or loss as a bargain purchase gain.

2.3 Business combinations (cont'd)

Non-controlling interests that are present ownership interests and entitle their holders to a proportionate share of the entity's net assets in the event of liquidation may be initially measured either at fair value or at the non-controlling interests' proportionate share of the recognized amounts of the acquiree's identifiable net assets. The choice of measurement basis is made on a transaction-by-transaction basis. Other types of non-controlling interests are measured at fair value or, when applicable, on the basis specified in another KIFRS.

The transfer consideration of the Group as a result of the business combination includes the assets and liabilities from the contingent consideration arrangement and the contingent consideration is measured at the fair value at the acquisition date and is included as part of the consideration transferred. Changes in fair value after the acquisition date are adjusted retrospectively and adjusted in the corresponding goodwill if the conditions of the measurement period adjustments are met. Measurement Period Adjustments are adjustments that result from acquiring additional information about the facts and circumstances that existed at the acquisition date during the 'Adjustment Period' (which cannot exceed one year from the acquisition date).

Changes in fair value of contingent consideration that do not qualify for measurement period adjustments are accounted for in accordance with the classification of contingent consideration. Contingent consideration that is classified as equity is subsequently accounted for as equity if the settlement is not made at the reporting date. Contingent consideration that is classified as an asset or a liability is remeasured at subsequent reporting dates in accordance with KIFRS 1039 Financial Instruments: Recognition and Measurement or KIFRS 1037 Provisions, Contingent Liabilities and Contingent Assets. If the gain or loss is recognized, it is recognized in profit or loss.

In a staged business combination, the Group remeasures the previously held equity interest in the acquiree to its fair value at the acquisition date and, if any, the result is recognized in profit or loss. Recognition of changes in the value of interests in the acquiree prior to the acquisition date to other comprehensive income is reclassified to profit or loss in the same manner as if the previously held equity interests were disposed of directly.

If the initial accounting for the business combination cannot be completed by the end of the reporting period in which the business combination occurs, the Group reports provisional amounts in the consolidated financial statements for items for which accounting is not completed. In the event that there is newly acquired information about facts and circumstances that existed at the acquisition date during the measurement period (see above) the Group would have had an effect on the measurement of the amount recognized at the acquisition date. Recognized provision is adjusted retrospectively or additional assets and liabilities are recognized.

2.4 Investment in associates and joint ventures

An associate is an entity over which the Group has significant influence. Significant influence is the power to participate in the financial and operating policy decisions of the investee, but is not control or joint control over those policies.

A joint venture is a type of joint arrangement whereby the parties that have joint control of the arrangement have rights to the net assets of the joint venture. Joint control is the contractually agreed sharing of control of an arrangement, which exists only when decisions about the relevant activities require unanimous consent of the parties sharing control.

Except for the case where an investment in an associate or a joint venture is classified as a held for sale in accordance with KIFRS 1105 Non-current Assets Held for Sale and Discontinued Operations, the profit or loss, are included in the consolidated financial statements by applying the equity method. In applying the equity method, investments in associates and joint ventures are carried at the acquisition cost less any impairment loss on the investments in associates and joint ventures, adjusted for changes in equity in net assets of associates and joint ventures consolidated financial statements. Losses of associates and joint ventures that exceed the interests of the Group in relation to the associates and joint ventures (including long-term investments that substantially form part of the net investment of the Group in the associates and joint ventures) Are legally or aggressively obligated, or are required to be paid on behalf of the joint venture.

The cost of acquisition over the fair value of identifiable assets, liabilities and contingent liabilities of associates and joint ventures at the acquisition date in excess of the Group's interest is recognized as goodwill. Goodwill is included in the carrying amount of the investment and reviewed for impairment as part of the investment. If the Group's share of the net fair value of identifiable assets, liabilities and contingent liabilities exceeding the cost of the consideration, even after review, is recognized in profit or loss.

2.4 Investment in associates and joint ventures (cont'd)

If the entity has retained some of the investment assets of existing associates and joint ventures even after it has lost significant influence over the associates and joint ventures, the fair value of the investment assets at the point of time when the significant influence is lost, Are considered to be the fair value at the initial recognition of the financial asset in accordance with KIFRS 1039. The difference between the carrying amount of the investment and the fair value of the investment is recognized in profit or loss, including the gain or loss on disposal of the associate. In addition, the investor accounts for all amounts recognized as other comprehensive income in relation to the associate and the joint venture on the same basis as the accounting treatment in case the associate and the joint venture directly dispose of the related asset or liability. Therefore, when an associate is required to reclassify the gain or loss previously recognized in other comprehensive income to the profit or loss as a result of the disposal of the asset or liability, the investor may reclassification gains or losses on equity Reclassified to profit or loss (reclassification adjustment).

If the equity method of accounting for associates or joint ventures decreases, but the equity method is applied, if the gain or loss previously recognized in other comprehensive income is reclassified to profit or loss as a result of the disposal of the related asset or liability, The proportionate portion of the decrease in ownership interest is reclassified to profit or loss. In addition, KIFRS 1105 is applied when a portion of investments in associates or joint ventures meets the criteria for sale.

The Group determines whether an impairment loss is recognized in respect of investments in associates and joint ventures in accordance with KIFRS 1039 Financial Instruments: Recognition and Measurement. If there is an indication of impairment, the total carrying amount of the associate and joint venture (including goodwill) is compared to the recoverable amount (the greater of fair value less cost to sell and value in use) in accordance with KIFRS 1036 Asset Impairment. The recognized impairment loss is not allocated to any assets (including goodwill) that are part of the carrying amount of associates and joint ventures. The reversal of impairment loss is recognized in accordance with KIFRS 1036 as the recoverable amount of the investment assets increases subsequently.

When an associate becomes a joint venture or, conversely, a joint venture becomes an associate, the Group continues to apply the equity method and does not remeasure residual equity.

When the Group transacts with an associate or a joint venture, the gain or loss on the transaction between the associate and the joint venture is recognized only to the extent of the equity interest in the associate and the joint venture, are recognized.

2.5 Investment in joint ventures

A joint venture is a type of joint arrangement whereby the parties that have joint control of the arrangement have rights to the net assets of the joint venture. Joint control is the contractually agreed sharing of control of an arrangement, which exists only when decisions about the relevant activities require unanimous consent of the parties sharing control.

When an entity performs an activity under a joint venture, the entity recognizes, as a co-operative, its own interest in the joint venture as follows:

- Own assets. Include own shares of assets that are jointly owned.
- Own debt. Including own shares of jointly-generated debt.
- The own share of output from joint sales.
- The own share of the output of the joint sales.
- Own expenses. Include own share of the costs incurred jointly.

The Group accounts for assets, liabilities, income and expenses of its own interests in joint ventures in accordance with the standards that apply to certain assets, liabilities, income and expenses.

If a joint operating entity, such as selling or investing in an asset in a joint operation, is deemed to perform a transaction with another party in the joint operation, the entity shall notify the other party We are only aware of the limit on shareholding.

If the co-operative, the Group, conducts transactions such as joint sales and purchases of assets, the Group does not recognize its portion of the profit or loss until the assets are resold to a third party.

2.6 Goodwill

Goodwill resulting from an acquisition of a business is carried at cost as established at the date of acquisition of the business less accumulated impairment losses, if any.

For the purpose of impairment testing, goodwill is allocated to each of the cash-generating units (CGUs) (or entities of CGUs) that is expected to benefit from the synergies of the combination.

A CGU to which goodwill has been allocated is tested for impairment annually, or more frequently when there is indication that the unit may be impaired. If the recoverable amount of the CGU is less than its carrying amount, the impairment loss is allocated first to reduce the carrying amount of any goodwill allocated to the unit and then to the other assets of the unit on a pro rata basis based on the carrying amount of each asset in the unit. Any impairment loss for goodwill is recognized directly in profit or loss. An impairment loss recognized for goodwill is not reversed in subsequent periods.

On disposal of the relevant CGU, the attributable amount of goodwill is included in the determination of the profit or loss on disposal.

The Group's accounting policies for goodwill arising on the acquisition of an associate are set out in Note 2.4.

2.7 Non-current assets held for sale and discontinued operations

2.7.1 Non-current assets held for sale

Non-current assets and disposal groups are classified as held for sale if their carrying amount will be recovered principally through a sale transaction rather than through continuing use. This condition is regarded as met only when the sale is highly probable and the non-current asset (or disposal group) is available for immediate sale in its present condition. Management must be committed to the sale, which should be expected to qualify for recognition as a completed sale within one year from the date of classification.

If the Group commits a sale plan that results in a loss of control of the subsidiary, the Group will, if the Group has satisfied the conditions previously mentioned, regardless of whether the Group has a non-controlling interest in the former subsidiary after the sale, all assets and liabilities are classified as held for sale.

If the Group is committed to a sale of an investment in an associate or a joint venture, all or part of the investment in the associate or joint venture to be sold will be classified as held for sale if it meets the criteria for sale, And the Group ceases to apply the equity method for investments in associates or joint ventures related to the items classified as held for sale. The Group continues to apply the equity method of accounting for residual interests in investments in associates or joint ventures that are not classified as held for sale. However, if the Group has a significant influence over the associates or joint ventures, the Group ceases to apply the equity method at the time of sale.

Unless the Group continues to apply the equity method to the Group's remaining retained interests in an associate or joint venture after the sale of an investment in an associate or a joint venture, the Group shall retain the remaining amount of the investment in the associate or joint venture Corporate KIFRS 1039 Financial assets: Recognition and measurement.

Non-current assets (and disposal groups) classified as held for sale are measured at the lower of their previous carrying amount and fair value less costs to sell.

Property, plant and equipment and intangible assets are not depreciated or amortized once classified as held for sale or as held for distribution.

Assets and liabilities classified as held for sale or for distribution are presented separately as current items in the statement of financial position.

2.7.2 Assets scheduled for distribution to owners (or disposal groups)

The Group also applied the accounting policies related to the types, presentation and measurement of non-current assets (or disposal groups) classified as held for sale to non-current assets (or disposal entities) that are classified as scheduled for distribution to owners who exercise their qualifications as owners.

In addition, if all owners with the same kind of equity instruments are treated equally in distributing these non-cash assets to owners who exercise their qualifications as owners free of charge and the assets are ultimately not controlled by the same party or parties before and after the distribution, we recognize any dividend payable at the time of declaring the distribution (when approved in the shareholders' meeting). The dividend payable is measured at the fair value of the non-cash assets to be distributed at the end of each reporting period and at the settlement date, and the change in the carrying amount of the dividend payable is recognized in other capital items in the financial statement as an adjustment to the amount of the distribution.

In settling the dividend payable, the Group shall recognize any difference between the carrying amount of the non-cash assets distributed and the carrying amount of the dividend payable as profit or loss.

2.7.3 Discontinued operation

Disposal entity is a discontinued operation if:

- It is a separate main business line or business area.
- It is a part of a single plan to dispose of separate major business lines or business areas.
- It is a subsidiary acquired solely for sale.

The Group excludes the profit or loss from the results of the continuing operation and displays the profit or loss as a single amount in the income statement. Additional details of discontinued operations are disclosed in Note 38.

2.8 Revenue from contracts with customers

A. Identifying performance obligations

The Group mainly engages in business area, such as power generation facilities, industrial facilities, construction machinery, engines, manufacture of casting and forgings, and construction.

The Group identifies performance obligations that are distinct in the contract with the customer. Accordingly, a performance obligation, unit of revenue recognition, may be additionally identified in a single contract, or performance obligations in multiple contracts can be combined as a single performance obligation. The timing of the Group's revenue recognition may vary depending on whether each performance obligation identified is satisfied at a point in time or over time.

The Entity identifies a performance obligation as a distinct performance obligation when the customer can benefit from the good or service either on its own or together with other resources that are readily available to the customer and the Entity's promise to transfer the good or service to the customer is separately identifiable from other promises in the contract. Also, for performance obligations that are distinct, a transaction price is allocated based on stand-alone selling prices or, if they are not directly observable, estimated them and allocated to meet the allocation objective.

The Group identifies (a) the EPC contract and (b) the O&M service as a distinct performance obligations and estimates the stand-alone selling price for each performance obligation to recognize revenue after allocating the transaction price. In addition, the Group recognizes a warranty that the customer has an option to purchase separately and shipping services and insurance provided in export sales as separate performance obligations. Revenue is recognized after the transaction price is allocated to such performance obligations.

2.8 Revenue from contracts with customers (cont'd)

B. Performance obligations satisfied over time

The power and industry sector of the Group engage in manufacturing and selling power generation equipment ordered by the customer with design elements designated. The Group determines the contract as a construction contract, measures the progress the input method, and recognizes revenue based on the percentage-of-completion.

The Group recognizes revenue according to the percentage-of-completion only in case when it does not create an asset with an alternative use to the Group as it performs its performance obligations and has an enforceable right to payment for performance completed to date since it considers the control of the goods or services is transferred over time.

As a result of review on possibility of alternative use and right to payment by contracts, the Group recognizes revenue by applying the percentage-of-completion.

C. Measurement of progress using input method

The power sector of the Group will purchase, manufacture, and install power generation related materials, such as boilers and turbines and generally carry out construction work over a long period of time.

At contract inception, the Group recognizes the same amount of revenue as the goods used to fulfil the performance obligation if the goods are not distinct and the costs of the goods transferred are expected to be significant compared to the total costs expected to be fully satisfied by the customer before the goods are received.

D. Variable consideration

The Group estimates variable consideration using the expected value method that better predicts to which it will be entitled and recognizes revenue in the amount of the transaction price that include variable consideration that is constrained until it is highly probable that a significant revenue reversal in the amount of cumulative revenue recognized until the expiry of return date. The Group recognizes a refund liability for the amount to which it does not expect to be entitled among the consideration received or expected to receive.

E. Allocation of the transaction price

The Group allocates the transaction price on the basis of the stand-alone selling price to the various performance obligations identified in a single contract. The Group uses the 'adjusted market assessment approach' to estimate the stand-alone selling price of each performance obligation and, in exceptional transactions, the 'expected cost plus a margin approach' to predict expected costs and add appropriate profit margins.

2.9 Rental income

The Group's policy for recognition of revenue from operating leases is described in Note 2.10.

2.10 Leases

The Group determines whether the contract itself is a lease or the contract contains lease at the time of agreement, considering whether the contract exchange the control of the identified asset for a certain period of time with price of the contract.

The Group as a lessee

The Group applies a single method on every lease except short-term leases and leases of low-value assets. The Group recognizes lease liabilities that represent the obligation to pay the leases and right-of-use assets that represents right-of-use.

2.10.1 Right-of-use assets

The Group recognizes right-of-use assets on lease commencement date (the date when the underlying asset is usable). Right-of-use asset is measured as cost, and the Group applies cost model on subsequent measurement. To apply cost model, the Group deducts accumulated depreciation and accumulated loss of impairment, and recognizes adjustments base on remeasurement of lease liabilities. The cost of the right-of-use assets includes the amount of the perceived lease liabilities, the initial direct cost, and the lease fee paid before or after the lease commencement date with received lease incentive deducted. The right-of-use assets are depreciated on a flat basis over a short period of time between the lease period and the estimated useful life of the assets.

If the ownership of the underlying asset is transferred to the Group at the end of the lease term or if the Group is expected to exercise the purchase option at the cost of the right-of-use assets, depreciation is calculated using the estimated useful life of the underlying asset of the asset.

The right-of-use assets are also subject to damage and the relevant accounting policy is described in Note 2.20.

2.10.2 Lease liabilities

On lease commencement date, the Group recognizes lease liabilities at the present value of the lease to be paid over the lease period. The lease fee consists of a fixed fee (including a substantial fixed fee, and the lease incentive to receive is deducted), a variable lease payment that varies according to the index or rate, and an amount expected to be paid according to the residual value guarantee. Lease fee also includes the amount to be borne to terminate the lease if the Group is fairly certain to exercise buying options, considering exercise cost of the buying options and termination options to lease term.

A variable lease that does not varies according to the index of rate (unless not from the production of inventories) is recognized during the period of time when an event or condition that causes a lease happens.

When the Group evaluates the present value of lease fee, it uses the incremental borrowing interest rate of the lease commencement date because it cannot easily calculate the internal rate of return of the lease. After the lease commencement date, the amount of lease liabilities increase to reflect interest and decreases to reflect the lease fee paid. In addition, the book values of the lease liabilities are remeasured if there is a change in the lease term, a change in the lease fee (for example, a change in the future lease due to a change in the index or rate used to calculate the lease fee), or a change in the option assessment to buy the underlying asset.

2.10.3 Short-term lease and Leases of low-value assets

The Group applies exemption rule for the recognition of short-term lease, which has a lease-term less than 12 months from the lease commencement date and do not include purchase options. In addition, the Group applies exemption rule for the recognition of leases of low-value assets on office equipment, etc., which is considered as low value assets. Lease fee of Short-term lease and leases of low-value of assets are recognized as cost based on straight-line method through the lease term.

The Group as lessor

The Group classifies leases that do not transfer most of the risks and compensation for the ownership of underlying assets as operating leases. Lease revenues are recognized based on straight-line method through the lease term and it can be classified as sales in the consolidated statements of income depending on the nature of the business.

2.11 Foreign currencies

The consolidated financial statements of the Group are presented in the currency of the primary economic environment in which the entity operates (its functional currency). For the purpose of the consolidated financial statements, the results and financial position of each group entity are expressed in Korean won, which is the functional currency of the entity and the presentation currency for the consolidated financial statements.

In preparing the financial statements, transactions in currencies other than the entity's functional currency (foreign currencies) are recognized at the rates of exchange prevailing at the dates of the transactions. At the end of each reporting period, monetary items denominated in foreign currencies are retranslated at the rates prevailing at that date. Non monetary items carried at fair value that are denominated in foreign currencies are retranslated at the rates prevailing at the date when the fair value was determined. Non monetary items that are measured in terms of historical cost in a foreign currency are not retranslated.

Exchange differences are recognized in profit or loss in the period in which they arise, except for:

- Exchange differences on foreign currency borrowings relating to assets under construction for future productive use, which are included in the cost of those assets when they are regarded as an adjustment to interest costs on those foreign currency borrowings
- Exchange differences on transactions entered into in order to hedge certain foreign currency risks (see Note 2.25 below for hedging accounting policies)
- Exchange differences on monetary items forming part of the net investment in the foreign operation.

In order to prepare consolidated financial statements, the assets and liabilities of foreign operations included in the Group are presented using the exchange rates at the end of the reporting period. Unless the foreign currency exchange rate fluctuates significantly during the period and the exchange rate at the transaction date is not required to be used, the items of profit or loss are translated at the average exchange rate for the year. Foreign exchange differences arising from such differences are recognized in other comprehensive income and accumulated in equity (If appropriate, allocate to non-controlling interests).

When a foreign operation is disposed of (In other words, the disposal of the entire amount of the Group's foreign operations, the disposal of the subsidiary including its overseas operations, the partial disposal of the equity of the joint venture, or the partial disposal of the equity interest in an associate If the equity interest is a financial asset that includes overseas business sites), the entire amount of foreign exchange differences related to the foreign operations attributable to the parent is reclassified to profit or loss. The cumulative exchange differences related to the foreign operations attributable to the non-controlling interests are eliminated but are not reclassified to profit or loss.

For certain dispositions that do not result in a loss of control over subsidiaries, including foreign operations, the proportionate share of the accumulated foreign exchange differences is reassigned to non-controlling interests and is not reclassified to profit or loss. For all other disposals (In other words, a decrease in ownership interest in an associate or joint venture of a group that does not result in significant influence or loss of joint control), the proportionate share of the accumulated foreign exchange differences is reclassified to profit or loss.

Fair value adjustments for goodwill and identifiable assets and liabilities arising from the acquisition of foreign operations are recognized in the income statement as assets and liabilities at the foreign operations and are retranslated at the exchange rates at the balance sheet date, the resulting foreign exchange difference is recognized as capital.

In determining the spot exchange rate to use on initial recognition of the related asset, expense or income (or part of it) on the derecognition of a non-monetary asset or non-monetary liability relating to advance consideration, the date of the transaction is the date on which the Group initially recognizes the non-monetary asset or non-monetary liability arising from the advance consideration. If there are multiple payments or receipts in advance, the Group determines the transaction date for each payment or receipt of advance consideration.

2.12 Borrowing costs

Borrowing costs directly attributable to the acquisition, construction or production of qualifying assets, which are assets that necessarily take a substantial period of time to get ready for their intended use or sale, are added to the cost of those assets, until such time as the assets are substantially ready for their intended use or sale.

Investment income earned on the temporary investment of specific borrowings pending their expenditure on qualifying assets is deducted from the borrowing costs eligible for capitalization.

All other borrowing costs are recognized in profit or loss in the period in which they are incurred.

2.13 Retirement benefit costs and termination benefits

The Group operates a defined benefit pension plan. The cost of providing benefits is determined using the projected unit credit method, with actuarial valuations being carried out at the end of each reporting period. Remeasurement, comprising actuarial gains and losses, the effect of the changes to the asset ceiling (if applicable) and the return on plan assets are reflected immediately in the consolidated statement of financial position with a charge or credit recognized in other comprehensive income in the period in which they occur. Remeasurement recognized in other comprehensive income is reflected immediately in retained earnings and will not be reclassified to profit or loss. Past service cost is recognized in profit or loss in the period of a plan amendment. Net interest is calculated by applying the discount rate at the beginning of the period to the net defined benefit liability or asset.

Defined benefit costs are composed of service cost (including current service cost, past service cost, as well as gains and losses on curtailments and settlements), net interest expense (income) and remeasurement.

The Group presents the service cost and net interest expense (income) components in profit or loss, and the remeasurement component in other comprehensive income. Curtailment gains and losses are accounted for as past service costs.

The retirement benefit liabilities recognized in the consolidated statement of financial position represents the actual deficit or surplus in the Group's defined benefit plans. Any surplus resulting from this calculation is limited to the present value of any economic benefits available in the form of refunds from the plans or reductions in future contributions to the plans.

A liability for a termination benefit is recognized at the earlier of when the entity can no longer withdraw the offer of the termination benefit and when the entity recognizes any related restructuring costs.

Contributions to defined contribution retirement benefit plans are recognized as an expense when employees have rendered service entitling them to the contributions.

2.14 Share-based payment transactions of the Group

Equity-settled share-based payments to employees are measured at the fair value of the equity instruments at the grant date.

The fair value determined at the grant date of the equity-settled share-based payments is expensed on a straight-line basis over the vesting period, based on the Group's estimate of equity instruments that will eventually vest. At the end of each reporting period, the Group revises its estimate of the number of equity instruments expected to vest. The impact of the revision of the original estimates, if any, is recognized in profit or loss, such that the cumulative expense reflects the revised estimate, with a corresponding adjustment in other component of equity.

2.15 Taxation

Income tax expenses represent the sum of the tax currently payable and deferred tax.

2.15.1 Current tax

The tax currently payable is based on taxable profit for the year. Taxable profit differs from profit as reported in the consolidated statement of profit or loss and comprehensive income because of items of income or expense that are taxable or deductible in other years and items that are never taxable or deductible. 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.

2.15.2 Deferred tax

Deferred tax is recognized on temporary differences between the carrying amounts of assets and liabilities in the financial statements and the corresponding tax bases used in the computation of taxable profit. Deferred tax liabilities are generally recognized for all taxable temporary differences. Deferred tax assets are generally recognized for all deductible temporary differences to the extent that it is probable that taxable profits will be available against which those deductible temporary differences can be utilized. Such deferred tax assets and liabilities are not recognized if the temporary difference arises from goodwill or from the initial recognition (other than in a business combination) of other assets and liabilities in a transaction that affects neither the taxable profit nor the accounting profit.

The Group can control the timing of the extinguishment of the temporary difference and the additions to the subsidiary, the investment in the associate and the interest in the joint venture, unless it is probable that the temporary difference will not cease in the foreseeable future deferred tax liabilities are recognized for temporary differences. Deferred tax assets arising from temporary differences arising from these investments and investments are highly probable to be taxable enough to enable the benefits of the temporary difference and are likely to expire in the foreseeable future recognize only if high.

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

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 realized, based on tax rates (and tax laws) that have been enacted or substantively enacted by the end of the reporting period. The measurement of deferred tax liabilities and assets reflects the tax consequences that would follow from the manner in which the Group expects, at the end of the reporting period, to recover or settle the carrying amount of its assets and liabilities.

Deferred income tax assets and liabilities are recognized when the Group has a legally enforceable right to offset current tax assets and current tax liabilities and are subject to the same taxation entities as the taxable entity. Are intended to settle the liabilities at the same time as they are expected to be settled at the balance sheet date, if the Group intends to settle the current tax liabilities and assets on a net basis, deferred tax liabilities are settled or deferred tax assets are recovered only offset.

2.15.3 Current and deferred taxes for the year

Current and deferred taxes are recognized in profit or loss, except when they relate to items that are recognized in other comprehensive income or directly in equity, in which case, the current and deferred taxes are also recognized in other comprehensive income or directly in equity, respectively. Where current tax or deferred tax arises from the initial accounting for a business combination, the tax effect is included in the accounting for the business combination.

2.16 Government grants

Government grants are not recognized until there is reasonable assurance that the Group will comply with the conditions attaching to them and that the grants will be received.

The benefit of a government loan at a below-market rate of interest is treated as a government grant, measured as the difference between proceeds received and the fair value of the loan based on prevailing market interest rates.

Government grants related to assets are presented in the consolidated statement of financial position by deducting the grant from the carrying amount of the asset. The related grant is recognized in profit or loss over the life of a depreciable asset as a reduced depreciation expense.

Government grants related to income are recognized in profit or loss on a systematic basis over the periods in which the Group recognizes as expenses the related costs for which the grants are intended to compensate. Government grants that are receivable as compensation for expenses or losses already incurred or for the purpose of giving immediate financial support to the Group with no future-related costs are recognized in profit or loss in the period in which they become receivable.

2.17 Property, plant and equipment

Property, plant and equipment are stated at cost less subsequent accumulated depreciation and accumulated impairment losses, other than land, for which revaluation model is applied after initial recognition. The cost of an item of property, plant and equipment is directly attributable to their purchase or construction, which includes any costs directly attributable to bringing the asset to the location and condition necessary for it to be capable of operating in the manner intended by management. It also includes the initial estimate of the costs of dismantling and removing the item and restoring the site on which it is located.

Subsequent costs are recognized in carrying amount of an asset or as a separate asset if it is probable that future economic benefits associated with the assets will flow to the Group and the cost of an asset can be measured reliably. Routine maintenance and repairs are expensed as incurred.

The Group does not depreciate land. Depreciation expense is computed using the straight-line method based on the estimated useful lives of the assets as follows:

	<u>Estimated useful lives (in years)</u>
Buildings	4-50
Structures	2-40
Machinery	2-20
Other property, plant and equipment	2-20

If each part of an item of property, plant and equipment has a cost that is significant in relation to the total cost of the item, 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.

An item of property, plant and equipment is derecognized upon disposal or when no future economic benefits are expected to arise from the continued use of the asset. Any gain or loss arising on derecognition of the property (calculated as the difference between the net disposal proceeds and the carrying amount of the asset) is included in profit or loss in the period in which the property is derecognized.

2.18 Investment properties

Investment properties are properties held to earn rentals and/or for capital appreciation (including property under construction for such purposes). Investment properties are measured initially at cost, including transaction costs. Subsequent to initial recognition, investment properties are stated at fair value, with any gains or losses arising on fair value fluctuation recognized in profit or loss.

Subsequent costs are recognized in carrying amount of an asset or 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. Routine maintenance and repairs are expensed as incurred.

An investment property is derecognized upon disposal or when the investment property is permanently withdrawn from use and no future economic benefits are expected from the disposal. Any gain or loss arising on derecognition of the property (calculated as the difference between the net disposal proceeds and the carrying amount of the asset) is included in profit or loss in the period in which the property is derecognized.

2.19 Intangible assets

2.19.1 Intangible assets acquired separately

Intangible assets with finite useful lives that are acquired separately are carried at cost, less accumulated amortization and accumulated impairment losses. Amortization is recognized on a straight-line basis over their estimated useful lives. The estimated useful life and amortization method are reviewed at the end of each reporting period, with the effect of any changes in estimate being accounted for on a prospective basis. Intangible assets with indefinite useful lives that are acquired separately are carried at cost less accumulated impairment losses.

2.19.2 Internally generated intangible assets - research and development expenditure

Expenditure on research activities is recognized as an expense in the period in which it is incurred.

Expenditure arising from development (or from the development phase of an internal project) is recognized as an intangible asset if, and only if, the development project is designed to produce new or substantially improved products, and the Group can demonstrate the technical and economic feasibility and measure reliably the resources attributable to the intangible asset during its development.

Subsequent to initial recognition, internally generated intangible assets are reported at cost, less accumulated amortization and accumulated impairment losses, on the same basis as intangible assets that are acquired separately.

2.19.3 Intangible assets acquired in a business combination

Intangible assets that are acquired in a business combination are recognized separately from goodwill and are initially recognized at their fair value at the acquisition date (which is regarded as their cost). Subsequent to initial recognition, intangible assets acquired in a business combination are reported at cost less accumulated amortization and accumulated impairment losses, on the same basis as intangible assets that are acquired separately.

2.19.4 Derecognition of intangible assets

An intangible asset is derecognized on disposal or when no future economic benefits are expected from its use. Gains or losses arising from derecognition of an intangible asset, measured as the difference between the net disposal proceeds and the carrying amount of the asset, are recognized in profit or loss when the asset is derecognized.

2.19.5 Amortization of intangible assets

Intangible assets other than memberships with indefinite useful lives are amortized using the straight-line method with acquiring cost, except for residual value, with the amortization beginning when the asset is available for use. The estimated useful lives of the assets are as follows:

	Estimated useful lives (in years)
Development costs	4–12
Industrial rights	5–10
Other intangible assets	2–20

2.20 Impairment of tangible and intangible assets other than goodwill

At the end of each reporting period, the Group reviews the carrying amounts of its tangible and intangible assets to determine whether there is any indication that those assets have suffered an impairment loss. If any such indication exists, the recoverable amount of the asset is estimated in order to determine the extent of the impairment loss (if any). When it is not possible to estimate the recoverable amount of an individual asset, the Group estimates the recoverable amount of the CGU to which the asset belongs.

Memberships with indefinite useful lives and intangible assets not yet available for use are tested for impairment at least annually, and whenever there is an indication that the asset may be impaired.

Recoverable amount is the higher of fair value less costs to sell and value in use. If the recoverable amount of an asset (or a CGU) is estimated to be less than its carrying amount, the carrying amount of the asset (or the CGU) is reduced to its recoverable amount and the reduced amount is recognized in profit or loss.

Where an impairment loss subsequently reverses, the carrying amount of the asset (or a CGU) is increased to the revised estimate of its recoverable amount, but so that the increased carrying amount does not exceed the carrying amount that would have been determined had no impairment loss been recognized for the asset (or the CGU) in prior years. A reversal of an impairment loss is recognized immediately in profit or loss.

2.21 Inventories

Inventories are stated at the lower of cost and net realizable value. Cost of inventories, except for those in transit, are measured under the weighted-average cost formula and consists of the purchase price, cost of conversion and other costs incurred in bringing the inventories to their present location and condition. Net realizable value represents the estimated selling price for inventories, less all estimated costs of completion and costs necessary to make the sale.

When inventories are sold, the carrying amount of those inventories is recognized as an expense (cost of sales) in the period in which the related revenue is recognized. The amount of any write-down of inventories to net realizable value and all losses of inventories is recognized as an expense in the period the write-down or loss occurs. The amount of any reversal of any write-down of inventories, arising from an increase in net realizable value, is recognized as a reduction in the amount of inventories recognized as an expense in the period in which the reversal occurs.

2.22 Provisions

Provisions are recognized when the Group has a present obligation (legal or constructive) as a result of a past event, it is probable that the Group will be required to settle the obligation, and a reliable estimate can be made of the amount of the obligation.

The amount recognized as a provision is the best estimate of the consideration required to settle the present obligation at the end of the reporting period, taking into account the risks and uncertainties surrounding the obligation. When a provision is measured using the cash flows estimated to settle the present obligation, its carrying amount is the present value of those cash flows (where the effect of the time value of money is material). The discount rate used is a pretax rate that reflects current market assessments of the time value of money and the risks specific to the liability. Where discounting is used, the increase in the provision due to the passage is recognized in profit or loss as borrowing cost.

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.

At the end of each reporting period, the remaining provision balance is reviewed and assessed to determine if the current best estimate is being recognized. If the existence of an obligation to transfer economic benefit is no longer probable, the related provision is reversed during the period.

2.23 Financial instruments

A financial instrument is any contract that gives rise to a financial asset of one entity and a financial liability or equity instrument of another entity.

2.23.1 Financial assets

[Initial recognition and measurement]

Financial assets are classified, at initial recognition, as subsequently measured at amortized cost, fair value through other comprehensive income (OCI), and fair value through profit or loss.

The classification of financial assets at initial recognition depends on the financial asset's contractual cash flow characteristics and the Group's business model for managing them.

In order for a financial asset to be classified and measured at amortized cost or fair value through OCI, it needs to give rise to cash flows that are 'solely payments of principal and interest (SPPI)' on the principal amount outstanding. This assessment is referred to as the SPPI test and is performed at an instrument level.

The Group's business model for managing financial assets refers to how it manages its financial assets in order to generate cash flows. The business model determines whether cash flows will result from collecting contractual cash flows, selling the financial assets, or both.

Purchases or sales of financial assets that require delivery of assets within a time frame established by regulation or convention in the market place (regular way trades) are recognized on the trade date, i.e., the date that the Group commits to purchase or sell the asset.

[Subsequent measurement]

For purposes of subsequent measurement, financial assets are classified in four categories:

- Financial assets at amortized cost (debt instruments)
- Financial assets at fair value through OCI with recycling of cumulative gains and losses (debt instruments)
- Financial assets designated at fair value through OCI with no recycling of cumulative gains and losses upon derecognition (equity instruments)
- Financial assets at fair value through profit or loss

Financial assets at amortized cost (debt instruments)

The Group measures financial assets at amortized cost if both of the following conditions are met:

- The financial asset is held within a business model with the objective to hold financial assets in order to collect contractual cash flows, and
- The contractual terms of the financial asset give rise on specified dates to cash flows that are solely payments of principal and interest on the principal amount outstanding

Financial assets at amortized cost are subsequently measured using the effective interest rate (EIR) method and are subject to impairment. Gains and losses are recognized in profit or loss when the asset is derecognized, modified or impaired.

Financial assets at fair value through OCI (debt instruments)

The Group measures debt instruments at fair value through OCI if both of the following conditions are met:

- The financial asset is held within a business model with the objective of both holding to collect contractual cash flows and selling, and
- The contractual terms of the financial asset give rise on specified dates to cash flows that are solely payments of principal and interest on the principal amount outstanding

2.23.1 Financial assets (cont'd)

For debt instruments at fair value through OCI, interest income, foreign exchange revaluation and impairment losses or reversals are recognized in the statements of income and computed in the same manner as for financial assets measured at amortized cost. The remaining fair value changes are recognized in OCI. Upon derecognition, the cumulative fair value change recognized in OCI is recycled to profit or loss.

Financial assets designated at fair value through OCI (equity instruments)

Upon initial recognition, the Group can elect to classify irrevocably its equity investments as equity instruments designated at fair value through OCI when they meet the definition of equity under KIFRS 1032 *Financial Instruments: Presentation* and are not held for trading.

Gains and losses on these financial assets are never recycled to profit or loss. Dividends are recognized as other income in the statements of income when the right of payment has been established, except when the Group benefits from such proceeds as a recovery of part of the cost of the financial asset, in which case, such gains are recorded in OCI. Equity instruments designated at fair value through OCI are not subject to impairment assessment.

The Group can elect to classify irrevocably its non-listed equity investments under this category.

Financial assets at fair value through profit or loss

Financial assets at fair value through profit or loss include financial assets held for trading and financial assets designated upon initial recognition at fair value through profit or loss. Financial assets are classified as held for trading if they are acquired for the purpose of selling or repurchasing in the near term. Derivatives, including separated embedded derivatives, are also classified as held for trading unless they are designated as effective hedging instruments. Financial assets with cash flows that are not solely payments of principal and interest are classified and measured at fair value through profit or loss, irrespective of the business model. Notwithstanding the criteria for debt instruments to be classified at amortized cost or at fair value through OCI, as described above, debt instruments may be designated at fair value through profit or loss on initial recognition if doing so eliminates, or significantly reduces, an accounting mismatch.

Financial assets at fair value through profit or loss are carried in the statements of financial position at fair value with net changes in fair value recognized in profit or loss.

This category contains derivatives and listed equity instruments that do not make an irrevocable choice to account for changes in fair value in other comprehensive income. Dividends on listed equity instruments are recognized in profit or loss at the time the rights are established.

A derivative embedded in a hybrid contract, with a financial liability or non-financial host, is separated from the host and accounted for as a separate derivative if: the economic characteristics and risks are not closely related to the host; a separate instrument with the same terms as the embedded derivative would meet the definition of a derivative; and the hybrid contract is not measured at fair value through profit or loss. Embedded derivatives are measured at fair value with changes in fair value recognized in profit or loss. Reassessment only occurs if there is either a change in the terms of the contract that significantly modifies the cash flows that would otherwise be required or a reclassification of a financial asset out of the fair value through profit or loss category.

A derivative embedded within a hybrid contract containing a financial asset host is not accounted for separately. The financial asset host together with the embedded derivative is required to be classified in its entirety as a financial asset at fair value through profit or loss.

2.23.1 Financial assets (cont'd)

[Derecognition]

A financial asset (or, where applicable, a part of a financial asset or part of a group of similar financial assets) is primarily derecognized (i.e., removed from the Group's consolidated statements of financial position) when:

- The rights to receive cash flows from the asset have expired, or
- The Group has transferred its rights to receive cash flows from the asset or has assumed an obligation to pay the received cash flows in full without material delay to a third party under a 'pass-through' arrangement; and either (a) the Group has transferred substantially all the risks and rewards of the asset, or (b) the Group has neither transferred nor retained substantially all the risks and rewards of the asset, but has transferred control of the asset

When the Group has transferred its rights to receive cash flows from an asset or has entered into a pass-through arrangement, it evaluates if, and to what extent, it has retained the risks and rewards of ownership. When it has neither transferred nor retained substantially all of the risks and rewards of the asset, nor transferred control of the asset, the Group continues to recognize the transferred asset to the extent of its continuing involvement. In that case, the Group also recognizes an associated liability. The transferred asset and the associated liability are measured on a basis that reflects the rights and obligations that the Group has retained.

Continuing involvement that takes the form of a guarantee over the transferred asset is measured at the lower of the original carrying amount of the asset and the maximum amount of consideration that the Group could be required to repay.

[Impairment of financial assets]

The Group recognizes an allowance for expected credit losses (ECLs) for all debt instruments not held at fair value through profit or loss. ECLs are based on the difference between the contractual cash flows due in accordance with the contract and all the cash flows that the Group expects to receive, discounted at an approximation of the original effective interest rate. The expected cash flows will include cash flows from the sale of collateral held or other credit enhancements that are integral to the contractual terms.

ECLs are recognized in two stages. For credit exposures for which there has not been a significant increase in credit risk since initial recognition, ECLs are provided for credit losses that result from default events that are possible within the next 12-months (a 12-month ECL). For those credit exposures for which there has been a significant increase in credit risk since initial recognition, a loss allowance is required for credit losses expected over the remaining life of the exposure, irrespective of the timing of the default (a lifetime ECL).

For trade receivables and contract assets, the Group applies a simplified approach in calculating ECLs. Therefore, the Group does not track changes in credit risk, but instead recognizes a loss allowance based on lifetime ECLs at each reporting date. The Group has established a provision matrix that is based on its historical credit loss experience, adjusted for forward-looking factors specific to the debtors and the economic environment.

2.23.2 Financial liabilities

[Initial recognition and measurement]

Financial liabilities are classified, at initial recognition, as financial liabilities at fair value through profit or loss, loans and borrowings, payables, or as derivatives designated as hedging instruments in an effective hedge, as appropriate.

All financial liabilities are recognized initially at fair value and, in the case of loans and borrowings and payables, net of directly attributable transaction costs.

[Subsequent measurement]

The measurement of financial liabilities depends on their classification, as described below.

Financial liabilities at fair value through profit or loss

Financial liabilities at fair value through profit or loss include financial liabilities held for trading and financial liabilities designated upon initial recognition as of fair value through profit or loss.

Financial liabilities are classified as held for trading if they are incurred for the purpose of repurchasing in the near term. This category also includes derivative financial instruments entered into by the Group that are not designated as hedging instruments in hedge relationships as defined by KIFRS 1109. Separated embedded derivatives are also classified as held for trading unless they are designated as effective hedging instruments.

Gains or losses on liabilities held for trading are recognized in profit or loss.

Financial liabilities designated upon initial recognition at fair value through profit or loss are designated at the initial date of recognition, and only if the criteria in KIFRS 1109 are satisfied.

Loans and borrowings

After initial recognition, interest-bearing loans and borrowings are subsequently measured at amortized cost using the EIR method. Gains and losses are recognized in profit or loss when the liabilities are derecognized as well as through the EIR amortization process.

Amortized cost is calculated by taking into account any discount or premium on acquisition and fees or costs that are an integral part of the EIR.

This category generally applies to interest-bearing loans and borrowings.

[Derecognition]

A financial liability is derecognized when the obligation under the liability is discharged or cancelled or expires. When an existing financial liability is replaced by another from the same lender on substantially different terms, or the terms of an existing liability are substantially modified, such an exchange or modification is treated as the derecognition of the original liability and the recognition of a new liability. The difference in the respective carrying amounts is recognized in profit or loss.

2.23.3 Offsetting of financial instruments

Financial assets and financial liabilities are offset and the net amount is reported in the consolidated statements of financial position if there is a currently enforceable legal right to offset the recognized amounts and there is an intention to settle on a net basis, to realize the assets and settle the liabilities simultaneously.

2.23.4 Financial guarantee liabilities

A financial guarantee contract is a contract that requires the issuer to make specified payments to reimburse the holder for a loss it incurs because a specified debtor fails to make payments when due in accordance with the terms of a debt instrument.

Financial guarantee liabilities are initially measured at their fair values and, if not designated as financial liabilities at fair value through profit or loss, or unless the transfer of a financial asset does not meet the derecognition criteria or the continuing involvement approach is applied are subsequently measured at the higher of:

- The amount loss allowances determined in accordance with KIFRS 1109 5.5, and
- The amount initially recognized, less cumulative amortization recognized in accordance with the KIFRS 1115

2.24 Equity instruments

An equity instrument is any contract that evidences a residual interest in the assets of an entity after deducting all of its liabilities. Equity instruments issued by the Group are recognized at the proceeds received, net of direct issue costs.

Repurchase of the Group's own equity instruments is recognized and deducted directly in equity. No gain or loss is recognized in profit or loss on the purchase, sale, issue or cancellation of the Group's own equity instruments.

2.25 Derivative financial instruments and hedge accounting

The Group uses derivative financial instruments, such as forward currency contracts, interest rate swaps and forward commodity contracts, to hedge its foreign currency risks, interest rate risks and commodity price risks, respectively. Such derivative financial instruments are initially recognized at fair value on the date on which a derivative contract is entered into and are subsequently remeasured at fair value. Derivatives are carried as financial assets when the fair value is positive and as financial liabilities when the fair value is negative.

For the purpose of hedge accounting, hedges are classified as:

- Fair value hedges when hedging the exposure to changes in the fair value of a recognized asset or liability or an unrecognized firm commitment
- Cash flow hedges when hedging the exposure to variability in cash flows that is either attributable to a particular risk associated with a recognized asset or liability or a highly probable forecast transaction or the foreign currency risk in an unrecognized firm commitment
- Hedges of a net investment in a foreign operation

At the inception of a hedge relationship, the Group formally designates and documents the hedge relationship to which the Group wishes to apply hedge accounting and the risk management objective and strategy for undertaking the hedge.

Beginning January 1, 2018, the documentation includes identification of the hedging instrument, the hedged item, the nature of the risk being hedged and how the Group will assess whether the hedging relationship meets the hedge effectiveness requirements (including the analysis of sources of hedge ineffectiveness and how the hedge ratio is determined). A hedging relationship qualifies for hedge accounting if it meets all of the following effectiveness requirements.

- There is 'an economic relationship' between the hedged item and the hedging instrument.
- The effect of credit risk does not 'dominate the value changes' that result from that economic relationship.
- The hedge ratio of the hedging relationship is the same as that resulting from the quantity of the hedged item that the Group actually hedges and the quantity of the hedging instrument that the Group actually uses to hedge that quantity of hedged item.

Hedges that meet the strict criteria for hedge accounting are accounted for, as described below.

2.25 Derivative financial instruments and hedge accounting (cont'd)

Fair value hedges

The change in the fair value of a hedging derivative is recognized in the statements of income. The change in the fair value of the hedged item attributable to the risk hedged is recorded as part of the carrying value of the hedged item and is also recognized in the statements of income.

For fair value hedges relating to items carried at amortized cost, any adjustment to carrying value is amortized through profit or loss over the remaining term of the hedge using the EIR method. EIR amortization may begin as soon as an adjustment exists and no later than when the hedged item ceases to be adjusted for changes in its fair value attributable to the risk being hedged.

If the hedged item is derecognized, the unamortized fair value is recognized immediately in profit or loss.

When an unrecognized firm commitment is designated as a hedged item, the subsequent cumulative change in the fair value of the firm commitment attributable to the hedged risk is recognized as an asset or liability with a corresponding gain or loss recognized in profit and loss.

Cash flow hedges

The effective portion of the gain or loss on the hedging instrument is recognized in OCI in the cash flow hedge reserve, while any ineffective portion is recognized immediately in the statements of income. The cash flow hedge reserve is adjusted to the lower of the cumulative gain or loss on the hedging instrument and the cumulative change in fair value of the hedged item.

The Group uses forward currency contracts as hedges of its exposure to foreign currency risk in forecast transactions and firm commitments, as well as forward commodity contracts for its exposure to volatility in the commodity prices. The ineffective portion relating to forward contracts is recognized as finance income or finance expenses.

The amounts accumulated in OCI are accounted for, depending on the nature of the underlying hedged transaction. If the hedged transaction subsequently results in the recognition of a non-financial item, the amount accumulated in equity is removed from the separate component of equity and included in the initial cost or other carrying amount of the hedged asset or liability. This is not a reclassification adjustment and will not be recognized in OCI for the year. This also applies where the hedged forecast transaction of a non-financial asset or non-financial liability subsequently becomes a firm commitment for which fair value hedge accounting is applied.

For any other cash flow hedges, the amount accumulated in OCI is reclassified to profit or loss as a reclassification adjustment in the same period or periods during which the hedged cash flows affect profit or loss.

If cash flow hedge accounting is discontinued, the amount that has been accumulated in OCI must remain in accumulated OCI if the hedged future cash flows are still expected to occur. Otherwise, the amount will be immediately reclassified to profit or loss as a reclassification adjustment. After discontinuation, once the hedged cash flow occurs, any amount remaining in accumulated OCI must be accounted for depending on the nature of the underlying transaction as described above.

Hedges of a net investment in a foreign operation

Hedges of a net investment in a foreign operation, including a hedge of a monetary item that is accounted for as part of the net investment, are accounted for in a way similar to cash flow hedges. Gains or losses on the hedging instrument relating to the effective portion of the hedge are recognized as OCI while any gains or losses relating to the ineffective portion are recognized in the statement of profit or loss. On disposal of the foreign operation, the cumulative value of any such gains or losses recorded in equity is transferred to the statement of profit or loss.

2.26 Fair value

Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date, regardless of whether that price is directly observable or estimated using another valuation technique. In estimating the fair value of an asset or a liability, the Group takes into account the characteristics of the asset or liability if market participants would take those characteristics into account when pricing the asset or liability at the measurement date. Fair value for measurement and/or disclosure purposes in these consolidated financial statements is determined on such a basis, except for share-based payment transactions that are within the scope of KIFRS 1102 *Share-based Payment*, leasing transactions that are within the scope of KIFRS 1017 *Leases* and measurements that have some similarities to fair value but are not fair value, such as net realizable value in KIFRS 1002 *Inventories*, or value in use in KIFRS 1036 *Impairment of Assets*.

In addition, for financial reporting purposes, fair value measurements are categorized into Levels 1, 2 or 3 based on the degree to which the inputs to the fair value measurements are observable and the significance of the inputs to the fair value measurement in their entirety, which are described in Note 10.

2.27 Approval of consolidated financial statements

The consolidated financial statements of the Group were approved by the Board of Directors on March 5, 2020 and will be finalized at the annual general meeting of shareholders on March 30, 2020.

3. Significant accounting judgements and key sources of estimation uncertainties

In the application of the Group's accounting policies for the consolidated financial statements, which are described in Note 2, management is required to make judgments, estimates and assumptions about the carrying amounts of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates.

The estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates are recognized in the period in which the estimate is revised if the revision affects only that period or in the period of the revision and future periods if the revision affects both current and future periods.

3.1 Revenue recognition

Revenue from a contract to provide services is recognized by reference to the stage of completion of the contract. The stage of completion of the contract is determined as reasonable estimation and is subject to change as related factors change.

3.2 Impairment of goodwill

Determining whether goodwill is impaired requires an estimation of the value in use of the CGUs to which goodwill has been allocated. The value in use calculation requires the directors to estimate the future cash flows expected to arise from the CGU and a suitable discount rate in order to calculate the present value.

3.3 Defined benefit liabilities

The Group's defined benefit liabilities are determined based on the actuarial valuation carried out at the end of each annual reporting period. Actuarial assumptions are the Group's best estimates of the variables, such as discount rates, rates of expected future salary increases and mortality rates.

3.4 Provisions

The Group provides warranty for products when it recognizes the relevant revenue. The Group calculates the guarantee provision as the best estimate that is deemed necessary to enhance future and current warranty obligations at the end of each reporting period. The Group continues to market new products using complex technologies, and depending on the local laws and practices, these accounting estimates may be changed to establish additional provisions in the future fiscal periods.

In addition, provisions for the expected cost of warranty obligations are recognized at the best estimate of the expenditure required to settle the Group's current and future obligations. Provisions are determined by the estimate based on past experience.

3.5 Revaluation model on land and fair value model on investment properties

As stated in Note 12 and Note 14, the Group uses evaluation technique, including inputs that are not based on observable market data to approximate revalued amount of land classified as property, plant and equipment and fair value of investment properties. The Group's management believes that the evaluation technique and assumptions that are used for valuation on land and investment properties are fair.

3.6 Deferred tax

Recognition and measurement of deferred tax assets and liabilities require the management's judgment, in particular, whether to recognize if the scope of deferred tax assets is affected by management's judgment and assumption in the future.

3.7 Estimated useful lives of property, plant and equipment and intangible assets

Useful lives for depreciation and amortization are determined by the management's judgment.

3.8 Lease - Calculation of incremental borrowing rate

The Group cannot readily determine the interest rate implicit in the lease, therefore, it uses its incremental borrowing rate (IBR) to measure lease liabilities. The IBR is the rate of interest that the Group would have to pay to borrow over a similar term, and with a similar security, the funds necessary to obtain an asset of a similar value to the right-of-use asset in a similar economic environment. The IBR therefore reflects what the Group 'would have to pay', which requires estimation when no observable rates are available (such as for subsidiaries that do not enter into financing transactions) or when they need to be adjusted to reflect the terms and conditions of the lease.

The Group estimates the IBR using observable inputs (such as market interest rates) when available and is required to make certain entity-specific estimates (such as the subsidiary's stand-alone credit rating).

3.9 Revenue recognition - Items deducted from sales

The Group deducts the promotions and incentives provided to customers from sales, and if the sales deduction items related to the generated sales are not settled, the amount is recognized based on the occurrence standard.

Unsettled amounts such as promotions and incentives are estimated based on accumulated experience at the time of sale, and the revenue of the Group is affected by the predicted sales deduction.

3.10 Fair value

When the fair values of financial instruments recorded in the consolidated statements of financial position cannot be measured based on quoted prices in active markets, their fair value is measured using valuation techniques including the discounted cash flow (DCF) model. The inputs to these models are taken from observable markets where possible, but where this is not feasible, a degree of judgement is required in establishing fair values. Judgements include considerations of inputs such as liquidity risk, credit risk and volatility. Changes in assumptions relating to these factors could affect the reported fair value of financial instruments.

3.11 Determination of consolidation

As of December 31, 2019, the parent company holds 34.4% of the voting rights of DHC and DHC holds 36.3% of the voting rights of DI. Most of the remaining stakes are held by small shareholders of less than 1%. The management of the Group reassess whether it controls subsidiaries listed above for the first time (January 1, 2013) and at the end of each subsequent reporting period. The executives of the Group concluded that they have control over the absolute size of the voting rights of the Group and the relative size of other shareholding voting rights and the degree of shareholding of other voting rights holders.

4. Financial risk management

The Group is exposed to various financial risks, such as market (foreign currency risk and interest rate risk), credit and liquidity related to the operations of the Group. The purpose of risk management policy is to minimize potential risks, which could have an adverse effect on financial performance.

Financial risk management activities are performed by Treasury and International Finance department, in accordance with the aforementioned documented risk management policies. In addition, the Group enters into derivative contracts to hedge against certain risks.

4.1 Market risk

4.1.1 Foreign currency risk

The Group's exposure to the risk of changes in foreign exchange rates relates primarily to the Group's operating activities (when revenue or expense is denominated in a foreign currency). The Group's basis for foreign currency risk management is to reduce income/loss volatility. Foreign currency risk is managed by the Group's policy on foreign currencies and foreign currency management for speculative purpose is strictly prohibited.

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 for the remaining exposure by using derivatives, such as currency forwards.

The carrying amount of the Group's monetary assets and liabilities denominated in foreign currencies other than the Group's functional currency as of December 31, 2019 and 2018 is as follows (Korean won in millions):

		December 31, 2019					
		USD	EUR	JPY	GBP	Others	Total
Assets	₩	1,624,788	₩ 400,817	₩ 8,978	₩ 145,659	₩ 521,641	₩ 2,701,883
Liabilities		1,727,139	512,984	46,752	43,475	132,096	2,462,446
	₩	(102,351)	₩ (112,167)	₩ (37,774)	₩ 102,184	₩ 389,545	₩ 239,437

		December 31, 2018					
		USD	EUR	JPY	GBP	Others	Total
Assets	₩	1,573,441	₩ 335,510	₩ 17,778	₩ 137,057	₩ 463,828	₩ 2,527,614
Liabilities		2,124,851	607,195	101,055	51,718	15,088	2,899,907
	₩	(551,410)	₩ (271,685)	₩ (83,277)	₩ 85,339	₩ 448,740	₩ (372,293)

The table below summarizes the impact of 10% increase/decrease of currency exchange rates on profit before income tax expenses for the years are as follows (Korean won in millions):

	Impact on profit before income tax expenses	
	2019	2018
10% Increase	₩ 23,944	₩ (37,229)
10% Decrease	(23,944)	37,229

The above-mentioned sensitivity analysis is based on monetary assets and liabilities denominated in foreign currencies other than the Group's functional currency as of December 31, 2019 and 2018.

4.1.2 Interest rate risk

The Group's interest rate risk is related to borrowings and bank deposits with floating interest rates, and 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. The purpose of interest rate risk management is to minimize uncertainty and finance expenses arising from interest rate fluctuation.

To manage its interest rate risk, the Group minimizes external borrowings using internal funds and reduces borrowings with high interest rates and maintains an appropriate balance between borrowings with floating interest rate and fixed-interest rate and short-term and long-term borrowings. The Group manages its interest rate risk preemptively through regular monitoring and adjustments to the changing domestic and overseas markets conditions and nature of its interest rates.

The carrying amount of the Group's financial assets and liabilities with floating interest rates exposed to interest rate risk as of December 31, 2019 and 2018 is as follows (Korean won in millions):

	December 31, 2019	December 31, 2018
Financial assets	₩ 459,746	₩ 458,919
Financial liabilities	(3,429,260)	(2,683,337)
	<u>₩ (2,969,514)</u>	<u>₩ (2,224,418)</u>

A sensitivity analysis on the Group's profit before income tax expenses assuming a 1% increase and decrease in interest rates for the years ended December 31, 2019 and 2018 is as follows (Korean won in millions):

	Impact on profit before income tax expenses	
	2019	2018
Increase	₩ (29,695)	₩ (22,224)
Decrease	29,695	22,224

4.1.3 Price risk

The Group is exposed to equity price risks arising from its listed equity investments. The Group periodically measures the risk as the fair value or future cash flows of equity investments may fluctuate due to the changes in market prices. Important investments in the Group's portfolio are individually managed, and acquisition and disposal are approved by the Board of Directors.

4.2 Credit risk

Credit risk refers to risk of financial losses to the Group when the counterparty defaults on the obligations of the contract. Credit risk arises from financial assets which are not equity securities, deposits in financial institution, financial derivatives and guarantee limit, and others. As well as from the Group's normal transactions and investing activities. To manage credit risk, the Group evaluates the creditworthiness of each customer or counterparty considering the financial status, past experience and other factors. The Group establishes credit limit for each customer and counterparty.

The Group evaluates the creditworthiness using open financial information and information provided by credit rating institution when the Group contracts with new customers. The Group decides credit transaction limit and is provided with collateral and guarantee based on evaluation.

Also, the Group reevaluates customers' creditworthiness periodically, reassesses credit transaction limit and readjusts level of collateral. The Group reports the present condition of delayed collection and collection measures periodically to financial assets, which has delayed collection and takes measures by causes of delay.

The carrying amount for the financial assets exposed to credit risk as of December 31, 2019 and 2018 is as follows (Korean won in millions). The carrying amount indicates the maximum exposure to credit risk.

	December 31, 2019	December 31, 2018
Cash and cash equivalents	₩ 1,840,834	₩ 2,456,189
Short-term and long-term financial instruments	301,079	411,224
Trade and other receivables	3,949,646	3,893,097
Deposits	356,690	337,018
Short-term and long-term investment securities (excluding equity securities):		
Financial assets at amortized cost	53,198	22,107
Financial assets at fair value through OCI	69,961	3,732
Financial assets at fair value through profit or loss	131,705	97,635
Derivative assets	54,941	44,835
	₩ 6,758,054	₩ 7,265,837

Apart from the above, in the case of contracts such as financial guarantees provided by the Group, the amount of guarantees to be paid by the Group at the request of the guarantee is the maximum amount exposed to the credit risk (see Note 33).

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4.2 Credit risk (cont'd)

Details of trade receivables and due from customers for contract work exposed to credit risk, presented using forecast model, as of December 31, 2019 and 2018 are as follows (Korean won in millions):

2019									
Trade receivables									
	Individually assessed trade receivables (*1)	Trade receivables assessed for impairment on a collective basis(*2)					Total	Due from customers for contract work (*1)	Total
		Within due	Less than 3 months	3-6 months	6-12 months	More than 12 months			
Book value	₩ 1,946,155	₩ 1,614,032	₩ 149,822	₩ 14,791	₩ 28,751	₩ 45,423	₩ 3,798,974	₩ 2,034,377	₩ 5,833,351
Expected credit loss rate	62.76%	0.20%	0.73%	9.17%	8.98%	55.61%		3.13%	
Expected credit loss	₩ 1,221,397	₩ 3,250	₩ 1,093	₩ 1,357	₩ 2,582	₩ 25,261	₩ 1,254,940	₩ 63,578	₩ 1,318,518

(*1) Trade receivables with indication of impairment that are individually identifiable, such as bankruptcy.

(*2) Trade receivables that are not individually significant and are classified into groups according to their similar characteristics.

2018									
Trade receivables									
	Individually assessed trade receivables (*1)	Trade receivables assessed for impairment on a collective basis(*2)					Total	Due from customers for contract work (*1)	Total
		Within due	Less than 3 months	3-6 months	6-12 months	More than 12 months			
Book value	₩ 2,079,683	₩ 1,516,910	₩ 149,251	₩ 33,399	₩ 45,584	₩ 55,808	₩ 3,880,635	₩ 2,066,026	₩ 5,946,661
Expected credit loss rate	61.59%	0.35%	0.73%	4.32%	5.25%	53.14%		2.90%	
Expected credit loss	₩ 1,280,978	₩ 5,382	₩ 1,083	₩ 1,443	₩ 2,391	₩ 29,659	₩ 1,320,936	₩ 59,840	₩ 1,380,776

(*1) Trade receivables with indication of impairment that are individually identifiable, such as bankruptcy.

(*2) Trade receivables that are not individually significant and are classified into groups according to their similar characteristics.

Details of other receivables among the financial assets as of December 31, 2019 are as follows (Korean won in millions):

	December 31, 2019									
	Individually assessed other receivables	Other receivables assessed for impairment on a collective basis								
		Within due	Less than 3 months		3–6 months		6–12 months		More than 12 months	Total
Loans and non-trade receivables	₩ 2,733,126	₩ 69,968	₩ 22,140	₩ 2,766	₩ 317	₩ 27,492	₩ 2,855,809			
Accrued income	105,619	4,996	-	-	-	-	110,615			
Financial lease receivables	-	12,035	-	-	-	-	12,035			
	₩ 2,838,745	₩ 86,999	₩ 22,140	₩ 2,766	₩ 317	₩ 27,492	₩ 2,978,459			

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4.2 Credit risk (cont'd)

December 31, 2018							
	Individually assessed other receivables	Other receivables assessed for impairment on a collective basis					Total
		Within due	Less than 3 months	3–6 months	6–12 months	More than 12 months	
Loans and non-trade receivables	₩ 2,470,849	₩ 148,939	₩ 43,443	₩ 9,535	₩ 2,754	₩ 24,748	₩ 2,700,268
Accrued income	127,102	9,819	-	-	-	-	136,921
	<u>₩ 2,597,951</u>	<u>₩ 158,758</u>	<u>₩ 43,443</u>	<u>₩ 9,535</u>	<u>₩ 2,754</u>	<u>₩ 24,748</u>	<u>₩ 2,837,189</u>

As of December 31, 2019 and 2018, allowance for doubtful accounts on other receivables above amounts to ₩1,506,731 million and ₩1,460,040 million, respectively.

4.3 Liquidity risk

Liquidity risk is the risk that the Group will encounter difficulty in meeting its financial liabilities' obligations related to its financing for its operation.

Based on the establishment of a regular funding plan, the Group prepares for the funding balance of its business activities, investment activities and financing activities for the maturity of financial assets and liabilities. The Group manages the liquidity risks that may occur in the future in advance by securing and maintaining required liquidity.

A summary of the Group's non-derivative liabilities' maturity as of December 31, 2019 and 2018 is as follows (Korean won in millions):

December 31, 2019						
	Book value	Nominal cash flows according to contract				
		Total	Less than 1 year	1–2 years	2–5 years	More than 5 years
Financial liabilities	₩ 17,975,228	₩ 18,091,657	₩ 13,583,916	₩ 2,141,556	₩ 2,224,070	₩ 142,115
Interest on financial liabilities	-	389,219	259,638	94,884	34,697	-
	<u>₩ 17,975,228</u>	<u>₩ 18,480,876</u>	<u>₩ 13,843,554</u>	<u>₩ 2,236,440</u>	<u>₩ 2,258,767</u>	<u>₩ 142,115</u>

December 31, 2018						
	Book value	Nominal cash flows according to contract				
		Total	Less than 1 year	1–2 years	2–5 years	More than 5 years
Financial liabilities	₩ 17,797,632	₩ 17,915,312	₩ 11,012,411	₩ 3,219,081	₩ 2,320,024	₩ 1,363,796
Interest on financial liabilities	-	770,247	344,779	169,053	239,916	16,499
	<u>₩ 17,797,632</u>	<u>₩ 18,685,559</u>	<u>₩ 11,357,190</u>	<u>₩ 3,388,134</u>	<u>₩ 2,559,940</u>	<u>₩ 1,380,295</u>

The above-mentioned maturity analysis is based on undiscounted cash flow according to the contract, which is different from non-derivative liabilities in the consolidated statements of financial position. Apart from the above-mentioned non-derivative liabilities, as of December 31, 2019, financial guarantee liabilities of the Group are explained in Note 33.

4.4 Capital risk

The Group performs capital risk management to maintain its ability to continuously provide profits to shareholders and parties in interest and to maintain optimum capital structure to reduce capital expenses.

The Group manages its capital structure through dividend payments to shareholders, returns capital to shareholders and issues new shares and sells its assets for debt reduction. Debt-to-equity ratio calculated as total liabilities divided by equity is used as an index to manage the Group's capital similar to overall industry practice.

Debt-to-equity ratios as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019	December 31, 2018
Total liabilities	₩ 22,350,207	₩ 21,735,235
Total equity	6,819,539	7,145,046
Debt-to-equity ratio	327.74%	304.20%

5. Restricted financial assets

Details of restricted financial assets as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019	December 31, 2018	Description
Cash and cash equivalents	₩ 6,184	₩ 13,889	Advances from construction contracts and others
Short-term financial instruments			Government R&D(*1), shared growth fund, establishment of the right of pledge, collaterals for borrowings and PRS guarantee deposits(*2) and others
	214,493	334,592	
Long-term financial instruments			Bank transaction deposits and others
	2,200	10,607	
Deposits			Reserves for repayments related to asset-backed loans
	-	3,898	
	₩ 222,877	₩ 362,986	

(*1) Can only be used for the purpose of carrying out specific national R&D tasks.

(*2) Deposits for Price Return Swap signed at the time of shares disposals of Doosan Bobcat Inc.

6. Short-term and long-term investment securities

Details of short-term and long-term investment securities as of December 31, 2019 and 2018 are as follows (Korean won in millions):

		December 31, 2019	December 31, 2018
Short-term investment securities	Financial assets at amortized cost	₩ 49,915	₩ 1,815
	Financial assets (designated) at fair value through OCI	69,961	3,732
	Financial assets at fair value through profit or loss	9,280	30,127
		<u>129,156</u>	<u>35,674</u>
Long-term investment securities(*1)	Financial assets at amortized cost	3,283	20,291
	Financial assets (designated) at fair value through OCI	226,274	19,591
	Financial assets at fair value through profit or loss	202,765	164,644
		<u>432,322</u>	<u>204,526</u>
		<u>₩ 561,478</u>	<u>₩ 240,200</u>

(*1) As of December 31, 2019, some of the long-term investment securities are provided as collateral for project financing (see Note 34).

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6. Short-term and long-term investment securities (cont'd)

Short-term and long-term investment securities as of December 31, 2019 and 2018 are as follows (Korean won in millions):

			December 31, 2019	December 31, 2018
Financial assets at amortized cost	Beneficiary certificates	NewBestDM 4th Co.,Ltd.	₩ 49,876	₩ 18,400
	Debt securities	Government and public bonds and others	3,322	3,707
			53,198	22,107
Financial assets (designated) at fair value through OCI	Marketable equity securities	Doosan Solus Co., Ltd., Doosan Fuel Cell Co., Ltd. and others	219,917	126
	Non-marketable equity securities	The Korea Economic Daily and others	6,357	19,464
	Debt securities	K-Partners 20th Co.,Ltd.	69,961	3,732
			296,235	23,322
Financial assets at fair value through profit or loss	Marketable equity securities	HTC and others	9,507	12,635
	Non-marketable equity securities	S-Y Highway Co., Ltd. and others	70,833	84,502
	Contributions	Construction Guarantee Cooperative and others	116,366	86,569
	Beneficiary certificates	Others	14,539	11,065
	Debt securities	Others	800	-
			212,045	194,771
			₩ 561,478	₩ 240,200

Changes in financial assets at fair value for the year ended December 31, 2019 and 2018 are as follows (Korean won in millions):

		2019						
		Beginning balance	Acquisition	Disposal	Valuation	Increase due to spin off(see Note 37)	Others	Ending balance
Financial assets (designated) at fair value through OCI	₩	23,322	₩ 66,438	₩ -	₩ 62,483	₩ 145,260	₩ (1,268)	₩ 296,235
Financial assets at fair value through profit or loss		194,771	39,933	(19,419)	(2,442)	-	(798)	212,045
	₩	218,093	₩ 106,371	₩ (19,419)	₩ 60,041	₩ 145,260	₩ (2,066)	₩ 508,280

		2018						
		Beginning balance	Effect of adoption of new accounting standards	Acquisition	Disposal	Valuation	Others	Ending balance
Financial assets (designated) at fair value through OCI	₩	-	₩ 96,121	₩ 83,016	₩ (162,529)	₩ 2,847	₩ 3,867	₩ 23,322
Financial assets at fair value through profit or loss		-	220,333	18,343	(33,443)	(21,088)	10,626	194,771
	₩	-	₩ 316,454	₩ 101,359	₩ (195,972)	₩ (18,241)	₩ 14,493	₩ 218,093

7. Trade and other receivables

Details of trade and other receivables as of December 31, 2019 and 2018 are as follows (Korean won in millions):

		December 31, 2019			
		Gross	Present value discount	Provision for impairment	Book value
Current:					
Trade receivables	₩	3,794,192	₩ (15,718)	₩ (1,254,704)	₩ 2,523,770
Non-trade receivables		740,893	-	(229,780)	511,113
Accrued income		110,615	-	(32,020)	78,595
Short-term loans		233,153	-	(143,838)	89,315
Current portion of long-term financial lease receivables		2,120	(498)	-	1,622
	₩	<u>4,880,973</u>	₩ <u>(16,216)</u>	₩ <u>(1,660,342)</u>	₩ <u>3,204,415</u>
		December 31, 2019			
		Gross	Present value discount	Provision for impairment	Book value
Non-current:					
Trade receivables	₩	4,782	₩ (58)	₩ (237)	₩ 4,487
Non-trade receivables		29,549	-	(8,934)	20,615
Long-term loans		1,852,214	(48,510)	(1,092,158)	711,546
Financial lease receivables		9,915	(1,332)	-	8,583
	₩	<u>1,896,460</u>	₩ <u>(49,900)</u>	₩ <u>(1,101,329)</u>	₩ <u>745,231</u>
		December 31, 2018			
		Gross	Present value discount	Provision for impairment	Book value
Current:					
Trade receivables	₩	3,868,711	₩ (19,691)	₩ (1,320,695)	₩ 2,528,325
Non-trade receivables		570,102	-	(185,092)	385,010
Accrued income		136,921	-	(32,463)	104,458
Short-term loans		198,533	-	(82,584)	115,948
Current portion of long-term financial lease receivables		-	-	-	-
	₩	<u>4,774,267</u>	₩ <u>(19,691)</u>	₩ <u>(1,620,834)</u>	₩ <u>3,133,742</u>
		December 31, 2018			
		Gross	Present value discount	Provision for impairment	Book value
Non-current:					
Trade receivables	₩	11,924	₩ (319)	₩ (241)	₩ 11,364
Non-trade receivables		31,990	(305)	(8,529)	23,156
Long-term loans		1,899,644	(23,436)	(1,151,372)	724,837
Financial lease receivables		-	-	-	-
	₩	<u>1,943,558</u>	₩ <u>(24,060)</u>	₩ <u>(1,160,142)</u>	₩ <u>759,357</u>

7. Trade and other receivables (cont'd)

Changes in allowance for doubtful accounts for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019				
	Beginning balance	Provision for impaired receivables	Write off	Others(*1)	Ending balance
Current:					
Trade receivables	₩ 1,320,695	₩ (8,565)	₩ (51,438)	₩ (5,988)	₩ 1,254,704
Non-trade receivables	185,092	50,158	(13,904)	8,434	229,780
Accrued income	32,463	8	(451)	-	32,020
Short-term loans	82,584	38,047	-	23,207	143,838
Non-current:					
Long-term trade receivables	241	-	-	(4)	237
Long-term non-trade receivables	8,529	405	-	-	8,934
Long-term loans	1,151,372	61,705	(57,280)	(63,639)	1,092,158
	<u>₩ 2,780,976</u>	<u>₩ 141,758</u>	<u>₩ (123,073)</u>	<u>₩ (37,990)</u>	<u>₩ 2,761,671</u>

(*1) Changes are caused by transfer to current, non-current, the spin off, changes in scope of consolidation and foreign exchange difference and others.

	2018				
	Beginning balance	Provision for impaired receivables	Write off	Others(*1)	Ending balance
Current:					
Trade receivables	₩ 1,371,448	₩ 57,739	₩ (59,203)	₩ (49,289)	₩ 1,320,695
Non-trade receivables	165,829	13,925	(58,274)	63,611	185,092
Accrued income	34,131	390	(2,058)	-	32,463
Short-term loans	136,450	3,985	(117)	(57,733)	82,584
Non-current:					
Long-term trade receivables	246	(4)	-	-	242
Long-term non-trade receivables	8,751	(222)	-	-	8,529
Long-term loans	768,230	332,620	(8,004)	58,527	1,151,372
	<u>₩ 2,485,085</u>	<u>₩ 408,432</u>	<u>₩ (127,656)</u>	<u>₩ 15,117</u>	<u>₩ 2,780,977</u>

(*1) Changes are caused by transfer to current, non-current, business combination and foreign exchange difference and others.

Impairment loss (reversal of impairment loss) on impaired trade receivables is included in selling and administrative expenses in the consolidated statements of income, and that on receivables other than impaired trade receivables is included in other non-operating expenses (income).

8. Inventories

Inventories as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019			December 31, 2018		
	Acquisition cost	Valuation allowance	Book value	Acquisition cost	Valuation allowance	Book value
Merchandises	₩ 401,030	₩ (26,858)	₩ 374,172	₩ 437,327	₩ (25,466)	₩ 411,861
Finished goods	722,328	(36,621)	685,707	705,055	(32,889)	672,166
Work in process	538,293	(14,306)	523,987	414,272	(13,698)	400,574
Raw materials	845,884	(42,426)	803,458	788,971	(33,669)	755,302
Materials in transit	263,047	-	263,047	329,250	-	329,250
Supplies	25,448	(2,631)	22,817	33,259	(94)	33,165
Others	8,560	-	8,560	5,704	-	5,704
	<u>₩ 2,804,590</u>	<u>₩ (122,842)</u>	<u>₩ 2,681,748</u>	<u>₩ 2,713,838</u>	<u>₩ (105,816)</u>	<u>₩ 2,608,022</u>

The amount of (reversal of) write-down of inventories recognized is ₩18,306 million and ₩(-)6,311 million for the years ended December 31, 2019 and 2018, respectively.

9. Derivatives

9.1 Details of gain (loss) on valuation of derivatives

Details of gain (loss) on valuation of derivatives as of December 31, 2019 and 2018 are as follows (Korean won in millions, foreign currency in thousands):

December 31, 2019							
Buy		Sell		Assets (liabilities)	Gain (loss)	Accumulated other comprehensive income(*1)	Firm commitment assets (liabilities)(*2)
Currency	Amount	Currency	Amount				
Currency forward contracts:							
KRW	2,279,396	USD	1,867,078	₩ (43,151)	₩ (36,266)	₩ 6,133	₩ 26,444
KRW	307,895	EUR	225,282	4,979	1,509	1,310	(706)
KRW	199,713	JPY	18,082,201	3,449	(2,622)	(1,112)	(1,895)
KRW	3,091	GBP	2,000	55	-	55	-
KRW	104,240	Other foreign currencies		(860)	(978)	(62)	424
USD	1,450,610	KRW	1,674,689	11,410	38,493	3,178	(3,497)
EUR	269,516	KRW	364,052	(10,462)	(3,907)	(1,085)	129
JPY	16,838,081	KRW	208,006	(24,110)	(1,527)	(132)	73
Other foreign currencies		KRW	21,007	284	(88)	527	-
Other foreign currencies		Other foreign currencies		(16,922)	(11,345)	570	(618)
Interest rate swap:							
KRW 5,000, 4.37% and others		KRW 5,000, MOR 3M+2.10% and others		(1,204)	-	(1,204)	-
Long-term borrowings in foreign currency(*3):							
KRW	-	USD	-	-	-	-	180
Embedded derivatives and others				-	(168)	-	-
Currency swap				12,753	1,588	(1,036)	-
Stock price swap(*4)				(14,157)	(14,157)	-	-
				(77,936)	(29,468)	7,142	20,534
Consolidation adjustments				-	167	-	-
Income tax effect				-	-	-	-
				₩ (77,936)	₩ (29,301)	₩	₩ 20,534

(*1) The amounts are gain (loss) on valuation of derivatives designated as cash flow hedges before income tax effect.

(*2) The Group recognizes ₩45,007 million and ₩24,472 million for firm commitment assets and liabilities, respectively, considering the amount adjusted for the current year sales in accordance with the application of fair value hedge accounting.

(*3) To avoid risk of fair value changes in firm commitment assets, the Group designated foreign currency long-term borrowings as hedging instruments.

(*4) During the current year, DHC, the Group's subsidiary, signed the Price Return Swap contract to exchange profits from changes in prices of shares of 10,188,147 shares of Doosan Bobcat Inc.

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9.1 Details of gain (loss) on valuation of derivatives (cont'd)

2018									
Buy		Sell				Accumulated other comprehensive income(*1)		Firm commitment assets (liabilities)(*2)	
Currency	Amount	Currency	Amount	Assets (liabilities)	Gain (loss)				
Currency forward contracts:									
KRW	3,191,040	USD	2,715,210	₩ (28,117)	₩ (51,923)	₩	3,127	₩	(48,784)
KRW	301,357	EUR	203,069	6,866	5,495		1,302		7,810
KRW	286,908	JPY	26,760,741	7,316	(5,425)		(971)		27,391
KRW	218,479	Other foreign currencies		1,625	(2,235)		223		4,662
USD	2,136,224	KRW	2,347,744	4,318	35,311		380		10,125
EUR	426,227	KRW	571,989	(17,601)	(9,837)		(5,896)		(995)
JPY	30,852,891	KRW	349,668	(27,181)	(168)		1,298		(1,477)
Other foreign currencies		KRW	139,591	(4,377)	(1,477)		(2,162)		(1,508)
GBP and others	12,470,000	EUR and others	11,164,000	(8,966)	16,871		(451)		(909)
Interest rate swap:									
KRW 5,000, 3.15% and others		KRW 5,000, MOR 3M+1.38% and others		9,060	(3)	-	3,543		-
Long-term borrowings in foreign currency(*3):									
KRW	-	USD	-	-	-		-		347
Embedded derivatives and others				168	(1,734)		-		-
Commodity forward contracts				(356)	-		(1,247)		-
Currency swap				(11,626)	7,885		(8,950)		-
Stock options				14,834	(6,828)		-		-
Stock price swap(*4)				7,918	7,918		-		-
				(46,119)	(6,150)		(9,804)		(3,338)
Consolidation adjustments				(168)	1,826				-
Income tax effect				-	-				-
				₩ (46,287)	₩ (4,324)	₩		₩	(3,338)

(*1) The amounts are gain (loss) on valuation of derivatives designated as cash flow hedges before income tax effect.

(*2) The Group recognizes ₩24,271 million and ₩27,610 million for firm commitment assets and liabilities, respectively, considering the amount adjusted for the current year sales in accordance with the application of fair value hedge accounting.

(*3) To avoid risk of fair value changes in firm commitment assets, the Group designated foreign currency long-term borrowings as hedging instruments.

(*4) During the current year, DHC, the Group's subsidiary, signed the Price Return Swap contract to exchange profits from changes in prices of shares and disposed of 10,578,070 shares of Doosan Bobcat Inc.

9.2 Stock options granted to financial investors

The Group participates in SOC and development project such as Masan sewer pipe BTL, Sangju-Yeongcheon highway, Suwon-Gwangmyeong highway, Seoul-Munsan highway and others as an investor of the construction. The Group signed a put option contract worth ₩12,600 million regarding shares acquired by the financial investors in order to gather financial investors. The Group classifies the option contract as a derivative asset, and there is no amount recognized as loss on valuation of derivatives or derivative liabilities for the changes in fair value of options.

Nuscale Korea LLC acquired preferred stock of Nuscale Power LLC, which is held by the Group. As of December 31, 2019, the Group signs a put option contract on the shares (USD 50 million) acquired by Nuscale Korea LLC.

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10. Financial instruments by category

Categories of financial instruments as of December 31, 2019 and 2018 are as follows (Korean won in millions):

December 31, 2019						
	Financial assets at fair value through profit or loss	Financial assets (designated) at fair value through OCI	Other financial assets(*1)	Financial assets at amortized cost	Book value	Fair value
Cash and cash equivalents	₩ -	₩ -	₩ -	₩ 1,840,834	₩ 1,840,834	₩ 1,840,834
Short-term and long-term financial instruments(*2)	9,000	-	-	292,079	301,079	301,079
Short-term and long-term investment securities	212,045	296,235	-	53,198	561,478	561,478
Trade and other receivables	-	12,250	-	3,937,396	3,949,646	3,949,646
Derivative assets	9,547	-	45,394	-	54,941	54,941
Deposits	-	-	-	356,690	356,690	356,690
	<u>₩ 230,592</u>	<u>₩ 308,485</u>	<u>₩ 45,394</u>	<u>₩ 6,480,197</u>	<u>₩ 7,064,668</u>	<u>₩ 7,064,668</u>

December 31, 2019					
	Financial liabilities at fair value through profit or loss	Other financial liabilities(*1)	Financial liabilities at amortized cost	Book value	Fair value
Trade and other payables	₩ -	₩ -	₩ 4,955,831	₩ 4,955,831	₩ 4,955,831
Borrowings, bonds and asset- backed loans	-	-	12,441,193	12,441,193	12,441,193
Lease liabilities	-	-	302,355	302,355	302,355
Derivative liabilities	45,863	87,015	-	132,878	132,878
Financial guarantee liabilities	-	16,055	-	16,055	16,055
	₩ 45,863	₩ 103,070	₩ 17,699,379	₩ 17,848,312	₩ 17,848,312

(*1) Include derivative assets designated as effective hedging instruments.

(*2) Some of the short-term financial instruments are provided as collateral for the Group's debt (see Note 34).

December 31, 2018						
	Financial assets at fair value through profit or loss	Financial assets (designated) at fair value through OCI	Other financial assets(*1)	Financial assets at amortized cost	Book value	Fair value
Cash and cash equivalents	₩ -	₩ -	₩ -	₩ 2,456,189	₩ 2,456,189	₩ 2,456,189
Short-term and long-term financial instruments	9,000	-	-	402,224	411,224	411,224
Short-term and long-term investment securities	194,771	23,322	-	22,107	240,200	240,200
Trade and other receivables	-	37,579	-	3,855,518	3,893,097	3,893,097
Derivative assets	21,320	-	23,516	-	44,836	44,836
Deposits	-	-	-	337,018	337,018	337,018
	<u>₩ 225,091</u>	<u>₩ 60,901</u>	<u>₩ 23,516</u>	<u>₩ 7,073,056</u>	<u>₩ 7,382,564</u>	<u>₩ 7,382,564</u>

	December 31, 2018							
	Financial liabilities at fair value through profit or loss		Other financial liabilities(*1)	Financial liabilities at amortized cost		Book value	Fair value	
Trade and other payables	₩	-	₩	-	₩	5,253,630	₩	5,253,630
Borrowings, bonds and asset-backed loans		-		-		12,544,002		12,544,002
Derivative liabilities		51,497		39,627		-		91,124
Financial guarantee liabilities		-		14,388		-		14,388
	₩	51,497	₩	54,015	₩	17,797,632	₩	17,903,144

(*1) Include derivative assets designated as effective hedging instruments.

10. Financial instruments by category (cont'd)

Fair value measurements of financial instruments by fair value hierarchy levels as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019			
	Level 1	Level 2	Level 3	Total
Financial assets:				
Financial assets (designated) at fair value through OCI	₩ 219,915	₩ 82,211	₩ 6,359	₩ 308,485
Financial assets at fair value through profit or loss	9,590	18,546	202,456	230,592
Other financial assets	-	45,394	-	45,394
	229,505	146,151	208,815	584,471
Financial liabilities:				
Financial liabilities at fair value through profit or loss	-	45,863	-	45,863
Other financial liabilities	-	87,015	-	87,015
	-	132,878	-	132,878
	₩ 229,505	₩ 13,273	₩ 208,815	₩ 451,593
	December 31, 2018			
	Level 1	Level 2	Level 3	Total
Financial assets:				
Financial assets (designated) at fair value through OCI	₩ 126	₩ 41,310	₩ 19,465	₩ 60,901
Financial assets at fair value through profit or loss	12,718	30,152	182,221	225,091
Other financial assets	-	23,516	-	23,516
	12,844	94,978	201,686	309,508
Financial liabilities:				
Financial liabilities at fair value through profit or loss	-	51,497	-	51,497
Other financial liabilities	-	39,627	-	39,627
	-	91,124	-	91,124
	₩ 12,844	₩ 3,854	₩ 201,686	₩ 218,384

The above table does not include information for those financial instruments, which are not measured at fair value because the carrying amount approximates fair value.

10. Financial instruments by category (cont'd)

The Group uses the following hierarchy for determining and disclosing the fair value of financial instruments by valuation technique. The level of hierarchy of fair value is as follows:

	Significance of input factor
Level 1:	Unadjusted quoted prices in active markets for identical assets or liabilities
Level 2:	Inputs other than quoted prices that are observable for the asset or liability, either directly or indirectly
Level 3:	Inputs that are not based on observable market data (unobservable inputs)

The fair value of financial instruments traded in active markets is based on quoted market prices at the dates of the consolidated statements of financial position. These instruments are included in Level 1. Instruments included in Level 1 comprise primarily listed equity investments classified as financial assets at fair value.

The fair value of financial instruments that are not traded in an active market (for example, over-the-counter derivatives) is determined by using valuation techniques. 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 for fair value of 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.

Valuation techniques and inputs used for derivatives designated as hedging instruments (Level 2) are as follows:

Valuation technique	Observable inputs	Explanation of input parameters
Discounted cash flow method	Forward exchange rate	It is based on forward exchange rate, disclosed on the market that remaining year is the same till maturity of forward contracts. If the forward exchange rate is not disclosed on the market, it is calculated by using interpolation method.
	Discount rate	It is determined by using yield curve that is disclosed at the end of the reporting year.

10. Financial instruments by category (cont'd)

Assumptions used in the valuation of financial assets at fair value that have been categorized into Level 3 as of December 31, 2019 are as follows:

Financial assets	Valuation techniques	Discount rate	Remarks
Incheon-Kimpo expressway Co, Ltd. and others	Dividend evaluation model	5.24%	Expected dividend cash flows
S-Y highway Co., Ltd.	Discounted cash flow model	7.40%	Forecasted cash flows
Metropolitan Western Expressway Co., Ltd.	Discounted cash flow model	7.40%	Forecasted cash flows from sale
West Seoul Urban Expressway Inc.	Past transaction model	-	Amount of recent sale transaction
Seoul-Munsan highway Co., Ltd.	Past transaction model	-	Amount of recent capital increase
Kyunggi South Road Co., Ltd.	Discounted cash flow model	7.40%	Forecasted shareholder cash flows
Daegu South Circulation Road Corporation	Discounted cash flow model	7.40%	Forecasted shareholder cash flows
South-Seoul LRT CO. Ltd.,	Past transaction model	-	Amount of recent capital increase
Construction Guarantee Cooperative	Past transaction model	-	Average of final bidding price of public sale
Machinery Financial Cooperative	Net asset value assessment	-	Net asset value
West Seoul Urban Expressway Inc.	Past transaction model	-	Amount of recent capital increase
Gyeonggi East-West Road Corporation Co., Ltd	Net asset value assessment	-	Net asset value
Korea Exim Bank public carbon fund	Expected selling value estimation method	-	Expected selling value
Engineering Guarantee Insurance	Expected selling value estimation method	-	Expected selling value
Gyeongnam-GENTECH Creative Economy Innovation Fund	Net asset value assessment	-	Net asset value
Emerald Technology Venture	Expected selling value estimation method	-	Operating profit ratio
Lanco Kondapalli Power Ltd.	Net asset value assessment	-	Net asset value
AI Asilah Desalination Company	Net asset value assessment	-	Net asset value
NuScale Power LLC	Net asset value assessment	-	Net asset value
Others	Expected selling value estimation method and others	-	Expected selling value and others

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10. Financial instruments by category (cont'd)

Meanwhile, changes in the carrying amount of financial assets at fair value through profit or loss and financial assets (designated) at fair value through OCI that have been categorized into Level 3 of fair value hierarchy for the year ended December 31, 2019 and 2018 are as follows (Korean won in millions):

		2019																
		Total comprehensive income (loss)																
		January 1, 2019	Profit or loss	Other comprehensive income	Buy	Sell	transfer	Others	December 31, 2019									
Financial assets (designated) at fair value through OCI	₩	19,465	₩	-	₩	(12,046)	₩	722	₩	-	₩	-	₩	(1,782)	₩	6,359		
Financial assets at fair value through profit or loss		182,221		(3)		-		39,720		(19,377)		(1)		(104)		202,456		
	₩	201,686	₩	(3)	₩	(12,046)	₩	40,442	₩	(19,377)	₩	(1)	₩	(1,886)	₩	208,815		
		2018																
		Total comprehensive income (loss)																
		January 1, 2018	Effect of adoption of new accounting standards	Profit or loss	Other comprehensive income	Buy	Sell	transfer	Others	December 31, 2018								
Financial assets (designated) at fair value through OCI	₩	-	₩	13,328	₩	-	₩	945	₩	3,091	₩	-	₩	100	₩	2,001	₩	19,465
Financial assets at fair value through profit or loss		-		186,208		(22,657)		-		18,028		(12,309)		-		12,951		182,221
	₩	-	₩	199,536	₩	(22,657)	₩	945	₩	21,119	₩	(12,309)	₩	100	₩	14,952	₩	201,686

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10. Financial instruments by category (cont'd)

Comprehensive income (loss) by categories of financial instruments for the years ended December 31, 2019 and 2018 is as follows (Korean won in millions):

	2019							
	Profit or loss(*1)							
	Interest	Dividend	Financial guarantee	Valuation gain/loss (except for derivatives)	Impairment and reversal			Other comprehensive income(*2)
					Impairment loss	Other impairment	Disposal	
Financial assets:								
Financial assets at amortized cost	₩ 48,498	₩ -	₩ -	₩ -	₩ (151,198)	₩ -	₩ (23,722)	₩ -
Financial assets (designated) at fair value through OCI	2,530	18	-	-	-	-	-	62,483
Financial assets at fair value through profit or loss	9,800	1,278	-	(2,442)	-	-	2,921	-
Other financial assets	460	-	-	-	-	-	-	-
	<u>₩ 61,288</u>	<u>₩ 1,296</u>	<u>₩ -</u>	<u>₩ (2,442)</u>	<u>₩ (151,198)</u>	<u>₩ -</u>	<u>₩ (20,801)</u>	<u>₩ 62,483</u>
Financial liabilities:								
Financial liabilities at amortized cost	₩ (613,219)	₩ -	₩ -	₩ -	₩ -	₩ -	₩ (7,884)	₩ -
Others	-	-	(10,329)	-	-	-	-	-
	<u>₩ (613,219)</u>	<u>₩ -</u>	<u>₩ (10,329)</u>	<u>₩ -</u>	<u>₩ -</u>	<u>₩ -</u>	<u>₩ (7,884)</u>	<u>₩ -</u>

(*1) Profit or loss includes the amounts classified as profit or loss from discontinued operations in consolidated statement of profit or loss.

(*2) Other comprehensive income is before income tax effect.

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10. Financial instruments by category (cont'd)

		2018						
		Profit or loss(*1)						
		Impairment and reversal					Other comprehensive income(*2)	
	Interest	Dividend	Financial guarantee	Valuation gain/loss (except for derivatives)	Impairment loss	Other impairment	Disposal	
Financial assets:								
Financial assets at amortized cost	₩ 28,549	₩ -	₩ -	₩ -	₩ (408,532)	₩ -	₩ (23,052)	₩ -
Financial assets (designated) at fair value through OCI	19,358	529	-	-	-	96	100	53
Financial assets at fair value through profit or loss	6	2,010	-	(22,722)	-	1,635	2,523	-
Other financial assets	-	-	-	-	-	-	-	-
	₩ 47,913	₩ 2,539	₩ -	₩ (22,722)	₩ (408,532)	₩ 1,731	₩ (20,429)	₩ 53
Financial liabilities:								
Financial liabilities at amortized cost	₩ (594,288)	₩ -	₩ -	₩ -	₩ -	₩ -	₩ (7,905)	₩ -
Others	-	-	(56)	-	-	-	-	-
	₩ (594,288)	₩ -	₩ (56)	₩ -	₩ -	₩ -	₩ (7,905)	₩ -

(*1) Profit or loss includes the amounts classified as profit or loss from discontinued operations in statement of profit or loss.

(*2) Other comprehensive income is before income tax effect.

Apart from the above financial instruments, comprehensive income (loss) by derivatives for the years ended December 31, 2019 and 2018 is as follows (Korean won in millions):

		2019			2018		
		Profit or loss		Other comprehensive income(*1)	Profit or loss		Other comprehensive loss(*1)
		Valuation	Disposal		Valuation	Disposal	
Derivatives not designated as hedging instruments	₩	22,694	₩ 2,089	₩ -	₩ 42,295	₩ 5,187	₩ -
Derivatives designated as fair value hedges		(56,840)	(2,770)	-	(28,223)	(2,615)	-
Derivatives designated as cash flow hedges		4,845	(4,975)	16,945	(18,396)	1,356	26,879
	₩	(29,301)	₩ (5,656)	₩ 16,945	₩ (4,324)	₩ 3,928	₩ 26,879

(*1) Other comprehensive income (loss) is before income tax effect.

Meanwhile, most of the foreign exchange differences (gain (loss) on foreign currency translations or transactions) from foreign currency transactions arise from financial assets (liabilities) at amortized cost other than derivative contracts.

10. Financial instruments by category (cont'd)

Financial assets and liabilities subject to an enforceable master-netting arrangement or similar agreement as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019			December 31, 2018		
	Gross recognized financial instruments	Gross financial instruments set off	Net amounts presented in the statements of financial position	Gross recognized financial instruments	Gross financial instruments set off	Net amounts presented in the statements of financial position
Financial assets:						
Trade receivables	₩ 8,332	₩ (4,260)	₩ 4,072	₩ 22,815	₩ (7,647)	₩ 15,168
Other receivables	8,079	(1,208)	6,871	161	(104)	57
Derivative assets	60,726	(30,468)	30,258	57,919	(44,252)	13,667
	<u>₩ 77,137</u>	<u>₩ (35,936)</u>	<u>₩ 41,201</u>	<u>₩ 80,895</u>	<u>₩ (52,003)</u>	<u>₩ 28,892</u>
Financial liabilities:						
Trade payables	₩ 43,110	₩ (5,468)	₩ 37,642	₩ 85,037	₩ (7,751)	₩ 77,286
Derivative liabilities	123,343	(30,468)	92,875	102,174	(44,252)	57,922
	<u>₩ 166,453</u>	<u>₩ (35,936)</u>	<u>₩ 130,517</u>	<u>₩ 187,211</u>	<u>₩ (52,003)</u>	<u>₩ 135,208</u>

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11. Investments in associates and joint ventures

Details of investments in associates and joint ventures as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	Location	Ownership interests (%)	Acquisition cost		Book value	
			December 31, 2019	December 31, 2018	December 31, 2019	December 31, 2018
Associates:						
The HS-Urban highway(*1)	Korea	27.29	₩ 9,578	₩ 9,578	₩ 3,806	₩ 4,920
Pospower Co., Ltd.(*1, 2)	Korea	9.00	43,568	43,568	42,961	43,448
Daejeong Marine Wind Power Plant Co., Ltd.	Korea	25.00	2,827	2,827	2,617	2,772
Potenit Co., Ltd.(*5)	Korea	27.80	5,333	5,333	-	4,779
New Bundang Line Co., Ltd.(*1)	Korea	29.03	13,681	13,681	-	-
Gyeonggi Railway Co., Ltd.(*1, 2)	Korea	6.99	7,067	7,067	-	-
Neo Trans Co., Ltd.	Korea	42.86	43	43	21,810	21,645
New Seoul Railroad Co.(*1, 2)	Korea	13.76	8,794	8,794	7,219	7,144
KIAMCO Gyeonggi Railway Investment Private Equity Investment Trust(*1)	Korea	35.70	28,072	28,072	-	-
Incheon Furecell Co.,Ltd.	Korea	20.00	4,700	4,700	4,439	4,662
Dongbuk LRT(*7)	Korea	-	-	1,694	-	1,693
Daesan Green Energy Co., Ltd.(*8)	Korea	-	-	5,100	-	4,527
Geaenzymes(*2)	USA	10.00	750	750	713	703
NewWave #5 Start-up Investment	Korea	30.00	6	408	85	774
KoFC-Neoplux Pioneer Champ 2010-7 Venture Capital Fund (*9)	Korea	-	-	1,571	-	1,958
2010 KIF-Neoplux IT Venture Fund	Korea	21.67	1,826	2,457	18	750
KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund(*4)	Korea	19.00	3,127	4,674	5,317	6,530
Future-Creation Neoplux Venture Capital Fund(*4)	Korea	16.25	4,711	4,711	5,259	5,715
Neoplux Technology Valuation Investment Fund(*4)	Korea	15.00	7,833	8,581	8,584	9,736
Neoplux Market Frontier Secondary Fund(*4)	Korea	15.79	8,954	7,243	8,105	8,391
Gyeonggi-Neoplux Superman Fund(*4)	Korea	15.88	3,564	1,728	4,187	1,602
Shinhan-Neoplux Energy Newbiz Fund (*4)	Korea	8.33	3,000	1,500	2,799	1,391
New Wave 6th investment fund(*6)	Korea	20.00	2,000	-	1,786	-
Neoplux No.1 Private Equity Fund(*9)	Korea	-	-	3,618	-	152
KTC-NP-Growth Champ 2011-2 PEF(*4)	Korea	5.56	2,837	4,681	6,011	14,810
Neoplux No.3 Private Equity Fund(*4)	Korea	10.00	9,170	7,030	6,979	6,850
Prestolite Asia LTD.	Korea	32.31	468	467	2,535	2,346
Wise Fashion Co., Ltd.(*6)	Korea	20.88	3,000	-	2,678	-
ReCarbon, Inc.(*2, 6)	USA	18.20	8,473	-	8,222	-
KDDI Korea Corporation(*2)	Korea	17.63	4,176	4,176	3,617	3,572
			187,558	184,052	149,747	160,870
Joint venture:						
Sichuan Kelun-Doosan Biotechnology Company Limited	China	50.00	2,526	2,526	4,052	3,220
Doosan Babcock BlackCat W.L.L	Qatar	49.00	243	243	-	-
Haman Industrial Complex(*1, 3)	Korea	80.33	2,400	3,600	-	-
Doosan PSI LLC	USA	50.00	1,108	1,108	2,181	1,337
Doosan Infracore Liaoning Machinery Sales Co., Ltd	China	43.00	718	718	107	292
Tianjin Lovol Doosan Engine Co., Ltd.	China	50.00				
			25,640	12,727	17,787	8,235
			32,635	20,922	24,127	13,084
			₩ 220,193	₩ 204,974	₩ 173,874	₩ 173,954

(*1) Provided as collateral for project financing.

(*2) Although the Group has less than 20% shares in the investee, it is classified as an associate since the Group can exercise voting rights in its Board of Directors' meeting.

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11. Investments in associates and joint ventures (cont'd)

(*3) Although the Group has more than 50% shares in the investee, it is classified as a joint venture since the Group has no control due to the inter-shareholder agreement.

(*4) The Group classified Neoplux Co., Ltd., which was a subsidiary, as an associate because it can exercise significant influence as a business executive member.

(*5) During the previous year, DI, a subsidiary, acquired the 27.8% of shares of Potent Co., Ltd for ₩5,333 million. Meanwhile, DI has a call option that allows DI to acquire an additional 34.6% of shares of Potent Co., Ltd within five years after 2 years since the acquisition.

(*6) During the current year, the Group newly acquired the investee.

(*7) During the current year, the Group disposed the investee.

(*8) During the current year, the investee was succeeded to the newly established Doosan Fuel Cell Co., Ltd. by the spin off.

(*9) During the current year, the investee was liquidated.

Changes in investment in associates and joint ventures for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019						
	Beginning balance	Acquisition (disposal)	Dividends	Share of profit (loss) of associates and joint ventures accounted for using the equity method	Share of other comprehensive income (loss) of associates and joint ventures	Other(*2)	Ending balance
Associates:							
The HS-Urban highway	₩ 4,920	₩ -	₩ -	₩ (1,211)	₩ -	₩ 97	₩ 3,806
Pospower Co., Ltd.	43,448	-	-	(477)	(10)	-	42,961
Daejeong Marine Wind Power Plant Co., Ltd	2,772	-	-	(155)	-	-	2,617
Potent Co., Ltd	4,779	-	-	(4,779)	-	-	-
New Bundang Line Co., Ltd.(*4)	-	-	-	-	-	-	-
Gyeonggi Railway Co., Ltd.(*4)	-	-	-	-	-	-	-
Neo Trans Co., Ltd.	21,645	-	-	165	-	-	21,810
New Seoul Railroad Co.	7,144	-	-	75	-	-	7,219
KIAMCO Gyeonggi Railway Investment Private Equity Investment Trust	-	-	-	-	-	-	-
Incheon Furecell Co., Ltd.	4,662	-	-	(223)	-	-	4,439
Dongbuk LRT	1,693	(1,665)	-	(28)	-	-	-
Daesan Green Energy Co. Ltd.(*3)	4,527	-	-	(1,957)	-	(2,570)	-
Geaenzymes	703	-	-	(21)	-	31	713
NewWave #5 Start-up Investment(*1)	774	(402)	(435)	148	-	-	85
KoFC-Neoplux Pioneer Champ 2010-7 Venture Capital Fund(*1)	1,958	(1,571)	62	(449)	-	-	-
2010 KIF-Neoplux IT Venture Fund(*1)	750	(631)	-	(101)	-	-	18
KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund(*1)	6,530	(1,547)	(855)	1,189	-	-	5,317
Future Creation Neoplux Investment Partnership(*1)	5,715	-	-	(456)	-	-	5,259

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11. Investments in associates and joint ventures (cont'd)

	2019						
	Beginning balance	Acquisition (disposal)	Dividends	Share of profit (loss) of associates and joint ventures accounted for using the equity method	Share of other comprehensive income (loss) of associates and joint ventures	Other(*2)	Ending balance
Associates:							
Neoplux Technology Valuation Investment Fund(*1)	₩ 9,736	₩ (748)	₩ -	₩ (404)	₩ -	₩ -	₩ 8,584
Neoplux Market Frontier Secondary Fund(*1)	8,391	1,711	(659)	(1,338)	-	-	8,105
Gyeonggi-Neoplux Superman Fund(*1)	1,602	1,836	-	749	-	-	4,187
Shinhan-Neoplux Energy Newbiz Fund(*1)	1,391	1,500	-	(92)	-	-	2,799
New Wave 6th investment fund(*1)	-	2,000	-	(214)	-	-	1,786
Neoplux No.1 Private Equity Fund(*1)	152	-	-	(192)	-	40	-
KTC-NP-Growth Champ 2011-2 PEF(*1)	14,810	(1,844)	(7)	(6,708)	(240)	-	6,011
Neoplux No.3 Private Equity Fund(*1)	6,850	2,140	-	(2,011)	-	-	6,979
Prestolite Asia LTD.	2,346	-	-	189	-	-	2,535
Wise Fashion Co., Ltd	-	3,000	-	(322)	-	-	2,678
ReCarbon, Inc.	-	8,473	-	(211)	-	(40)	8,222
KDDI Korea Corporation	3,572	-	(149)	194	-	-	3,617
	160,870	12,252	(2,043)	(18,640)	(250)	(2,442)	149,747
Joint ventures:							
Sichuan Kelun-Doosan Biotechnology Company Limited	3,220	-	(603)	1,383	52	-	4,052
Doosan Babcock BlackCat W.L.L	-	-	-	-	-	-	-
Doosan PSI LLC	1,337	-	-	802	-	42	2,181
Doosan Infracore Liaoning Machinery Sales Co., Ltd	292	-	-	(193)	-	8	107
Tianjin Lovol Doosan Engine Co., Ltd.	8,235	12,913	-	(3,139)	-	(222)	17,787
	13,084	12,913	(603)	(1,147)	52	(172)	24,127
	₩ 173,954	₩ 25,165	₩ (2,646)	₩ (19,787)	₩ (198)	₩ (2,614)	₩ 173,874

(*1) Share of profit (loss) of associates and joint ventures accounted for using the equity method of the above entities are classified as sales.

(*2) Changes due to exchange rate differences and the scope of consolidation.

(*3) Share of profit (loss) of associates and joint ventures accounted for using the equity method of the above entities are recognized as discontinued operations.

(*4) In accordance with the amendment of KIFRS 1028, share of loss of associates and joint ventures on long-term investment interests are additionally recognized ₩4,795 million (see Note 2).

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11. Investments in associates and joint ventures (cont'd)

	2018						
	Beginning balance	Acquisition (disposal)	Dividends	Share of profit (loss) of associates and joint ventures accounted for using the equity method	Share of other comprehensive income (loss) of associates and joint ventures	Other(*2)	Ending balance
Associates:							
Tamra Offshore Wind Power Co., Ltd.	₩ 11,413	₩ (4,400)	₩ -	₩ 5,898	₩ (1,753)	₩ (11,158)	₩ -
The HS-Urban highway Pospower Co., Ltd.	9,700	-	-	(2,830)	(1,941)	(9)	4,920
Daejeong Marine Wind Power Plant Co., Ltd	-	43,568	-	(121)	1	-	43,448
Potenit Co., Ltd	-	2,827	-	(55)	-	-	2,772
DSDMP	2,735	5,333	-	(553)	-	(1)	4,779
New Bundang Line Co., Ltd.	-	(2,857)	-	-	122	-	-
Gyeonggi Railway Co., Ltd.	-	-	-	-	-	-	-
Neo Trans Co., Ltd.	20,987	-	-	658	-	-	21,645
New Seoul Railroad Co.	7,528	-	-	(384)	-	-	7,144
KIAMCO Gyeonggi Railway Investment Private Equity Investment Trust	24,801	3,273	-	(28,074)	-	-	-
Incheon Furecell Co., Ltd.	-	4,700	-	(38)	-	-	4,662
Dongbuk LRT	-	1,694	-	(1)	-	-	1,693
Daesan Green Energy Co. Ltd.(*3)	-	5,100	-	(573)	-	-	4,527
Geaenzymes	-	750	-	(80)	1	32	703
NewWave #5 Start-up Investment(*1)	952	(522)	-	344	-	-	774
KoFC-Neoplux Pioneer Champ 2010-7 Venture Capital Fund(*1)	3,109	(1,008)	-	(144)	1	-	1,958
2010 KIF-Neoplux IT Venture Fund(*1)	922	-	-	(172)	-	-	750
KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund(*1)	7,620	(1,653)	-	562	1	-	6,530
Future Creation Neoplux Investment Partnership(*1)	6,978	(2,359)	-	1,096	-	-	5,715

Doosan Corporation and its subsidiaries
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11. Investments in associates and joint ventures (cont'd)

	2018						
	Beginning balance	Acquisition (disposal)	Dividends	Share of profit (loss) of associates and joint ventures accounted for using the equity method	Share of other comprehensive income (loss) of associates and joint ventures	Other(*2)	Ending balance
Associates:							
Neoplux Technology Valuation Investment Fund(*1)	₩ 5,884	₩ 2,700	₩ -	₩ 1,152	₩ -	₩ -	₩ 9,736
Neoplux Market Frontier Secondary Fund(*1)	4,679	2,557	(1,650)	2,805	-	-	8,391
Gyeonggi-Neoplux Superman Fund(*1)	773	918	-	(89)	-	-	1,602
Shinhan-Neoplux Energy Newbiz Fund(*1)	497	1,000	-	(106)	-	-	1,391
Neoplux No.1 Private Equity Fund(*1)	72	-	-	80	-	-	152
KTC-NP-Growth Champ 2011-2 PEF(*1)	8,194	(1,306)	(7)	7,719	210	-	14,810
Neoplux No.3 Private Equity Fund(*1)	-	7,030	-	(180)	-	-	6,850
Prestolite Asia LTD.	2,182	-	-	164	-	-	2,346
KDDI Korea Corporation	3,117	-	(22)	477	-	-	3,572
	122,143	67,345	(1,679)	(12,445)	(3,358)	(11,136)	160,870
Joint ventures:							
Sichuan Kelun-Doosan Biotechnology Company Limited	2,918	-	(1,531)	1,850	(17)	-	3,220
Doosan Babcock BlackCat W.L.L	-	-	-	(281)	-	281	-
Doosan PSI LLC	1,090	-	-	196	-	51	1,337
Doosan Infracore Liaoning Machinery Sales Co., Ltd	411	-	-	(119)	-	-	292
Tianjin Lovol Doosan Engine Co., Ltd.	-	12,727	-	(3,998)	-	(494)	8,235
	4,419	12,727	(1,531)	(2,352)	(17)	(162)	13,084
	₩ 126,562	₩ 80,072	₩ (3,210)	₩ (14,797)	₩ (3,375)	₩ (11,298)	₩ 173,954

(*1) Share of profit (loss) of associates and joint ventures accounted for using the equity method of the above entities are classified as sales.

(*2) Changes due to exchange rate differences and the scope of consolidation.

(*3) Share of profit (loss) of associates and joint ventures accounted for using the equity method of the above entities are recognized as discontinued operations.

The changes above do not include associates and joint ventures that ceased to apply the equity method.

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11. Investments in associates and joint ventures (cont'd)

The condensed financial information of associates and joint ventures as of and for the years ended December 31, 2019 and 2018 is as follows (Korean won in millions):

	2019			
	Total assets	Total liabilities	Sales	Profit (loss) for the year
Associates:				
The HS-Urban highway	₩ 172,125	₩ 157,720	₩ 10,387	₩ 974
Pospower Co., Ltd.	707,051	199,846	-	(5,294)
Daejeong Marine Wind Power Plant Co., Ltd.	6,181	1,450	-	(617)
Potenit Co., Ltd.	6,041	11,380	1,565	(2,243)
New Bundang Line Co., Ltd.	838,864	975,027	103,015	(25,043)
Gyeonggi Railway Co., Ltd.	643,509	733,172	45,556	(33,580)
Neo Trans Co., Ltd.	68,267	17,381	94,406	385
New Seoul Railroad Co.	205,457	152,996	-	(2,595)
KIAMCO Gyeonggi Railway Investment Private Equity Investment Trust	78,705	16	-	4
Incheon Furecell Co., Ltd.	22,669	475	-	(1,004)
Geaenzymes	589	1,071	412	(695)
NewWave #5 Start-up Investment	285	-	2,009	493
KoFC-Neoplux Pioneer Champ 2010-7 Venture Capital Fund	-	-	1,894	(2,282)
2010 KIF-Neoplux IT Venture Fund	84	-	726	(466)
KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund	30,904	2,911	8,700	6,257
Future-Creation Neoplux Venture Capital Fund	36,977	4,614	127	(2,808)
Neoplux Technology Valuation Investment Fund	58,187	961	3,873	(2,699)
Neoplux Market Frontier Secondary Fund	52,798	1,469	3,737	(8,471)
Gyeonggi-Neoplux Superman Fund	26,363	-	36	4,716
Shinhan-Neoplux Energy Newbiz Fund	33,593	-	28	(1,105)
New Wave 6th investment fund	8,930	-	17	(1,070)
Neoplux No.1 Private Equity Fund	-	-	2,924	(1,279)
KTC-NP-Growth Champ 2011-2 PEF	117,544	9,337	5,986	(120,731)
Neoplux No.3 Private Equity Fund	69,788	-	182	(20,107)
Prestolite Asia LTD.	11,979	4,134	12,526	598
Wise Fashion Co., Ltd.	2,514	861	5,780	(1,541)
ReCarbon, Inc.	15,439	6,461	216	(5,475)
KDDI Korea Corporation	26,485	5,964	34,058	1,109
Joint ventures:				
Sichuan Kelun-Doosan Biotechnology Company Limited	10,154	2,050	9,594	2,767
Doosan Babcock BlackCat W.L.L	813	1,559	10,183	(608)
Doosan PSI LLC	9,924	5,561	19,412	1,605
Doosan Infracore Liaoning Machinery Sales Co., Ltd	1,807	1,205	14,864	(449)
Tianjin Lovol Doosan Engine Co. Ltd.	41,629	1,007	-	(6,278)

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11. Investments in associates and joint ventures (cont'd)

	2018			
	Total assets	Total liabilities	Sales	Profit (loss) for the year
Associates:				
The HS-Urban highway	₩ 178,270	₩ 159,208	₩ 9,328	₩ (5,437)
Pospower Co., Ltd.	425,632	35,760	-	(4,536)
Daejeong Marine Wind Power Plant Co., Ltd.	6,440	1,091	-	(590)
Potenit Co., Ltd	8,478	11,575	813	(1,901)
New Bundang Line Co., Ltd.	865,489	976,609	87,340	(39,867)
Gyeonggi Railway Co., Ltd.	670,303	728,713	43,801	(36,376)
Neo Trans Co., Ltd.	67,484	16,983	90,893	1,534
New Seoul Railroad Co.	142,131	87,076	-	(2,795)
KIAMCO Gyeonggi Railway Investment Private Equity Investment Trust	78,689	16	-	4
Incheon Furecell Co., Ltd.	23,635	415	-	(191)
Dongbuk LRT	7,659	-	-	(3)
Daesan Green Energy Co. Ltd.	52,582	2,774	-	(1,192)
Geaenzymes	871	674	744	(787)
NewWave #5 Start-up Investment	2,579	-	242	1,147
KoFC-Neoplux Pioneer Champ 2010-7 Venture Capital Fund	13,128	3,181	1,459	(729)
2010 KIF-Neoplux IT Venture Fund	3,463	-	-	(792)
KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund	37,437	3,069	1,137	2,961
Future-Creation Neoplux Venture Capital Fund	39,654	4,483	1,969	6,748
Neoplux Technology Valuation Investment Fund	65,975	1,065	143	7,683
Neoplux Market Frontier Secondary Fund	53,155	14	12,563	17,762
Gyeonggi-Neoplux Superman Fund	10,087	-	12	(557)
Shinhan-Neoplux Energy Newbiz Fund	16,697	-	22	(1,269)
Neoplux No.1 Private Equity Fund	15,993	14,982	1,116	534
KTC-NP-Growth Champ 2011-2 PEF	276,107	9,535	138,267	138,923
Neoplux No.3 Private Equity Fund	69,159	664	49	(1,804)
Prestolite Asia LTD.	11,698	4,438	-	505
KDDI Korea Corporation	25,660	5,400	40,532	2,713
Joint ventures:				
Sichuan Kelun-Doosan Biotechnology Company Limited	11,108	4,669	8,641	3,701
Doosan Babcock BlackCat W.L.L	1,132	1,385	849	(352)
Doosan PSI LLC	8,695	6,021	16,091	387
Doosan Infracore Liaoning Machinery Sales Co., Ltd	1,826	780	15,415	(194)
Tianjin Lovol Doosan Engine Co. Ltd.	22,353	223	-	(2,334)

Condensed financial information above does not include associates and joint ventures that ceased to apply the equity method.

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11. Investments in associates and joint ventures (cont'd)

Adjustments from net assets of associates and joint ventures to carrying amount of investments in associates and joint ventures as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019					
	Net assets	Percentage of ownership (%)	Group's shares in net assets	Adjustment amounts		
				Goodwill	Internal transactions and others	Book value
Associates:						
The HS-Urban highway	₩ (14,405)	27.29	₩ 3,931	₩ -	₩ (125)	₩ 3,806
Pospower Co., Ltd.	507,205	9.00	45,648	8,360	(11,047)	42,961
Daejeong Marine Wind Power Plant Co., Ltd.	4,731	25.00	1,183	1,434	-	2,617
Potenit Co., Ltd.	(5,339)	27.80	(1,485)	39	1,446	-
New Bundang Line Co., Ltd.	(136,163)	29.03	(39,528)	-	39,528	-
Gyeonggi Railway Co., Ltd.	(89,663)	6.99	(6,267)	-	6,267	-
Neo Trans Co., Ltd.	50,886	42.86	21,810	-	-	21,810
New Seoul Railroad Co.	52,461	13.76	7,219	-	-	7,219
KIAMCO Gyeonggi Railway Investment Private Equity Investment Trust	78,689	35.70	28,092	-	(28,092)	-
Incheon Furecell Co., Ltd.	22,194	20.00	4,439	-	-	4,439
Geaenzymes	(482)	10.00	(48)	683	78	713
NewWave #5 Start-up Investment	285	30.00	85	-	-	85
KoFC-Neoplux Pioneer Champ 2010-7 Venture Capital Fund	-	19.68	-	-	-	-
2010 KIF-Neoplux IT Venture Fund	84	21.67	18	-	-	18
KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund	27,993	19.00	5,317	-	-	5,317
Future Creation Neo Plux Investment Partnership	32,362	16.25	5,259	-	-	5,259
Neoplux Technology Valuation Investment Fund	57,226	15.00	8,584	-	-	8,584
Neoplux Market Frontier Secondary Fund	51,329	15.79	8,105	-	-	8,105
Gyeonggi-Neoplux Superman Fund	26,363	15.88	4,187	-	-	4,187
Shinhan-Neoplux Energy Newbiz Fund	33,593	8.33	2,799	-	-	2,799
New Wave 6th investment fund	8,930	20.00	1,786	-	-	1,786
Neoplux No.1 Private Equity Fund	-	15.00	-	-	-	-
KTC-NP-Growth Champ 2011-2 PEF	108,207	5.56	6,011	-	-	6,011
Neoplux No.3 Private Equity Fund	69,788	10.00	6,979	-	-	6,979
Prestolite Asia LTD.	7,845	32.31	2,535	-	-	2,535
Wise Fashion Co., Ltd.	1,652	20.88	345	2,333	-	2,678
ReCarbon, Inc.	8,978	18.20	1,634	6,588	-	8,222
KDDI Korea Corporation	20,521	17.63	3,617	-	-	3,617
Joint ventures:						
Sichuan Kelun-Doosan Biotechnology Company Limited	8,104	50.00	4,052	-	-	4,052
Doosan Babcock BlackCat W.L.L	(746)	49.00	(365)	-	365	-
Doosan PSI LLC	4,363	50.00	2,181	-	-	2,181
Doosan Infracore Liaoning Machinery Sales Co., Ltd	602	43.00	259	-	(152)	107
Tianjin Lovol Doosan Engine Co. Ltd.	40,622	50.00	20,312	-	(2,525)	17,787

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11. Investments in associates and joint ventures (cont'd)

	December 31, 2018					
	Net assets	Percentage of ownership (%)	Group's shares in net assets	Adjustment amounts		Book value
				Goodwill	Internal transactions and others	
Associates:						
The HS-Urban highway	₩ 19,062	27.29	₩ 5,202	₩ -	₩ (282)	₩ 4,920
Pospower Co., Ltd.	389,872	9.00	35,088	8,360	-	43,448
Daejeong Marine Wind Power Plant Co., Ltd.	5,349	25.00	1,337	1,435	-	2,772
Potenit Co., Ltd.	(3,097)	27.80	(861)	5,640	-	4,779
New Bundang Line Co., Ltd.	(111,120)	29.03	(32,258)	-	32,258	-
Gyeonggi Railway Co., Ltd.	(58,410)	6.99	(4,082)	-	4,082	-
Neo Trans Co., Ltd.	50,501	42.86	21,645	-	-	21,645
New Seoul Railroad Co.	55,055	13.76	7,577	-	(433)	7,144
KIAMCO Gyeonggi Railway Investment Private Equity Investment Trust	78,673	35.70	28,090	-	(28,090)	-
Incheon Furecell Co., Ltd.	23,220	20.00	4,644	-	18	4,662
Dongbuk LRT	7,659	22.00	1,685	-	8	1,693
Daesan Green Energy Co. Ltd.	49,808	10.00	4,981	-	(454)	4,527
Geaenzymes	196	10.00	20	683	-	703
NewWave #5 Start-up Investment	2,579	30.00	774	-	-	774
KoFC-Neoplux Pioneer Champ 2010-7 Venture Capital Fund	9,947	19.68	1,958	-	-	1,958
2010 KIF-Neoplux IT Venture Fund	3,463	21.67	750	-	-	750
KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund	34,369	19.00	6,530	-	-	6,530
Future Creation Neo Plux Investment Partnership	35,171	16.25	5,715	-	-	5,715
Neoplux Technology Valuation Investment Fund	64,910	15.00	9,736	-	-	9,736
Neoplux Market Frontier Secondary Fund	53,141	15.79	8,391	-	-	8,391
Gyeonggi-Neoplux Superman Fund	10,087	15.88	1,602	-	-	1,602
Shinhan-Neoplux Energy Newbiz Fund	16,697	8.33	1,391	-	-	1,391
Neoplux No.1 Private Equity Fund	1,011	15.00	152	-	-	152
KTC-NP-Growth Champ 2011-2 PEF	266,572	5.56	14,810	-	-	14,810
Neoplux No.3 Private Equity Fund	68,496	10.00	6,850	-	-	6,850
Prestolite Asia LTD.	7,260	32.31	2,346	-	-	2,346
KDDI Korea Corporation	20,260	17.63	3,572	-	-	3,572
Joint ventures:						
Sichuan Kelun-Doosan Biotechnology Company Limited	6,439	50.00	3,220	-	-	3,220
Doosan Babcock BlackCat W.L.L	(253)	49.00	(124)	-	124	-
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.	22,130	50.00	11,066	-	(2,831)	8,235

The above adjustments do not include associates and joint ventures that ceased to apply the equity method.

Doosan Corporation and its subsidiaries
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12. Property, plant and equipment

Changes in property, plant and equipment for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019					
	Land	Buildings and structures	Machinery	Others	Construction in progress	Total
January 1	₩ 4,809,788	₩ 1,352,944	₩ 898,157	₩ 372,598	₩ 334,842	₩ 7,768,329
Effect of adoption of new accounting standards(see Note 2)	18,858	196,377	20,633	56,244	-	292,112
Acquisition/capital expenditure	6,162	82,116	84,152	153,522	347,368	673,320
Reclassification	(15,034)	39,332	152,150	14,595	(209,446)	(18,403)
Disposal	(148,578)	(1,160)	(5,338)	(7,891)	(29,578)	(192,545)
Depreciation	(1,039)	(143,488)	(210,046)	(145,917)	-	(500,490)
Impairment loss(Reversal)	2,163	(43,750)	(651)	(258)	(1,269)	(43,765)
Changes in scope of consolidation(*1)	(4,233)	(31,873)	(27,559)	(44,831)	(49,235)	(157,731)
Reclassification of assets as held for sale(see Note 39)	-	-	-	(10,961)	(710)	(11,671)
Asset revaluation	108,222	-	-	-	-	108,222
Others(*2)	1,983	17,668	5,979	7,525	2,826	35,981
December 31	₩ 4,778,292	₩ 1,468,166	₩ 917,477	₩ 394,626	₩ 394,798	₩ 7,953,359
Acquisition cost	₩ 3,050,376	₩ 2,745,957	₩ 3,335,872	₩ 1,246,289	₩ 396,098	₩ 10,774,592
Accumulated depreciation and accumulated impairment losses	(13,283)	(1,277,791)	(2,418,394)	(851,663)	(1,301)	(4,562,432)
Accumulated revaluation surplus	1,741,199	-	-	-	-	1,741,199

(*1) Changes due to transfer and acquisition of business and decrease by the spin off are included (see Note 37).

(*2) Changes due to exchange rate difference and others.

	2018					
	Land	Buildings and structures	Machinery	Others	Construction in progress	Total
January 1	₩ 5,071,608	₩ 1,538,929	₩ 1,015,975	₩ 335,510	₩ 236,793	₩ 8,198,815
Acquisition/capital expenditure	11,481	22,007	56,569	114,382	210,962	415,401
Reclassification	10,113	13,926	95,714	28,185	(111,763)	36,175
Disposal	(21,805)	(4,445)	(11,120)	(8,674)	(498)	(46,542)
Depreciation	(43)	(93,212)	(209,275)	(98,119)	-	(400,649)
Impairment	-	(1,607)	(801)	18	(2,465)	(4,855)
Changes in scope of consolidation(*1)	(259,351)	(131,094)	(51,223)	2,274	(685)	(440,079)
Others(*2)	(2,215)	8,440	2,318	(978)	2,498	10,063
December 31	₩ 4,809,788	₩ 1,352,944	₩ 898,157	₩ 372,598	₩ 334,842	₩ 7,768,329
Acquisition cost	₩ 3,086,313	₩ 2,485,008	₩ 3,341,647	₩ 1,151,249	₩ 334,842	₩ 10,399,059
Accumulated depreciation and accumulated impairment losses	-	(1,132,064)	(2,443,490)	(778,651)	-	(4,354,205)
Accumulated revaluation surplus	1,723,475	-	-	-	-	1,723,475

(*1) Changes due to transfer and acquisition of business are included.

(*2) Changes due to exchange rate difference and others.

Meanwhile, the Group's land and buildings are partially pledged as collateral for loans from KDB and others (see Note 34).

12. Property, plant and equipment (cont'd)

Changes in right-of-use assets classified as property, plant and equipment for the years ended December 31, 2019 are as follows(Korean won in millions):

	2019					
	Land	Buildings and structures	Machinery	Others	Construction in progress	Total
January 1	₩ -	₩ -	₩ 1,270	₩ 10,727	₩ -	₩ 11,997
Effect of adoption of new accounting standards(see Note 2)	18,858	196,377	20,633	56,244	-	292,112
Acquisition/capital expenditure	276	46,304	5,435	22,079	-	74,094
Reclassification	-	32	-	-	-	32
Disposal(*3)	-	-	-	(192)	-	(192)
Depreciation	(996)	(55,077)	(8,036)	(45,900)	-	(110,009)
Changes in scope of consolidation(*1)	-	(1,209)	-	(301)	-	(1,510)
Others(*2)	366	4,754	613	(188)	-	5,545
December 31	₩ 18,504	₩ 191,181	₩ 19,915	₩ 42,469	₩ -	₩ 272,069
Acquisition cost	₩ 19,490	₩ 245,107	₩ 30,144	₩ 99,215	₩ -	₩ 393,956
Accumulated depreciation and accumulated impairment losses	(986)	(53,926)	(10,229)	(56,746)	-	(121,887)

(*1) Decrease due to the spin off is included (see Note 37).

(*2) Changes due to exchange rate difference and others.

(*3) The amount due to the termination of the lease contract.

The details of revaluation model, which the Group applies to measurement of the land, are as follows:

The Group recognizes subsequent measurement of the land as revaluation, and the revaluation amount is the fair value of the revaluation date. As of December 31, 2019, the fair value of land assets was determined from the appraisal that was undertaken by independently qualified valuers, the First Appraisal & Consulting Co., Ltd ("FACC") and Mirae & Saehan Appraisal Co., Ltd., on October 31, 2019.

FACC and Mirae & Saehan Appraisal Co., Ltd. are members of Korea Association of Property Appraisers and comprise of certified professionals that have a significant amount of industry experience.

Other comprehensive income recognized in the consolidated statement of comprehensive income related to revaluation model, which the Group applies to measurement of the land is ₩108,222 million as of December 31, 2019.

Meanwhile, if the land were stated at cost, the land would amount to ₩3,037,093 million and ₩3,086,313 million as of December 31, 2019 and 2018, respectively.

12. Property, plant and equipment (cont'd)

Fair value measurements of land assets by fair value hierarchy level as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019			December 31, 2018		
	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3
Land	₩ -	₩ -	₩ 4,778,292	₩ -	₩ -	₩ 4,809,788

Valuation technique and inputs used for fair value measurement of land assets (Level 3) are as follows:

Valuation technique	Significant inputs that are not based on observable market data (unobservable inputs)	Explanation of input parameters
Official Assessed Reference Land Price ("OARLP"): OARLP of similar parcels nearby the subject land and reflating corrections necessary for differences between the subject and the comparable	Fluctuation rate of land price and others Parcel conditions and others Land conditions affecting the sales price and others	Fair value increases (decreases), if rate of land price increases (decreases). Fair value increases (decreases), if correction of parcel conditions and others increases (decreases). Fair value increases (decreases), if correction of land conditions affecting the sales price increases (decreases).
Trade Case Comparison method: When comparing the transaction case of an object that is similar to the target object, fair value is measured through the process of correcting the private information, correcting the timing, comparing the factors of the value formation and others	Private information correction Point-in-time correction Value formation factor	Fair value increases (decreases), If the private information correction increases (decreases) Fair value increases (decreases), if the point-in-time correction increases (decreases) Fair value increases (decreases), If the value forming factor increases (decreases)

Capitalized borrowing costs for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019	2018
Capitalized borrowing cost	₩ 3,619	₩ 4,846
Capitalization interest rate	3.69% ~ 4.20%	3.65% ~ 4.26%

12. Property, plant and equipment (cont'd)

Classification of depreciation for the years ended December 31, 2019 and 2018 is as follows (Korean won in millions):

	2019	2018
Cost of sales	₩ 371,006	₩ 325,537
Selling and administrative expenses	93,018	47,660
Research and development cost and others	21,625	20,845
Loss from discontinued operations	14,841	6,607
	<u>₩ 500,490</u>	<u>₩ 400,649</u>

Classification of depreciation for the year ended December 31, 2019 incurred in right-of-use assets classified as property, plant and equipment is as follows (Korean won in millions):

	2019
Cost of sales	₩ 75,086
Selling and administrative expenses	33,793
Research and development cost and others	575
Loss from discontinued operations	555
	<u>₩ 110,009</u>

13. Intangible assets

Changes in intangible assets for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019				
	Goodwill	Industrial rights	Development costs	Other intangible assets	Total
January 1	₩ 4,567,200	₩ 1,094,801	₩ 1,108,590	₩ 247,619	₩ 7,018,210
Acquisition/capital expenditure	-	33,199	343,441	42,073	418,713
Reclassification	-	635	(33,296)	31,622	(1,039)
Disposal	-	(57)	(476)	(1,217)	(1,750)
Amortization	-	(1,661)	(126,648)	(62,170)	(190,479)
Impairment	-	-	(18,607)	(4,296)	(22,903)
Reversal of impairment loss	-	-	-	2,054	2,054
Changes in scope of consolidation(*1)	8,726	(774)	(7,909)	603	646
Reclassification of assets as held for sale(see Note 39)	-	(29)	-	(9,764)	(9,793)
Others(*2)	110,395	30,089	851	2,795	144,130
December 31	<u>₩ 4,686,321</u>	<u>₩ 1,156,203</u>	<u>₩ 1,265,946</u>	<u>₩ 249,319</u>	<u>₩ 7,357,789</u>
Acquisition costs	₩ 4,686,321	₩ 1,340,349	₩ 2,009,416	₩ 783,649	₩ 8,819,735
Accumulated amortization (accumulated impairment losses are included)	-	(184,146)	(743,470)	(534,330)	(1,461,946)

(*1) Changes due to transfer and acquisition of business and decrease due to the spin off are included (see Note 37).

(*2) Changes due to exchange rate difference and others.

13. Intangible assets (cont'd)

	2018				
	Goodwill	Industrial rights	Development costs	Other intangible assets	Total
January 1	₩ 4,444,600	₩ 1,066,139	₩ 999,299	₩ 281,973	₩ 6,792,011
Acquisition/capital expenditure	-	872	336,454	22,524	359,850
Reclassification	-	537	(26,601)	30,852	4,788
Disposal	-	(79)	-	(2,979)	(3,058)
Amortization	-	(1,615)	(150,485)	(70,119)	(222,219)
Impairment	-	-	(45,898)	(11,464)	(57,362)
Reversal of impairment loss	-	-	-	19	19
Changes in scope of consolidation (*1)	1,222	-	(1,953)	(4,258)	(4,989)
Others(*2)	121,378	28,947	(2,226)	1,071	149,170
December 31	₩ 4,567,200	₩ 1,094,801	₩ 1,108,590	₩ 247,619	₩ 7,018,210
Acquisition costs	₩ 4,567,200	₩ 1,275,391	₩ 1,778,055	₩ 790,911	₩ 8,411,557
Accumulated amortization (accumulated impairment losses are included)	-	(180,590)	(669,465)	(543,292)	(1,393,347)

(*1) Changes due to transfer and acquisition of business are included.

(*2) Changes due to exchange rate difference and others.

The carrying amount of membership with indefinite useful lives in other intangible assets is ₩41,661 million and ₩44,962 million as of December 31, 2019 and 2018, respectively.

Meanwhile, expenditure on research and development, which was recognized as expenses, amounted to ₩276,940 million and ₩254,414 million for the years ended December 31, 2019 and 2018, respectively.

Before impairment test, the carrying amount of goodwill was allocated to CGUs as follows (Korean won in millions):

Company	CGUs	December 31, 2019	December 31, 2018	Description
Doosan Corporation	Mottrol BG	₩ 84,562	₩ 84,562	Manufacturing and sale of hydraulic components
	Industrial vehicles BG	81,041	78,230	Manufacturing and sale of forklifts
	FuelCell BG(*1)	17,776	41,606	Manufacturing and sale of fuel cell
Doosan Logistics Solution Co., Ltd.	Logistics automation	12,891	-	Development and sale of logistics automation, maintenance
DHC	Power plant	670,382	648,433	Manufacturing and sale of power plant
DI	Construction machine	3,748,557	3,643,257	Manufacturing and sale of construction equipment
DEC	Construction industry	60,049	60,049	Housing construction and infrastructure construction
Oricom Inc.	Magazine	1,373	1,373	Advertising services
	Advertisement	9,690	9,690	
		₩ 4,686,321	₩ 4,567,200	

(*1) Part of its goodwill (Carrying amount: ₩24,232 million) was transferred to the newly incorporated company, Doosan Fuel Cell Co., Ltd. due to the spin off in the current year (see Note 37).

13. Intangible assets (cont'd)

The recoverable amount of CGU is determined based on a value in use calculation, and discount rate and permanent growth rate used in calculating value in use as of December 31, 2019 are as follows:

Company	CGUs	Discount rate	Permanent growth rate
Doosan Corporation	Mottrol BG	11.97%	1.00%
	Industrial vehicles BG	10.14%	1.00%
	Fuel Cell BG	9.67%, 12.40%	1.00%
Doosan Logistics Solution Co., Ltd.	Logistics automation	17.53%	-
DHC	Power plant	9.60%	1.00%
DI	Construction machine	7.85%, 9.07%	1.50%
DEC	Construction industry	11.40%	1.00%
Oricom Inc.	Magazine	10.04%	-
	Advertisement	10.04%	1.00%

Estimates for value in use calculation are as follows.

The Group uses cash flow projections based on financial budgets approved by the directors covering five-year years for a value in use calculation. The financial budgets are determined based on historical result and expectation of market growth. Cash flows beyond that five-year years have been extrapolated using a '0-1.50%' growth rate, continuing the fifth year cash flow. Permanent growth rate does not exceed long-term average growth rate of market, and the discount rates used reflect relevant risks specific to the CGUs.

The recoverable amount may change according to changes in key assumptions. Accordingly, the Group's management regularly observes relevant turnovers and industrial trends.

Capitalized borrowing costs for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019	2018
Capitalized borrowing cost	₩ 24,547	₩ 19,185
Capitalization interest rate	3.69% ~ 4.20%	3.65% ~ 4.19%

Classification of amortization for the years ended December 31, 2019 and 2018 is as follows (Korean won in millions):

	2019	2018
Cost of sales	₩ 129,798	₩ 149,393
Selling and administrative expenses	56,614	71,935
Research and development cost and others	292	365
Loss from discontinued operations	3,775	526
	₩ 190,479	₩ 222,219

13. Intangible assets (cont'd)

Development costs for the year ended December 31, 2019 are as follows (Korea won in millions):

Company	Individual assets	December 31, 2019	Residual depreciation year(*1)
DHC	Large Gas Turbine	₩ 444,398	-
	Standard thermal power 500MW	54,435	-
	IGCC gasification plant	46,491	18.58 years
	Wind Power 3MW Class III Model	18,989	3.67 years
	5.5MW offshore wind power model development	15,238	-
DI	Engine Development Project for Stage 5(*2)	19,991	-
	Engine Development Project for Stage 5(*2)	21,870	4.25 ~ 4.75 years
	Loaders generation 6	31,028	-
	Engine Development Project for Vehicle	13,253	-
	Engine Development Project for Electronic Generators	9,567	-
	Large Excavator (DX800) Development Project	2,901	3.42 years
	BHL Project	4,889	3.42 years

(*1) If the amortization begins, the remaining amortization year is recorded. If not started, it is marked with '-'.
(*2) Some sub-projects among the development costs commenced depreciation and they are presented separately.

Intangible assets for which an impairment loss has been recognized for the year ended December 31, 2019 are as follows (Korea won in millions):

Company	Classification	Individual assets	Amount of impairment loss		December 31, 2019	Recoverable amount assessment methods
			2019	Accumulated		
DHC	Development costs	Top-mounted internal measurement system (TM-ICI) technology development and one other(*1)	₩ 1,237	₩ 1,237	₩ -	Value in use
	Development costs	Concept design development of PCCS passive heat exchanger and seven others(*1)	2,442	2,442	-	Value in use
	Development costs	Others	1,068	1,742	-	Value in use
DI	Development costs	DL06 Engine Development	763	2,318	501	Value in use
	Development costs	Medium Frame GenV and others	4,824	4,824	-	Value in use

13. Intangible assets (cont'd)

Company	Classification	Individual assets	Amount of impairment loss		December 31, 2019	Recoverable amount assessment methods
			2019	Accumulated		
Doosan Corporation	Development costs	Electronic new business R&D(*2)	₩ 3,104	₩ 4,520	₩ -	Value in use
	Development costs	Bio product improvement development cost and others	353	-	-	Value in use
Doosan Robotics Inc.	Development costs	Development of 10Kg-class manufacturing robot(*3)	4,333	5,058	1,199	Value in use
			₩ 18,124	₩ 22,141	₩ 1,700	
DHC	Other intangible assets	Golf membership and others	4,760	5,111	-	Value in use
Doosan Cuvex	Other intangible assets	Resort membership	19	26	-	Fair value
Doosan Corporation	Other intangible assets	Construction of Duty-Free Distribution System (DDF) and others(*4)	7,090	-	-	Value in use
	Other intangible assets	Registered Duty-Free trademark right(*4)	29	-	-	Value in use
	Other intangible assets	Golf membership	-	298	-	Fair value
Doosanbears Inc	Other intangible assets	Golf membership (*5)	-	170	220	Fair value
			11,898	5,605	220	
			₩ 30,022	₩ 27,746	₩ 1,920	

(*1) Due to the uncertainty of getting projects arising from suspension of new nuclear power plants constructions and rapid demand decrease from environment regulations in China, the Group reduced all of the carrying amount.

(*2) The Group recognized all of the related carrying amount as impairment loss, due to a decrease in value in use arising from decline in volume compared to estimates at the time of development.

(*3) The Group recognized some of the related carrying amount as impairment loss, due to a decrease in sales volume of the target model.

(*4) Due to suspension of the Duty-Free business, the Group reduces all of the carrying amount about the distribution sales system and trademark right.

(*5) The recoverable amount is estimated by reflecting the fair value of the individual asset.

13. Intangible assets (cont'd)

Intangible assets recognized for the reversal of impairment loss for the years ended December 31, 2019 are as follows (Korea won in millions):

Company	Classification	Individual asset	Reversal of impairment loss	Recoverable amount assessment methods
DHC	Other intangible assets	Golf membership(*1)	₩ 2,054	Fair value

(*1) The recoverable amount is estimated by reflecting the fair value of the individual asset.

The accounts on the statements of comprehensive income for which the Group recognizes an impairment loss (reversal) for the years ended December 31, 2019 and 2018 are as follows (Korea won in millions):

	2019	2018
Other non-operating expenses	₩ 22,549	₩ 57,362
Other non-operating income	(2,054)	(19)
Loss from discontinued operations	7,473	-
	<u>₩ 27,968</u>	<u>₩ 57,343</u>

14. Investment properties

Changes in investment properties for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019			2018		
	Land	Building	Total	Land	Building	Total
January 1	₩ 376,581	₩ 78,209	₩ 454,790	₩ 382,456	₩ 85,395	₩ 467,851
Acquisition/capital expenditure	993	4,191	5,184	-	1,976	1,976
Disposal	-	(1,188)	(1,188)	-	(1,273)	(1,273)
Revaluation(*1)	9,285	(4,203)	5,082	3,792	(3,188)	604
Decrease due to spin off(see Note 37)	(5,136)	-	(5,136)	-	-	-
Reclassification	11,845	36,611	48,456	(9,612)	(4,701)	(14,313)
Others(*2)	-	-	-	(55)	-	(55)
December 31	<u>₩ 393,568</u>	<u>₩ 113,620</u>	<u>₩ 507,188</u>	<u>₩ 376,581</u>	<u>₩ 78,209</u>	<u>₩ 454,790</u>

(*1) Gain or loss on revaluation of investment properties is included in other non-operating income and expenses in the consolidated statements of income.

(*2) Changes due to exchange rate difference and others.

The Group's land and buildings included in the above investment properties are pledged as collateral for borrowings from financial institutions (see Note 34).

14. Investment properties (cont'd)

Meanwhile, lease income related to investment properties amounted to ₩25,215 million and ₩29,604 million for the years ended December 31, 2019 and 2018, respectively.

Details of fair value model that the Group applies for measurement of investment properties are as follows:

The Group recognizes subsequent measurement of investment properties using fair value, As of December 31, 2019, the fair value of investment properties was determined from the appraisal that was undertaken by independently qualified valuers, the First Appraisal & Consulting Co., Ltd ("FACC") and Mirae & Saehan Appraisal Co., Ltd., on November 30, 2019.

FACC and Mirae & Saehan Appraisal Co., Ltd. are members of Korea Association of Property Appraisers, and comprise of certified professionals who have a significant amount of industry experience.

Fair value measurements of investment properties by fair value hierarchy level as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019			December 31, 2018		
	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3
Land	₩ -	₩ -	₩ 393,568	₩ -	₩ -	₩ 376,581
Buildings	-	-	113,620	-	-	78,209
	₩ -	₩ -	₩ 507,188	₩ -	₩ -	₩ 454,790

Valuation techniques and inputs used for fair value measurement of investment properties (Level 3) are as follows:

Valuation techniques	Significant inputs that are not based on observable market data (unobservable inputs)	Correlation between unobservable inputs and fair value arguments
Official Assessed Reference Land Price ("OARLP"): OARLP of similar parcels nearby the subject land and reflating corrections necessary for differences between the subject and the comparable	Fluctuation rate of land price and others Parcel conditions and others Land conditions affecting the sales price and others	Fair value increases (decreases), if rate of land price increases (decreases). Fair value increases (decreases), if correction of parcel conditions and others increases (decreases). Fair value increases (decreases), if correction of land conditions affecting the sales price increases (decreases).
Trade case comparison method: When comparing the transaction case of an object that is similar to the target object, fair value is measured through the process of correcting the private information, correcting the timing, comparing the factors of the value formation, etc	Private information correction Point-in-time correction Value formation factor	Fair value increases (decreases), If the private information correction increases (decreases) Fair value increases (decreases), if point-in-time correction increases (decreases) Fair value increases (decreases), If the value-forming factor increases (decreases).
Estimated cost price approach: Fair value is based on depreciation and replacement costs considered with structure, building materials, construction condition, building equipment, end use, present condition and management condition	Replacement cost	Fair value decreases (increases), if replacement cost increases (decreases).

15. Bonds and borrowings

15.1 Bonds

Bonds as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	Annual interest rate (%)	December 31, 2019	December 31, 2018
Public issued bonds	1.77~5.87	₩ 1,506,680	₩ 1,656,860
Private placement bonds(*1)	3.03~5.10	413,000	432,000
Bonds with stock warrants	1.00~4.00	1,057,185	1,224,771
Bonds payables in foreign currency(*2)	2.13~4.55	621,980	686,994
		3,598,845	4,000,625
Less: Warrants adjustment		(126,462)	(176,863)
More: Premium on bonds		108,674	123,209
Less: Discount on bonds		(23,726)	(35,007)
Less: Current portion of long-term bonds		(2,423,498)	(1,409,156)
		₩ 1,133,833	₩ 2,502,808

(*1) Property, plant and equipment are pledged as collateral for the above bonds (see Note 34).

(*2) The Group is provided with guarantees from Korea Exim Bank and Kookmin Bank in connection with foreign currency contingent assets (see Note 33).

15.2 Convertible bonds

Changes in convertible bonds issued by the Group for the year ended December 31, 2018 are as follows (Korean won in million):

	January 1	Repayment(*1)	Exercise/ amortization	December 31
Convertible bonds	₩ 6,265	₩ (6,265)	₩ -	₩ -
Yield to maturity premium	679	(679)	-	-
Discount on bonds	(42)	-	42	-
Adjustment for conversion rights	(132)	-	132	-
Book value	6,770	(6,944)	174	-
Consideration for conversion rights (other capital surplus)	277	-	-	277

(*1) During the previous year, DEC, a subsidiary, repaid 85th convertible bond issued in 2015.

15.3 Bonds with stock warrants

Changes in bonds with stock warrants issued by the Group for the year ended December 31, 2019 and 2018 are as follows (Korean won in million):

	2019				
	January 1	Issue/ repayment	Exercise/ amortization	Adjustment	December 31
Bonds with stock warrants	₩ 1,224,771	₩ (167,570)	₩ (15)	₩ (1)	₩ 1,057,185
Yield to maturity premium	123,209	(14,532)	(2)	(1)	108,674
Discount on bonds	(21,816)	2,163	4,689	2,823	(12,141)
Adjustment for stock warrants	(176,863)	8,913	45,005	(3,517)	(126,462)
Book value(*1)	1,149,301	(171,026)	49,677	(696)	1,027,256
Consideration for stock warrants (other capital surplus)	103,468	-	(4,828)	-	98,640

(*1) The book value was substituted by liquidity for the current year.

	2018				
	January 1	Issue/ repayment (*1)	Exercise/ amortization	Adjustment	December 31
Bonds with stock warrants	₩ 1,194,175	₩ (56,196)	₩ (5,252)	₩ 92,044	₩ 1,224,771
Yield to maturity premium	126,255	(4,227)	(3,647)	4,828	123,209
Discount on bonds	(21,285)	(924)	6,761	(6,368)	(21,816)
Adjustment for stock warrants	(219,142)	(2,122)	51,739	(7,338)	(176,863)
Book value	1,080,002	(63,468)	49,601	83,166	1,149,301
Consideration for stock warrants (other capital surplus)	103,903	1,298	(1,733)	-	103,468

(*1) During the previous year, DEC, a subsidiary, made early redemption of part of 92nd bond with stock warrants issued in 2016 and newly issued 94th bond with stock warrants.

15.3 Bonds with stock warrants (cont'd)

The details of bond with stock warrants are as follows:

The 93rd bond with stock warrants issued by DEC, a subsidiary, is as follows (Korean won in millions):

Issue date	Maturity date	Par interest rate	Guaranteed rate of return	Exercisable year	Exercisable price (Korean won)	Par value	Issue value(*1)	Book value
March 21, 2017	March 21, 2020	2.50%	5.50%	From one month after the date of bond issue to one month before the date of repayment	₩2,470 per share	₩ 150,000	₩ 144,480	₩ 9,946

(*1) Issue value is the par value less the discount on bonds.

① Early repayment right

An early repayment right can be exercised for all or part of the principal amount outstanding on the interest payment date, which is 2 years from the issue date, and interest payment date of the 2.5 years from the issue date.

② Method of repayment at maturity

The bond pays interest at an interest rate of 2.50% and, for bonds that do not convert to maturity, the Group will repay 109.7128% of the principal amount of with the yield on maturity(YTM) at an annual rate of 5.50% (3-month compound interest) on March 21, 2020.

③ Exercise price

In case when a bond holder issues shares, such as capital transfer of reserves, share dividends, paid-in capital increase in the amount of issue that is below the pre-adjustment exercisable value before exercising stock warrants, or in the event of the adjustment of the exercise price from issuing securities granting stock warrants such as the issuance of stock warrants, or bonds with stock warrants or conversion rights, the exercise price is adjusted.

④ Exercise of stock warrants

Due to the exercise of stock warrants, 14.73% of the principal amount was exercised, and 3.57% of the bond principal was paid as of December 31, 2019. The number of shares issued from the exercise of stock warrants of a bond with stock warrant is 7,465,686 shares as of December 31, 2019.

15.3 Bonds with stock warrants (cont'd)

94th bond with stock warrants issued by DEC, a subsidiary, is as follows (Korean won in millions):

Issue date	Maturity date	Par interest rate	Guaranteed rate of return	Exercisable year	Exercisable price (Korean won)	Par value	Issue value(*1)	Book value
May 11, 2018	May 11, 2021	4.00%	7.00%	From one month after the date of bond issue to one month before the date of repayment	₩2,070 per share	₩ 70,000	₩ 67,033	₩ 54,748

(*1) Issue value is the par value less the discount on bonds.

① Early repayment right

An early repayment right can be exercised for all or part of the principal amount outstanding on the interest payment date, which is 1.5 years from the issue date, and interest payment date of the 6 months from the issue date

② Method of repayment at maturity

The bond pays interest at an interest rate of 4.0% and, for bonds that do not convert to maturity, the Group will repay 109.9188% of the principal amount of with the yield on maturity(YTM) at an annual rate of 7.0% (3-month compound interest) on May 11, 2021.

③ Exercise price

In case when a bond holder issues shares, such as capital transfer of reserves, share dividends, paid-in capital increase in the amount of issue that is below the pre-adjustment exercisable value before exercising stock warrants, or in the event of the adjustment of the exercise price from issuing securities granting stock warrants such as the issuance of stock warrants or bonds with stock warrants or conversion rights, the exercise price is adjusted.

④ Exercise of stock warrants

Due to the exercise of stock warrants, 0.05% of the principal amount was exercised, and 0.04% of the bond principal was paid as of December 31, 2019. The number of shares issued from the exercise of stock warrants of a bond with stock warrant is 11,508 shares as of December 31, 2019.

15.3 Bonds with stock warrants (cont'd)

48th bond with stock warrants issued by DHC, a subsidiary, is as follows (Korean won in millions):

Issue date	Maturity date	Par interest rate	Guaranteed rate of return	Exercisable year	Exercisable price (Korean won)	Par value	Issue value(*1)	Book value
May 4, 2017	May 4, 2022	1.00%	2.00%	From one month after the date of bond issue to one month before the date of repayment	₩17,100 per share	₩ 500,000	₩ 491,546	₩ 477,917

(*1) Issue value is the par value less the discount on bonds.

① Early repayment right

An early repayment right can be exercised for all or part of the principal amount outstanding on the interest payment date, which is 3 years from the issue date.

② Method of repayment at maturity

The bond pays interest at an interest rate of 1.00% and, for bonds that do not convert to maturity, the Group will repay 105.2448% of the principal amount of with the yield on maturity(YTM) at an annual rate of 2.00% (3-month compound interest) on May 4, 2022.

③ Exercise price

In case when a bond holder issues shares, such as capital transfer of reserves, share dividends, paid-in capital increase in the amount of issue that is below the pre-adjustment exercisable value before exercising stock warrants, or in the event of the adjustment of the exercise price from issuing securities granting stock warrants such as the issuance of stock warrants or bonds with stock warrants or conversion rights, the exercise price is adjusted.

④ Exercise of stock warrants

Due to the exercise of stock warrants, 0.05% of the principal amount was exercised, and 0.04% of the bond principal was paid for as of December 31, 2019. The number of shares issued from the exercise of stock warrants of a bond with stock warrant is 11,394 shares as of December 31, 2019.

15.3 Bonds with stock warrants (cont'd)

31st bond with stock warrants issued by DI, a subsidiary, is as follows (Korean won in millions):

Issue date	Maturity date	Par interest rate	Guaranteed rate of return	Exercisable year	Exercisable price (Korean won)	Par value	Issue value(*1)	Book value
August 1, 2017	August 1, 2022	2.00%	4.75%	From one month after the date of bond issue to one month before the date of repayment	₩6,430 per share	₩ 500,000	₩ 491,607	₩ 484,645

(*1) Issue value is the par value less the discount on bonds.

① Early repayment right

An early repayment right can be exercised for all or part of the principal amount outstanding on the interest payment date, which is 3 years from the issue date.

② Method of repayment at maturity

The bond pays interest at an interest rate of 2.00% and, for bonds that do not convert to maturity, the Group will repay 115.4175% of the principal amount of with the yield on maturity(YTM) at an annual rate of 4.75% (3-month compound interest) on August 1, 2022.

③ Exercise price

In case when a bond holder issues shares, such as capital transfer of reserves, share dividends, paid-in capital increase in the amount of issue that is below the pre-adjustment exercisable value before exercising stock warrants, or in the event of the adjustment of the exercise price from issuing securities granting stock warrants such as the issuance of stock warrants or bonds with stock warrants or conversion rights, the exercise price is adjusted.

④ Exercise of stock warrants

Due to the exercise of stock warrants, 1.13% of the principal amount was exercised, and 1.09% of the bond principal was paid as of December 31, 2019. The number of shares issued from the exercise of stock warrants of a bond with stock warrant is 705,965 shares as of December 31, 2019.

15.4 Short-term borrowings

Short-term borrowings as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	Creditor	Annual interest rate (%)	December 31, 2019(*3)	December 31, 2018
Borrowings in Korean won:				
Doosan Corporation (*2, 5)	Korea Exim Bank and others	2.95 ~ 5.64	₩ 604,149	₩ 186,442
DHC(*1)	KDB and others	1.40 ~ 5.09	2,239,206	1,023,950
DI(*1)	Korea Exim Bank and others	2.57 ~ 3.95	350,986	607,375
DEC(*1)	Construction Guarantee Cooperative and others	1.43 ~ 8.27	49,039	67,274
			<u>3,243,380</u>	<u>1,885,041</u>
Borrowings in foreign currency:				
Doosan Corporation (*2)	Woori Bank and others	0.02 ~ 5.09	220,744	144,814
	Disposal of receivables in foreign currency(*4)	-	-	1,645
DHC(*1)	HSBC and others	1.16 ~ 10.45	871,686	810,842
DI(*1)	KDB and others	0.28 ~ 5.96	251,988	331,010
	Disposal of receivables in foreign currency(*4)	-	10,013	13,090
DEC(*1)	Asia Commercial Bank and others	2.50 ~ 3.70	16,256	1,121
			<u>1,370,687</u>	<u>1,302,522</u>
			<u>₩ 4,614,067</u>	<u>₩ 3,187,563</u>

(*1) DHC's foreign subsidiaries and consolidated subsidiaries of the DHC's subsidiaries are included.

(*2) The Group's subsidiaries other than above (*1) are included.

(*3) The Group pledges property, plant and equipment and investments in associates as collateral for the above borrowings (see Note 34).

(*4) In the case of the disposal of financial assets that do not meet the "derecognition of financial assets" requirement, the Group continues to recognize the assets in the consolidated statements of financial position, and the related receivable amount is recognized as short-term borrowings (see Note 33.3).

(*5) The Group entered into put options on all or part of the redeemable convertible preferred stocks held by investors and the related commitment amount is recognized as short-term borrowings.

15.5 Long-term borrowings

Long-term borrowings as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	Creditor	Annual interest rate (%)	December 31, 2019(*3)	December 31, 2018
Borrowings in Korean won:				
Doosan Corporation (*2)	KDB and others	3.08~6.70	₩ 679,499	₩ 485,500
DHC(*1)	Korea Exim Bank and others	2.34 ~ 5.30	538,097	865,189
DI(*1)	KDB and others	3.99 ~ 4.40	380,000	380,000
DEC(*1)	KDB and others	7.50, CD +2.50	95,000	73,000
Doosan Cuvex Co., Ltd(*1)	SBI Saving Bank and others	5.00	1,000	40,936
DBC Co., Ltd(*1)	The Korea Securities Finance Corporation	4.50 ~ 6.70	-	178,200
			1,693,596	2,022,825
Borrowings in foreign currency:				
Doosan Corporation (*2)	Korea Exim Bank and others	2.15 ~ 4.94	51,704	222,562
DHC(*1)	Mashreq bank and others	0.94 ~ 10.05	634,722	791,604
DI(*1)	USA Institutional investors and banks and others	2.30 ~ 8.00	1,002,720	1,512,341
			1,689,146	2,526,507
			₩ 3,382,742	₩ 4,549,332
Less: present value discounts			(14,658)	(13,051)
Less: current portion of long-term borrowings			(1,109,271)	(868,681)
			₩ 2,258,813	₩ 3,667,600

(*1) DHC's foreign subsidiaries and consolidated subsidiaries of the DHC's subsidiaries are included.

(*2) The Group's subsidiaries other than above (*1) are included.

(*3) The Group repays principal of above borrowings in instalments and pledges property, plant and equipment as collateral for the above borrowings (see Note 34).

15.6 Asset-backed loans

Asset-backed loans as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	Creditor	Annual interest rate (%)	December 31, 2019(*1)	December 31, 2018
Asset-backed loans:				
Doosan corporation(*2)	Bank of China and others	4.2 ~ 4.75	₩ 155,000	₩ -
DHC	KDB and others	3.05 ~ 5.50	369,000	420,000
DEC	Shinyoung Securities and others	7.30 ~ 7.50	382,100	492,000
			<u>₩ 906,100</u>	<u>₩ 912,000</u>
Less: present value discounts			(4,391)	(3,808)
Less: short-term asset-backed loans			(381,574)	(491,371)
Less: current portion of long-term asset-backed loans			(227,845)	(168,033)
			<u>₩ 292,290</u>	<u>₩ 248,788</u>

(*1) The Group pledges property, plant and equipment and others as collateral for the above asset-backed loans (see Note 34).

(*2) Doosan Corporation and its subsidiaries are included. Meanwhile, the carrying amount of receivables recognized in the consolidated statement of financial position as of December 31, 2019, is ₩1,852 million, as it does not meet the requirement to remove financial instruments in relation to the current liabilities (see Note 33).

16. Lease

16.1 Right-of-use assets

Changes in right-of-use assets and classification of depreciation expenses for each category of accounts for the current year are described in Note 12.

16.2 Lease liabilities

Changes in lease liabilities for the year ended December 31, 2019 are as follows (Korean won in millions):

	Lease liabilities
Beginning balance	₩ -
Effect of adoption of new accounting standards and account reclassification(see Note 2)	335,526
Payment of lease fees	(126,499)
Acquisition of lease assets	74,094
Cancel contracts	(500)
Interest expense	18,803
Decrease due to spin off(see Note 37)	(3,071)
Others	4,002
Ending balance	<u>₩ 302,355</u>

16.2 Lease liabilities (cont'd)

The maturity analysis of lease liabilities for the year ended December 31, 2019 is as follows (Korean won in millions):

	Nominal cash flow according to contract				
	Total	Less than 1 year	1 ~ 2 years	2 ~ 5 years	More than 5 years
Lease liabilities	₩ 352,048	₩ 97,542	₩ 61,066	₩ 108,487	₩ 84,953

Classification of expenses for the years ended December 31, 2019 incurred in short-term lease and leases of low-value assets that are not included in right-of-use assets are as follows (Korean won in millions):

	2019
Cost of sales	₩ 10,117
Selling and administrative expenses	16,871
Research and development cost and others	1,384
Loss from discontinued operations	72
	₩ 28,444

During the current year, cash outflows from financing activities due to the repayment of lease liabilities were ₩126,499 million, and cash outflows from operating activities due to short-term and leases of low value fees were ₩28,444 million. Therefore, the total cash outflow of the lease is ₩154,943 million.

During the current year, the rental income from sub leases of right-of-use assets is ₩3,964 million.

16.3 Lease receivables

The maturity analysis of lease receivables for the years ended December 31, 2019 is as follows (Korean won in millions):

	Nominal cash flow according to contract				
	Total	Less than 1 year	1 ~ 2 years	2 ~ 5 years	More than 5 years
Lease receivables	₩ 12,724	₩ 2,134	₩ 2,756	₩ 6,934	₩ 900

17. Net defined benefit liabilities

The Group operates a defined benefit plan for employees, and the actuarial valuation of plan assets and the defined benefit liabilities is performed by a reputable actuary using the projected unit credit method.

Details of net defined benefit liabilities as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019	December 31, 2018
Present value of defined benefit liabilities	₩ 2,600,437	₩ 2,384,181
Fair value of plan assets	(1,884,124)	(1,714,867)
Net defined benefit liabilities	₩ 716,313	₩ 669,314

Pension costs generated by defined benefits retirement pension charged to profit or loss for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019	2018
Current service costs	₩ 106,687	₩ 113,087
Net interest costs	25,289	30,699
Effect from curtailment and settlement	(9,129)	(5,634)
	₩ 122,847	₩ 138,152

17. Net defined benefit liabilities (cont'd)

Classification of the pension costs generated by defined benefits retirement pension recognized in the consolidated statements of income for the years ended December 31, 2019 and 2018 is as follows (Korean won in millions):

	2019	2018
Cost of sales	₩ 62,223	₩ 93,017
Selling and administrative expenses	48,453	37,545
Research and development cost and others	9,206	5,814
Loss from discontinued operations	2,965	1,776
	<u>₩ 122,847</u>	<u>₩ 138,152</u>

Changes in net defined benefit liabilities for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019		
	Defined benefit liabilities	Plan assets	Net defined benefit liabilities
Beginning balance	₩ 2,384,181	₩ (1,714,867)	₩ 669,314
Profit or loss:			
Current service cost	106,687	-	106,687
Interest cost (income)	76,621	(51,332)	25,289
Past service cost	(9,129)	-	(9,129)
	<u>174,179</u>	<u>(51,332)</u>	<u>122,847</u>
Remeasurements:			
Return on plan assets (excluding amounts included in interest income)	-	(142,363)	(142,363)
Actuarial gain from change in demographic assumptions	(1,538)	-	(1,538)
Actuarial gain from change in financial assumptions	210,431	-	210,431
Others	22,354	-	22,354
	<u>231,247</u>	<u>(142,363)</u>	<u>88,884</u>
Transfer in and out	4,061	362	4,423
Changes in scope of consolidation and others(*1)	(31,943)	25,721	(6,222)
Contributions by employer directly to plan assets	3,118	(14,504)	(11,386)
Contributions by user directly to plan assets	-	(144,762)	(144,762)
Benefit payments	(241,853)	206,602	(35,251)
Others	77,447	(48,981)	28,466
Ending balance	<u>₩ 2,600,437</u>	<u>₩ (1,884,124)</u>	<u>₩ 716,313</u>

(*1) Changes due to the spin off (see Note 37).

17. Net defined benefit liabilities (cont'd)

	2018		
	Defined benefit liabilities	Plan assets	Net defined benefit liabilities
Beginning balance	₩ 2,489,741	₩ (1,760,859)	₩ 728,882
Profit or loss:			
Current service cost	113,087	-	113,087
Interest cost (income)	73,262	(42,563)	30,699
Past service cost	(5,634)	-	(5,634)
	180,715	(42,563)	138,152
Remeasurements:			
Return on plan assets (excluding amounts included in interest income)	-	88,503	88,503
Actuarial gain from change in demographic assumptions	(17,503)	-	(17,503)
Actuarial gain from change in financial assumptions	(111,096)	-	(111,096)
Others	23,654	-	23,654
	(104,945)	88,503	(16,442)
Transfer in and out	(5,250)	157	(5,093)
Business combination	(33,921)	30,060	(3,861)
Contributions by employer directly to plan assets	2,390	(22)	2,368
Contributions by user directly to plan assets	-	(119,283)	(119,283)
Benefit payments	(169,000)	99,728	(69,272)
Others	24,451	(10,588)	13,863
Ending balance	₩ 2,384,181	₩ (1,714,867)	₩ 669,314

Assumptions used for actuarial valuation as of December 31, 2019 and 2018 are as follows:

	December 31, 2019	December 31, 2018
Discount rate (%)	0.90~7.39	1.29~7.76
Salary growth rate (%)	1.30~7.39	2.00~8.00

Details of plan assets as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019	December 31, 2018
Equity securities	₩ 384,019	₩ 302,645
Debt securities	653,650	623,806
Saving deposits and others	846,455	788,416
	₩ 1,884,124	₩ 1,714,867

Plan assets are mostly invested in assets that have a quoted market price in an active market.

17. Net defined benefit liabilities (cont'd)

The sensitivity analysis for the significant actuarial assumptions as of December 31, 2019 and 2018 is as follows (Korean won in millions):

			Amount	Ratio
December 31, 2019	Discount rate	1% increase	₩ (296,685)	(-)11.41%
		1% decrease	378,240	14.55%
	Salary growth rate	1% increase	124,670	4.79%
		1% decrease	(98,085)	(-)3.77%
December 31, 2018	Discount rate	1% increase	(258,162)	(-)10.83%
		1% decrease	308,851	12.95%
	Salary growth rate	1% increase	67,030	2.81%
		1% decrease	(62,419)	(-)2.62%

The weighted average maturity of defined benefit liabilities as of December 31, 2019 and 2018 is 12.98 years and 11.89 years. the Group expects to pay contributions amounting to ₩154,994 million in the following year.

Meanwhile, the amount recognized for the defined contribution retirement benefit plan is ₩26,229 million and ₩20,792 million as of December 31, 2019 and 2018, respectively.

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18. Provisions

Changes in provisions for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019													
	Beginning balance		Increase (decrease)		Used		Others(*1)		Ending balance		Current		Non-current	
Provision for product warranties	₩	411,003	₩	229,287	₩	(164,982)	₩	4,081	₩	479,389	₩	247,772	₩	231,617
Provision for restoration		6,036		14,414		(1,338)		82		19,194		-		19,194
Provision for loss compensation		42		8,209		(7,419)		(54)		778		-		778
Provision for construction losses		15,950		(3,748)		(23)		533		12,712		12,712		-
	₩	433,031	₩	248,162	₩	(173,762)	₩	4,642	₩	512,073	₩	260,484	₩	251,589

(*1) It includes changes in the amounts from foreign exchange rate, the scope of consolidation, and etc.

	2018							
	Beginning balance	Adoption of new accounting standards (*1)	Increase (decrease)	Used	Others(*2)	Ending balance	Current	Non-current
Provision for product warranties	₩ 399,983	₩ -	₩ 72,786	₩ (33,815)	₩ (27,951)	₩ 411,003	₩ 185,078	₩ 225,925
Provision for sales return	5,514	(179)	(5,427)	-	92	-	-	-
Provision for restoration	6,378	-	133	(743)	268	6,036	-	6,036
Provision for loss compensation	37	-	4	-	1	42	-	42
Provision for construction losses	-	10,143	6,111	(176)	(128)	15,950	10,150	5,800
	<u>₩ 411,912</u>	<u>₩ 9,964</u>	<u>₩ 73,607</u>	<u>₩ (34,734)</u>	<u>₩ (27,718)</u>	<u>₩ 433,031</u>	<u>₩ 195,228</u>	<u>₩ 237,803</u>

(*1) The Group recognized the adjustment amount of due from customers for contract work and due to customers for contract work as a provision as a result of the adoption of KIFRS 1115.

(*2) It includes changes in the amounts from foreign exchange rate, the scope of consolidation, and etc.

The Group recognizes the expected expenses due to quality assurance, exchange and refund, defect repair, and subsequent post-service as provisions based on the warranty year and past experience rate.

Meanwhile, the Group recognizes provisions for other liabilities amounting to ₩224,919 million and ₩120,928 million related to pending litigations as of December 31, 2019 and 2018, respectively.

19. Share capital and share premium

Changes in share capital and share premium for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions, except for share data):

	Number of shares		Share capital				Share premium
	Ordinary shares	Preferred shares	Ordinary shares	Preferred shares	Total		
Balance at January 1, 2018	19,198,003	5,396,759	₩ 107,862	₩ 26,984	₩ 134,846	₩	355,916
Capital share issue cost	-	-	-	-	-	-	(1)
Retirement of shares	(959,901)	-	-	-	-	-	-
Balance at December 31, 2018	18,238,102	5,396,759	107,862	26,984	134,846		355,915
Spin off(*1)	(1,714,267)	(507,259)	(8,571)	(2,537)	(11,108)		(33,453)
Balance at December 31, 2019	16,523,835	4,889,500	₩ 99,291	₩ 24,447	₩ 123,738	₩	322,462

(*1) The number of shares, share capital and share premium decreased due to the spin off of the Group (see Note 37).

The Group's number of shares authorized is 400,000,000 shares with a par value of ₩5,000 per share. The amount of share capital is not the same as total par value of shares issued due to retirement of shares.

The number of shares with the limited voting rights under commercial law are 3,000,866 shares and 3,306,169 shares as of December 31, 2019 and 2018, respectively. Preferred shares do not have voting rights.

20. Capital surplus

Details of capital surplus as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019	December 31, 2018
Share premium	₩ 322,462	₩ 355,915
Revaluation reserves	277,542	277,542
Other capital surplus	132,262	127,977
	<u>₩ 732,266</u>	<u>₩ 761,434</u>

21. Other equity items

Other capital items as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019	December 31, 2018
Treasury stocks(*1)	₩ (185,025)	₩ (203,567)
Loss on disposal of treasury stocks	(16,738)	(16,738)
Stock options	3,265	4,066
Loss from capital reduction(*2)	(948,311)	(127,318)
Others	(46,112)	(52,780)
	<u>₩ (1,192,921)</u>	<u>₩ (396,337)</u>

(*1) According to the spin off during the current year, the long-term investment securities were recognized and removed from other capital items in the consolidated financial statements of the Company, as it was a share of the newly incorporated company among the treasury stock held by the Group before the spin off (see Note 37).

(*2) According to the spin off during the current year, the amount of non-cash assets distributed to the owner was ₩ (-)865,554 million and the replacement amount from share capital and share premium amounted to ₩44,561 million were recognized as loss from capital reduction (see Notes 19, 37).

21.1 Treasury stocks

The Company acquired registered ordinary shares and non-voting preferred shares, and recognized them as other capital items for the stabilization of share price. Changes in treasury stocks for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions, except for share data):

	Number of treasury stocks			Book value of treasury stocks		
	Ordinary shares	Preferred shares	Total	Ordinary shares	Preferred shares	Total
Balance at January 1, 2018	4,266,070	673,054	4,939,124	₩ 246,923	₩ 15,052	₩ 261,975
Disposal(retirement of shares)	(959,901)	-	(959,901)	(58,408)	-	(58,408)
Balance at December 31, 2018	<u>3,306,169</u>	<u>673,054</u>	<u>3,979,223</u>	<u>₩ 188,515</u>	<u>₩ 15,052</u>	<u>₩ 203,567</u>
Balance at January 1, 2019	3,306,169	673,054	3,979,223	₩ 188,515	₩ 15,052	₩ 203,567
Decrease due to spin off(see Note 37)	(310,760)	(63,264)	(374,024)	(17,719)	(1,415)	(19,134)
Acquisition	<u>5,457</u>	<u>2,314</u>	<u>7,771</u>	<u>435</u>	<u>157</u>	<u>592</u>
Balance at December 31, 2019	<u>3,000,866</u>	<u>612,104</u>	<u>3,612,970</u>	<u>₩ 171,231</u>	<u>₩ 13,794</u>	<u>₩ 185,025</u>

21.2 Share-based payment

The Company granted stock options to its directors several times in the past. Stock options are settled based on the Board of Directors' decision by issuance of new shares, treasury stocks or cash settlement. Vesting condition offers two-year service after the resolution at the shareholders' meeting. The number of granted options as of December 31, 2019 is as follows (Korean won, except for share data):

	Date of grant	Number of granted options	Exercisable year	Exercisable price	Expected fair value at the date of grant
12th	2010.3.26	4,258	2013.3.26 - 2020.3.26	₩ 116,500	₩ 56,460
13th	2011.3.25	3,168	2014.3.25 - 2021.3.25	137,500	68,045
14th	2012.3.30	6,880	2015.3.30 - 2022.3.30	156,200	63,647
15th	2013.3.29	25,362	2016.3.29 - 2023.3.28	128,100	43,353
16th	2014.3.28	32,152	2017.3.28 - 2024.3.27	134,300	39,558

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

	Risk-free interest rate	Expected exercisable year	Expected volatility	Expected dividend yield ratio
12th	3.82%	3.27	71.67%	35.00%
13th	3.66%	3.29	73.42%	40.00%
14th	3.57%	3.41	62.76%	43.00%
15th	2.45%	3.42	49.22%	46.00%
16th	2.88%	3.60	40.90%	48.00%

Risk-free interest rate is based on a three-year treasury bond yield rate.

21.2 Share-based payment (cont'd)

Changes in stock options for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions, except for share data):

2019								
	Number of ordinary shares to be issued				Valuation amount			
	Beginning	Forfeited	Spin off(*1)	Ending	Beginning	Forfeited	Spin off(*1)	Ending
10th	1,850	(1,850)	-	-	₩ 99	₩ (99)	₩ -	₩ -
12th	5,800	(1,100)	(442)	4,258	327	(62)	(25)	240
13th	4,000	(500)	(332)	3,168	272	(34)	(23)	215
14th	8,500	(900)	(720)	6,880	541	(57)	(46)	438
15th	28,800	(800)	(2,638)	25,362	1,249	(35)	(114)	1,100
16th	39,900	(4,400)	(3,348)	32,152	1,578	(174)	(132)	1,272
	<u>88,850</u>	<u>(9,550)</u>	<u>(7,480)</u>	<u>71,820</u>	<u>₩ 4,066</u>	<u>₩ (461)</u>	<u>₩ (340)</u>	<u>₩ 3,265</u>

(*1) During the current year, the company was succeeded to the newly incorporated company according to the spin off (see Note 37).

2018						
	Number of ordinary shares to be issued			Valuation amount		
	Beginning	Forfeited	Ending	Beginning	Forfeited	Ending
9th	11,900	(11,900)	-	₩ 819	₩ (819)	₩ -
10th	1,850	-	1,850	99	-	99
12th	39,310	(33,510)	5,800	2,219	(1,892)	327
13th	15,500	(11,500)	4,000	1,055	(783)	272
14th	23,300	(14,800)	8,500	1,483	(942)	541
15th	50,400	(21,600)	28,800	2,185	(936)	1,249
16th	65,000	(25,100)	39,900	2,571	(993)	1,578
	<u>207,260</u>	<u>(118,410)</u>	<u>88,850</u>	<u>₩ 10,431</u>	<u>₩ (6,365)</u>	<u>₩ 4,066</u>

As of December 31, 2019, the weighted-average remaining contractual year (from December 31, 2019 to maturity) of stock options is 3.3 years.

22. Accumulated other comprehensive income

Accumulated other comprehensive income as of December 31, 2019 and 2018 is as follows (Korean won in millions):

	December 31, 2019	December 31, 2018
Profit(Loss) on valuation of financial assets (designated) at fair value through OCI	₩ 33,163	₩ (20,336)
Share of other comprehensive loss of associates and joint ventures	(8,866)	(8,676)
Loss on foreign operations translation	(83,569)	(98,366)
Gain on valuation of derivatives designated as cash flow hedges	41,790	37,760
Land revaluation surplus	<u>666,189</u>	<u>641,067</u>
	<u>₩ 648,707</u>	<u>₩ 551,449</u>

23. Retained earnings

Retained earnings as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019	December 31, 2018
Legal reserves	₩ 67,423	₩ 67,423
Discretionary reserves	-	10,000
Unappropriated retained earnings	1,183,302	882,712
	<u>₩ 1,250,725</u>	<u>₩ 960,135</u>

The Commercial Code of the Republic of Korea requires the Group to appropriate an amount equal to a minimum of 10% of annual cash dividends declared as a legal reserve until the reserve equals 50% of its issued share capital.

Details of dividends for the year ended December 31, 2019 are as follows (Korean won, except for share data and dividend amount):

	2019		
	Preferred shares (old)	Preferred shares (new)	Ordinary shares
Par value per share	₩ 5,000	₩ 5,000	₩ 5,000
The 1st quarter:			
Number of shares issued	4,411,074	985,685	19,198,003
Number of treasury stocks	620,812	52,242	4,266,070
Shares eligible for dividends	3,790,262	933,443	14,931,933
Rate of dividend per par value	26%	26%	26%
Dividend per share	₩ 1,300	₩ 1,300	₩ 1,300
Dividend amount (Korean won in million)	₩ 4,927	₩ 1,213	₩ 19,412
The 2nd quarter:			
Number of shares issued	4,411,074	985,685	19,198,003
Number of treasury stocks	620,812	52,242	4,266,070
Shares eligible for dividends	3,790,262	933,443	14,931,933
Rate of dividend per par value	26%	26%	26%
Dividend per share	₩ 1,300	₩ 1,300	₩ 1,300
Dividend amount (Korean won in million)	₩ 4,927	₩ 1,213	₩ 19,412
The 3rd quarter:			
Number of shares issued	4,411,074	985,685	19,198,003
Number of treasury stocks	620,812	52,242	4,266,070
Shares eligible for dividends	3,790,262	933,443	14,931,933
Rate of dividend per par value	26%	26%	26%
Dividend per share	₩ 1,300	₩ 1,300	₩ 1,300
Dividend amount (Korean won in million)	₩ 4,927	₩ 1,213	₩ 19,412
Year end (planned):			
Number of shares issued	3,996,462	893,038	16,523,835
Number of treasury stocks	564,242	47,862	3,000,866
Shares eligible for dividends	3,432,220	845,176	13,522,969
Rate of dividend per par value	27%	26%	26%
Dividend per share	₩ 1,350	₩ 1,300	₩ 1,300
Dividend amount (planned) (Korean won in million)	₩ 4,633	₩ 1,099	₩ 17,580

23. Retained earnings (cont'd)

Details of dividends paid by the Company for the year ended December 31, 2019 are as follows (Korean won in millions):

	Preferred shares (old)	Preferred shares (new)	Ordinary shares	Total
Annual dividends for prior year:				
Shares eligible for dividends	3,790,262	933,443	14,931,933	
Dividend per share (Korean won)	₩ 1,350	₩ 1,300	₩ 1,300	
	₩ 5,117	₩ 1,213	₩ 19,412	₩ 25,742
Interim dividends for the current year:				
Shares eligible for dividends	3,790,262	933,443	14,931,933	
Dividend per share (Korean won)	₩ 3,900	₩ 3,900	₩ 3,900	
	₩ 14,782	₩ 3,640	₩ 58,235	₩ 76,657
	₩ 19,899	₩ 4,853	₩ 77,647	₩ 102,399

24. Information for non-controlling interests

24.1 Redeemable convertible preferred share

As a subsidiary, DHC completed the redemption rights exercise on December 6, 2019 for the redeemable convertible preferred stock issued on December 6, 2014. Details are as follows:

	Details
Issue date	December 06, 2014
Issued shares	Cumulative non-participating preferred shares
Total number of outstanding shares	13,203,540 shares
Issue price per share	₩28,250
Redemption date	December 06, 2019
Total number of redemption shares	12,904,210 shares (Excluding 299,330 shares converted to ordinary shares due to exercise of conversion rights of preferred shareholders after the issue date and before the redemption date)
Redemption price per share	Deduction of dividend prepayment from the amount of 5.48% per annum added to the issue price

24.2 Hybrid bonds

DPS.S.A., a subsidiary, completely exercised the call option for its hybrid bonds (USD 300,000 thousand) issued on December 3, 2018.

25. Operating segment information

The Group is engaged in various businesses, such as heavy industry, machinery manufacturing, apartment construction industry and service industry, key products and services of each division are as follows:

Operating segment	Main products and services
Electro-Materials BG(*1)	Manufacture and sale of copper clad laminates
Mottrol BG	Manufacture and sale of hydraulic equipment
Industrial Vehicle BG	Manufacture and sale of forklifts
Doosan Digital Innovation BG(*2)	Development and maintenance service of information technology system and others
Others	Advertisement, manufacture and sale of industrial equipment, operations of golf club and condominium, etc.
DHC(*3)	NSSS, BOP, Turbine, freshwater and water treatment facilities, plant facilities installment construction, road construction, etc.
DI	Internal combustion engine, various construction machinery, transportation equipment and parts, etc.
DEC	Apartment construction etc.
DE(*4)	Marine engine, internal combustion engine, internal combustion power generation, nuclear emergency generator, etc.

(*1) In accordance with the resolution of the general shareholders' meeting dated August 13, 2019, the Group divided its fuel cell business division of the businesses to establish Doosan Fuel Cell Co., Ltd. on October 1, 2019, and divided the material business division to establish Doosan Solus Co., Ltd. (see Note 37). Accordingly, the business performance of the fuel cell and material business, which are succeeded to the newly incorporated company, was marked as discontinued, and the comparative consolidated income statement for the year ended December 31, 2018 was rewritten. In addition, the Group decided to stop the duty-free business through the board of directors' meeting on October 29, 2019. On December 30, 2019, the Group concluded a contract to transfer part of its inventory, tangible and intangible assets of the duty-free business division to the Hyundai Department Store duty-free shop, and the sale was completed on February 13, 2020. Accordingly, the business performance of the duty-free business was marked as discontinued, the comparative consolidated income statement for the year ended December 31, 2018 was rewritten (see Note 38).

(*2) During the current year, the Information and Communication BU changed its organization name to Digital Innovation BU

(*3) During the current year, as DHC reorganized its business to improve synergy and efficiency among business units, the Group restated operating segment information for the prior year.

(*4) During the current year, as the Group sold DE and recognized profit or loss before the sale as profit or loss from discontinued operations, the Group restated operating segment information for the prior year.

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25. Operating segment information (cont'd)

Information on each business segment for the years ended December 31, 2019 and 2018 is as follows (Korean won in millions):

	2019				
	Total sales	Inter-segment sales(*2)	Net sales	Operating profit (loss)	Profit (loss) for the year
Electro-Materials BG(*1)	₩ 1,160,400	₩ (273,488)	₩ 886,912	₩ 113,337	₩ 134,689
Mottrol BG	562,691	(82,053)	480,638	38,917	30,455
Industrial Vehicle BG	912,744	(195)	912,549	61,611	43,202
Doosan Digital Innovation BG	250,029	(220,388)	29,641	26,678	21,893
Others(*1)	1,753,815	(231,521)	1,522,294	(64,009)	417,392
DHC	5,950,733	(280,174)	5,670,559	152,138	(589,929)
DI	8,185,840	(73,242)	8,112,598	840,397	395,698
DEC	1,781,925	(104,025)	1,677,900	81,028	(75,166)
	20,558,177	(1,265,086)	19,293,091	1,250,097	378,234
Adjustment for discontinued operations(*1)	(1,136,018)	378,665	(757,353)	27,059	57,964
Consolidation adjustments	(886,421)	886,421	-	(15,296)	(3,091)
	₩ 18,535,738	₩ -	₩ 18,535,738	₩ 1,261,860	₩ 433,107

(*1) It includes the fuel cell, materials and duty-free business unit classified as discontinued operations.

(*2) It contains the amount of adjustment for discontinued operations of the fuel cell, materials and duty-free business unit classified as discounted operation.

	2018				
	Total sales	Inter-segment sales(*2)	Net sales	Operating profit (loss)	Profit (loss) for the year
Electro-Materials BG	₩ 867,921	₩ (11,024)	₩ 856,897	₩ 92,475	₩ 65,808
Mottrol BG	594,350	(87,851)	506,499	59,407	46,497
Industrial Vehicle BG	870,222	(151)	870,071	56,534	35,864
Doosan Digital Innovation BG	225,099	(203,617)	21,482	30,553	25,725
Others	1,479,745	(202,152)	1,277,593	45,546	(25,922)
DHC	5,806,630	(354,018)	5,452,612	203,140	(51,611)
DI	7,730,108	(63,333)	7,666,775	848,127	394,170
DEC	1,547,804	(49,390)	1,498,414	(52,151)	(551,780)
DE(*1)	200,186	-	200,186	(23,839)	(21,983)
	19,322,065	(971,536)	18,350,529	1,259,792	(83,232)
Adjustment for discontinued operations(*1)	(951,991)	50,762	(901,229)	(15,111)	19,603
Consolidation adjustments	(920,774)	920,774	-	(68,305)	(276,882)
	₩ 17,449,300	₩ -	₩ 17,449,300	₩ 1,176,376	₩ (340,511)

(*1) It includes DE, the fuel cell, materials and duty-free business unit classified as discontinued operations

(*2) It contains the amount of adjustment for discontinued operations of DE, the fuel cell, materials and duty-free business unit classified as discounted operation.

Segment assets and liabilities as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019		December 31, 2018	
	Assets	Liabilities	Assets	Liabilities
Electro-Materials BG	₩ 488,424	₩ 242,908	₩ 623,736	₩ 329,968
Mottrol BG	344,996	256,314	335,935	244,506
Industrial Vehicle BG	679,213	415,645	584,517	355,744
Doosan Digital Innovation BG	115,067	85,978	102,872	70,976
Others	5,318,193	3,003,217	5,074,403	2,701,428
DHC	14,374,611	10,023,084	14,168,828	9,288,372
DI	11,338,593	7,071,041	11,029,167	7,208,352
DEC	2,329,566	1,763,226	2,399,085	2,031,410
	34,988,663	22,861,413	34,318,543	22,230,756
Consolidation adjustments	(5,818,916)	(511,206)	(5,438,261)	(495,521)
	₩ 29,169,747	₩ 22,350,207	₩ 28,880,282	₩ 21,735,235

26. Revenues

26.1 Disaggregation of revenues

Details of disaggregation of revenues for the year ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019		2018	
Revenues from contracts with customers:				
Sales on merchandise and finished goods	₩	10,605,422	₩	10,056,422
Construction contracts		7,427,865		6,925,174
Others		476,833		381,277
		<u>18,510,120</u>		<u>17,362,873</u>
Others:				
Rental and others		25,618		86,427
	₩	<u>18,535,738</u>	₩	<u>17,449,300</u>

		2019					
		Electro- Materials BG	Mottrol BG	Industrial Vehicle BG	DDI BU	Others(*1)	DHC
Geographical market:							
Korea	₩	487,956	₩ 197,696	₩ 427,889	₩ 21,974	₩ 1,407,396	₩ 2,281,024
USA		15,733	-	253,325	314	114,881	118,698
Asia		317,332	282,943	26,140	794	15	1,701,854
Middle East		-	-	-	-	-	617,228
Europe		65,891	-	205,195	6,559	-	947,734
Others		-	-	-	-	-	4,021
	₩	<u>886,912</u>	₩ <u>480,639</u>	₩ <u>912,549</u>	₩ <u>29,641</u>	₩ <u>1,522,292</u>	₩ <u>5,670,559</u>
Timing of revenue recognition:							
Transfer at a point in time	₩	886,709	₩ 477,906	₩ 834,247	₩ 1,019	₩ 956,349	₩ 181,589
Transfer over time		203	2,733	78,302	28,622	565,943	5,488,970
	₩	<u>886,912</u>	₩ <u>480,639</u>	₩ <u>912,549</u>	₩ <u>29,641</u>	₩ <u>1,522,292</u>	₩ <u>5,670,559</u>

		2019				
		DI	DEC	Subtotal	Adjustment for discontinued operations(*1)	Total
Geographical market:						
Korea	₩	1,682,037	₩ 1,614,399	₩ 8,120,371	₩ (752,865)	₩ 7,367,506
USA		3,664,566	-	4,167,517	120,138	4,287,655
Asia		1,362,654	47,873	3,739,605	(58,735)	3,680,870
Middle East		-	-	617,228	-	617,228
Europe		1,394,750	15,629	2,635,758	(65,891)	2,569,867
Others		8,591	-	12,612	-	12,612
	₩	<u>8,112,598</u>	₩ <u>1,677,901</u>	₩ <u>19,293,091</u>	₩ <u>(757,353)</u>	₩ <u>18,535,738</u>
Timing of revenue recognition:						
Transfer at a point in time	₩	7,885,785	₩ 11,223	₩ 11,234,827	₩ (762,965)	₩ 10,471,862
Transfer over time		226,813	1,666,678	8,058,264	5,612	8,063,876
	₩	<u>8,112,598</u>	₩ <u>1,677,901</u>	₩ <u>19,293,091</u>	₩ <u>(757,353)</u>	₩ <u>18,535,738</u>

(*1) It includes the fuel cell, materials and duty-free business unit classified as discontinued operations.

26.1 Disaggregation of revenues (cont'd)

		2018					
		Electro- Materials BG	Mottrol BG	Industrial Vehicle BG	DDI BU	Others(*1)	DHC
Geographical market:							
Korea	₩	511,987	₩ 225,912	₩ 457,842	₩ 19,614	₩ 1,255,389	₩ 2,035,336
USA		14,039	-	195,083	18	22,205	97,523
Asia		275,147	280,587	21,498	1,496	-	1,208,625
Middle East		-	-	-	-	-	1,218,255
Europe		55,724	-	195,648	353	-	891,776
Others		-	-	-	-	-	1,097
	₩	<u>856,897</u>	₩ <u>506,499</u>	₩ <u>870,071</u>	₩ <u>21,481</u>	₩ <u>1,277,594</u>	₩ <u>5,452,612</u>
Timing of revenue recognition:							
Transfer at a point in time	₩	856,818	₩ 500,648	₩ 793,242	₩ 605	₩ 811,385	₩ 282,741
Transfer over time		79	5,851	76,829	20,876	466,209	5,169,871
	₩	<u>856,897</u>	₩ <u>506,499</u>	₩ <u>870,071</u>	₩ <u>21,481</u>	₩ <u>1,277,594</u>	₩ <u>5,452,612</u>
		2018					
		DI	DEC	DE(*1)	Subtotal	Adjustment for discontinued operations(*1)	Total
Geographical market:							
Korea	₩	1,739,249	₩ 1,454,792	₩ 152,853	₩ 7,852,973	₩ (910,389)	₩ 6,942,584
USA		3,233,952	38,317	158	3,601,295	167,864	3,769,159
Asia		1,402,286	-	39,573	3,229,212	(95,377)	3,133,835
Middle East		-	-	-	1,218,255	-	1,218,255
Europe		1,282,141	5,305	1,279	2,432,226	(57,003)	2,375,223
Others		9,147	-	6,323	16,567	(6,323)	10,244
	₩	<u>7,666,775</u>	₩ <u>1,498,414</u>	₩ <u>200,186</u>	₩ <u>18,350,528</u>	₩ <u>(901,228)</u>	₩ <u>17,449,300</u>
Timing of revenue recognition:							
Transfer at a point in time	₩	7,543,964	₩ 25,526	₩ 200,186	₩ 11,015,114	₩ (936,013)	₩ 10,079,101
Transfer over time		122,811	1,472,888	-	7,335,414	34,785	7,370,199
	₩	<u>7,666,775</u>	₩ <u>1,498,414</u>	₩ <u>200,186</u>	₩ <u>18,350,528</u>	₩ <u>(901,228)</u>	₩ <u>17,449,300</u>

(*1) It includes DE, the fuel cell, materials and duty-free business unit classified as discontinued operations.

26.2 Contract balances

Receivables, contract assets and liabilities arising from contracts with customers as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019	December 31, 2018
Receivables in trade and other receivables(*1)	₩ 2,743,974	₩ 2,719,247
Contract assets(*2)	1,973,317	2,010,667
Contract liabilities	(1,915,771)	(1,626,461)

(*1) As of December 31, 2019 and 2018, provisions of ₩ 1,254,940 million and ₩ 1,320,936 million are included.

(*2) As of December 31, 2019 and 2018, provisions of ₩ 63,578 million and ₩ 59,840 million are included.

Contract assets are amounts unbilled that the Group has a right to receive as consideration in exchange for the goods or services transferred to the customer and are transferred to receivables upon billings. Contract liabilities are advances from customers for construction contracts performed over time and are recognized as revenue as the Group transfers the goods or services to the customer.

The Group recognized assets for the costs it spent to enter into a contract with the customer, such as brokerage fees, which would not have been incurred unless the contract was entered into.

Details of incremental cost of obtaining a contract as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019	2018
Incremental cost of obtaining a contract recognized as an asset as of December 31, 2019 and 2018	₩ 54,901	₩ 45,579
Amount of amortization recognized as cost of sales for the year ended December 31, 2019 and 2018	17,442	22,052

The incremental cost of obtaining a contract is amortized and recognized as expenses in the same manner as revenue recognized over the progress of the particular contract concerned.

The Group recognized design costs of an asset to be transferred for certain contracts that are not yet approved as an asset as they relate directly to a contract or to an anticipated contract with the customer that the entity can specifically identify, generate or enhance resources of the entity that will be used in satisfying performance obligations in the future, and are expected to be recovered.

Details of costs to fulfill a contract as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019	2018
Costs to fulfill a contract recognized as assets as of December 31, 2019 and 2018	₩ 123,701	₩ 107,642
Amount of amortization recognized as cost of sales for the year ended December 31, 2019 and 2018	79,329	22,893

The costs to fulfill a contract are amortized and recognized as expenses on a systematic basis consistent with the transfer of the related goods or services to the customers.

26.3 Change in the balance of construction contracts

As a contract that recognizes revenue over time by applying the cost-based input method, changes in the balance of construction contracts for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

		2019			
	Project	Beginning balance	Changes	Recognized construction revenue	Ending balance
DHC DEC(*1)	Fadhili CHP and others	₩ 15,381,173	₩ 3,906,870	₩ (5,401,992)	₩ 13,886,051
	Gimhae Centum We've and others	7,703,952	1,659,097	(1,748,573)	7,614,476
Doosan Mecatec Co., Ltd.	SPL Tr.6 MVA0-00002 and others	340,479	375,456	(311,567)	404,368
		23,425,604	5,941,423	(7,462,132)	21,904,895
Inter-company transactions		(437,982)	89,485	92,497	(256,000)
Amount attributable to discontinued operation segment		(9,240)	(95)	258	(9,077)
		<u>₩ 22,978,382</u>	<u>₩ 6,030,813</u>	<u>₩ (7,369,377)</u>	<u>₩ 21,639,818</u>

(*1) The construction contracts which belongs to discontinued operations are not transferred by the terms of transfer and acquisition of business contracts as of December 31, 2019 are included.

		2018			
	Project	Beginning balance	Changes	Recognized construction revenue	Ending balance
DHC DEC(*1)	Fadhili CHP and others	₩ 17,030,437	₩ 3,525,560	₩ (5,174,824)	₩ 15,381,173
	Gimhae Centum We've and others	7,163,280	2,063,280	(1,522,608)	7,703,952
DE(*2)	Shin-kori # 3,4 Emergency generator, alternate power diesel generator and 10 others	20,686	(2,428)	(18,258)	-
Doosan Mecatec Co., Ltd.	SPL Tr.6 MVA0-00002 and others	215,501	330,376	(205,398)	340,479
		24,429,904	5,916,788	(6,921,088)	23,425,604
Inter-company transactions		(458,840)	(20,535)	41,393	(437,982)
Amount attributable to discontinued operation segment		(37,022)	9,194	18,588	(9,240)
		<u>₩ 23,934,042</u>	<u>₩ 5,905,447</u>	<u>₩ (6,861,107)</u>	<u>₩ 22,978,382</u>

(*1) The construction contracts which belongs to discontinued operations are not transferred by the terms of transfer and acquisition of business contracts as of December 31, 2018 are included.

(*2) During the previous year, the Group classified it as a discontinued operation.

26.4 The effect of changing in accounting estimate that related contracts recognized revenue over a year by applying the cost-based input method

Changes in profit or loss in the current and succeeding reporting years and the amount of due from customers for contract work (excluding foreign currency translation effect) resulting from changes in total contract revenue and in total estimated contract costs for construction contracts in progress as of December 31, 2019 are as follows (Korean won in millions):

	2019					
	Changes in contract amount	Changes in total input cost	Impact on profit or loss for the current year	Impact on profit or loss for the succeeding year	Changes in due from/to customers for contract work	Provision for construction loss
DHC	₩ 590,016	₩ 509,499	₩ (31,053)	₩ 111,570	₩ (31,053)	₩ 11,256
DEC	295,145	322,849	(43,265)	15,561	(43,265)	478
Doosan Mecatec Co., Ltd.	7,693	(1,458)	1,141	8,010	1,141	978
	₩ 892,854	₩ 830,890	₩ (73,177)	₩ 135,141	₩ (73,177)	₩ 12,712

The impacts on profit or loss for the current year and succeeding year are determined based on total estimated contract costs which are estimated based on the circumstances present from the start of the contract to the end of current year and the estimated contract revenue as of December 31, 2019. The total contract costs and contract revenue may change in the future.

As of December 31, 2019, contracts in which revenue has been recognized over time, which is more than 5% of sales of the year ended December 31, 2018 are as follows (Korean won in millions):

	Contract date	Contractual completion date	Percentage-of-completion (%)	Due from customers		Trade receivables (receivables from construction contracts)	
				Total	Accumulated impairment loss	Total	Provision for impairment
UAE BNPP 1, 2 NSSS(*1)	2010-06-30	2019-08-30	99.00	₩ -	₩ -	₩ -	₩ -
Samcheok Thermal Power Plant Unit 1 and 2	2018-07-24	2024-04-30	8.00	-	-	-	-
Shin-Kori 5 and 6 NSSS	2014-08-28	2024-06-30	70.00	-	-	-	-
Vinh Tan 4 TPP(*2)	2014-02-26	2018-06-26	100.00	44,939	13	21,901	-
UAE BNPP 3, 4 NSSS	2010-06-30	2020-12-31	98.00	13,276	4	-	-
Shinhan Wool 1, 2 NSSS	2009-07-31	2021-08-31	97.00	-	-	-	-
Shin-Kori 3 and 4 NSSS(*1)	2006-08-28	2019-08-31	100.00	-	-	6,425	2
Yanbu ph.3 MSF(*1)	2012-12-04	2019-04-30	98.00	-	-	-	-
Qurayyah Add-On (*1)	2009-09-16	2014-10-15	100.00	-	-	8,299	2
Fadhili CHP(*1)	2016-11-12	2019-11-30	97.00	100,966	30	-	-
Song Hau1(*1)	2015-04-10	2019-10-02	84.00	30,922	9	-	-
Nghi Son II	2014-12-24	2022-07-10	39.00	189,292	42	9,999	3
Jawaharpur	2016-12-22	2021-10-21	45.00	29,770	-	46,837	-
Obra C	2016-12-22	2021-10-21	41.00	-	-	31,017	-

(*1) In discussions with the client regarding the extension of the contract year.

(*2) It completed the production, but it will be ready-made for billing at the time of coming trial running and commercial driving in the contract.

27. Breakdown of expenses by nature

Breakdown of expenses by nature for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019	2018
Changes in inventories	₩ (326,823)	₩ (224,748)
Purchases of raw materials and merchandise	8,852,346	8,337,723
Employee benefits expenses	2,523,665	2,398,202
Depreciation and amortization	672,353	615,735
Others	5,552,337	5,146,012
	<u>₩ 17,273,878</u>	<u>₩ 16,272,924</u>

28. Selling and administrative expenses

Selling and administrative expenses for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019	2018
Salaries	₩ 689,701	₩ 657,145
Pension costs	51,958	38,235
Employee benefits	135,364	121,565
Travel expenses	63,230	60,982
Sales commission	93,651	99,807
Taxes and dues	34,615	31,325
Depreciation	93,018	41,795
Insurance expenses	30,324	28,946
Repairing expenses	10,914	5,677
Advertising expenses	64,453	59,118
Packaging expenses	17,753	17,861
Research and development	256,057	224,336
Training expenses	11,618	8,921
Freight expenses	26,487	24,704
Promotional expenses	14,778	14,571
Commission expenses	139,017	139,218
Service contract expenses	10,569	16,806
(Reversal of) bad debt expenses	(6,850)	69,379
Amortization	56,614	67,809
Expansion expenses of overseas market	15,668	16,626
Warranty expenses	18,021	15,372
Others	70,504	118,590
	<u>₩ 1,897,464</u>	<u>₩ 1,878,788</u>

29. Finance income and expenses

Finance income and expenses for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019	2018
Finance income:		
Interest income	₩ 60,577	₩ 47,090
Dividend income	1,296	2,539
Gain on foreign currency transaction	159,393	152,735
Gain on foreign currency translation	91,970	80,472
Gain on derivative transactions	73,056	123,850
Gain on valuation of derivatives	85,279	98,809
Gain on valuation of firm commitment	67,884	77,092
Gain on repayment of borrowings	1,767	-
Financial guarantee income	193	778
	<u>541,415</u>	<u>583,365</u>
Finance expenses:		
Interest expense	597,136	571,223
Loss on foreign currency transactions	170,541	179,385
Loss on foreign currency translations	130,282	128,887
Loss on derivative transactions	78,712	119,923
Loss on valuation of derivatives	114,580	102,941
Loss on valuation of firm commitment	23,778	19,609
Loss on repayment of bonds	7,482	7,606
Loss on repayment of borrowings	2,168	298
Financial guarantee expense	76,220	69,310
Others	2,421	1,876
	<u>1,203,320</u>	<u>1,201,058</u>
	<u>₩ (661,905)</u>	<u>₩ (617,693)</u>

30. Other non-operating income and expenses

Other non-operating income and expenses for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019	2018
Other non-operating income:		
Gain on disposal of short-term investment securities	₩ 558	₩ 1,277
Gain on disposal of long-term investment securities	3,115	1,556
Gain on valuation of short-term financial assets	8,242	10,232
Gain on disposal of property, plant and equipment	3,087	2,227
Gain on disposal of intangible assets	90	1,021
Reversal of impairment loss of intangible asset	2,054	19
Gain on valuation of investment properties	9,318	4,330
Reversal of impairment loss of long-term financial assets	-	96
Others	34,897	59,580
	<u>61,361</u>	<u>80,338</u>
Other non-operating expenses:		
Loss on disposal of trade receivables	24,277	20,085
Impairment loss (reversal of loss) of long-term investment securities	-	(1,635)
Loss on disposal of property, plant and equipment	34,453	10,997
Loss on disposal of intangible assets	203	291
Impairment loss of property, plant and equipment	44,592	4,873
Impairment loss of intangible assets	22,549	56,991
Loss on valuation of investment properties	4,235	3,726
Donations	20,380	18,036
Others	325,014	506,709
	<u>475,703</u>	<u>620,073</u>
	<u>₩ (414,342)</u>	<u>₩ (539,735)</u>

31. Income tax expenses

Details of income tax expenses for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019	2018
Income tax on profit for the year	₩ 187,023	₩ 125,775
Deferred tax:		
Origination and reversal of temporary differences	65,539	162,576
Charged or credited directly to equity	(7,257)	(11,713)
Others	105	278
Income tax expenses directly reflected to discontinued operations	(833)	(26,893)
Income tax expenses	<u>₩ 244,577</u>	<u>₩ 250,023</u>

31. Income tax expenses (cont'd)

Changes in deferred tax assets and liabilities for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019				
	Changes				Ending balance
	Beginning balance	Profit or loss	Equity	Decrease due to spin off(see Note 37)	
Allowance for doubtful accounts	₩ 226,684	₩ 228,955	₩ 1,660	₩ -	₩ 457,299
Derivatives	(665,911)	692,501	(4,893)	-	21,697
Property, plant and equipment	(21,457)	(716,400)	5,105	(170)	(732,922)
Intangible assets	399,397	(355,562)	-	(1,812)	42,023
Assets and liabilities in foreign currencies	49	10,505	-	-	10,554
Defined benefit liabilities	14,643	212,203	15,555	(1,250)	241,151
Reserve for research and human resource	13,732	(13,732)	-	-	-
Investment properties	(45,628)	5,289	-	-	(40,339)
Others	82,535	(113,166)	(24,689)	(7,300)	(62,620)
Consolidation adjustments	3,846	(8,875)	5	-	(5,024)
	<u>₩ 7,890</u>	<u>₩ (58,282)</u>	<u>₩ (7,257)</u>	<u>₩ (10,532)</u>	<u>₩ (68,181)</u>

	2018			
	Changes			Ending balance
	Beginning balance	Profit or loss	Equity	
Allowance for doubtful accounts	₩ 243,741	₩ (17,057)	₩ -	₩ 226,684
Derivatives	(736,357)	76,078	(5,632)	(665,911)
Property, plant and equipment	40,755	(49,271)	(12,941)	(21,457)
Intangible assets	482,496	(83,099)	-	399,397
Assets and liabilities in foreign currencies	(18,076)	17,987	138	49
Defined benefit liabilities	8,994	10,464	(4,815)	14,643
Reserve for research and human resource	20,957	(7,225)	-	13,732
Investment properties	(20,218)	(25,410)	-	(45,628)
Others	187,630	(110,771)	5,676	82,535
Consolidation adjustments	(39,456)	37,441	5,861	3,846
	<u>₩ 170,466</u>	<u>₩ (150,863)</u>	<u>₩ (11,713)</u>	<u>₩ 7,890</u>

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 against deferred tax liabilities relating to income taxes levied by the same taxation authority.

Temporary differences, net loss and tax credit carryforwards, which have not been recognized as deferred income tax assets and expired or unused as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	December 31, 2019	December 31, 2018
Deductible temporary differences and others	₩ 4,181,695	₩ 4,647,243

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

31. Income tax expenses (cont'd)

Temporary differences from investments in subsidiaries, joint ventures and associated investments, which are not recognized as deferred tax assets (liabilities), are as follows (Korean won in millions):

	December 31, 2019	December 31, 2018	Remarks
Investments in subsidiaries	₩ (77,702)	₩ 114,165	Able to control the reversal of the temporary difference
Investments in associates and joint ventures	7,809	70,809	Probable that the temporary difference will not reverse in the foreseeable future
	<u>₩ (69,893)</u>	<u>₩ 184,974</u>	

A reconciliation of income tax expenses and profit before income tax expenses for the years ended December 31, 2019 and 2018 is as follows (Korean won in millions):

	2019	2018
Profit before income tax expenses	₩ 172,868	₩ (8,344)
Tax expense by applicable tax rates	87,693	(2,019)
Adjustments:		
Non-taxable income and non-deductible expenses	85,957	18,262
Tax credits	(38,659)	(21,791)
Temporary difference not recognized as deferred income tax	25,195	75,384
Others	84,391	180,187
Income tax expenses	<u>₩ 244,577</u>	<u>₩ 250,023</u>
Average effective tax rate (Income tax expenses/Profit before income tax expenses)	141.48%	-

32. Earnings (losses) per share

Earnings (losses) per share for the years ended December 31, 2019 and 2018 are as follows (Korean won, except for share data):

32.1 Basic earnings (losses) per share

Basic earnings (losses) per share for the years ended December 31, 2019 and 2018 are as follows:

	2019		
	Continuing	Discontinued	Total
Basic earnings (losses) per ordinary share	₩ (6,474)	₩ 28,374	₩ 21,900
Basic earnings (losses) per old-type preferred share(*1)	(6,487)	28,432	21,945
	2018		
	Continuing	Discontinued	Total
Basic losses per ordinary share	₩ (5,151)	₩ (804)	₩ (5,955)
Basic losses per old-type preferred share(*1)	(5,108)	(797)	(5,905)

(*1) The Group calculated earnings (losses) per share for old-type preferred share due to the nature of the share, which does not have preferred right on dividends and liquidation. Therefore, the share is considered as ordinary share, based on KIFRS 1033 *Earnings per share*.

32.1 Basic earnings (losses) per share (cont'd)

Profit (loss) for the year attributable to the ordinary equity holders of the parent is as follows:

	2019		
	Continuing	Discontinued	Total
Profit (loss) for the year attributable to the equity holders of the parent	₩ (98,426,182,729)	₩ 518,809,150,401	₩ 420,382,967,672
(-) Profit (loss) attributable to new-type preferred Shares	(19,951,981,523)	-	(19,951,981,523)
(-) Profit (loss) attributable to old-type preferred shares	24,003,622,804	(105,199,292,726)	(81,195,669,922)
Profit (loss) for the year attributable to the ordinary equity holders of the parent	<u>₩ (94,374,541,448)</u>	<u>₩ 413,609,857,675</u>	<u>₩ 319,235,316,227</u>
	2018		
	Continuing	Discontinued	Total
Loss for the year attributable to the equity holders of the parent	₩ (101,828,825,703)	₩ (15,033,262,115)	₩ (116,862,087,818)
(-) Profit attributable to new-type preferred shares	5,558,761,182	-	5,558,761,182
(-) Profit attributable to old-type preferred shares	19,358,904,172	3,023,031,948	22,381,936,120
Loss for the year attributable to the ordinary equity holders of the parent	<u>₩ (76,911,160,349)</u>	<u>₩ (12,010,230,167)</u>	<u>₩ (88,921,390,516)</u>

The weighted-average number of ordinary shares and old-type preferred shares outstanding used in basic earnings per share calculation for the years ended December 31, 2019 and 2018 are as follows:

	2019		2018	
	Ordinary shares	Old-type preferred shares	Ordinary shares	Old-type preferred shares
Beginning outstanding shares	14,931,933	3,790,262	14,931,933	3,790,262
Effect of decrease due to spin off	(355,136)	(90,246)	-	-
Weighted-average number of shares outstanding	14,576,797	3,700,016	14,931,933	3,790,262

32.2 Diluted earnings (losses) per share

Diluted earnings (losses) per share for the years ended December 31, 2019 and 2018 are as follows:

	2019		
	Continuing	Discontinued	Total
Diluted earnings (losses) per ordinary share	₩ (6,474)	₩ 28,374	₩ 21,900
Diluted earnings (losses) per old-type preferred share	(6,487)	28,432	21,945
	2018		
	Continuing	Discontinued	Total
Diluted losses per ordinary share	₩ (5,151)	₩ (804)	₩ (5,955)
Diluted losses per old-type preferred share	(5,108)	(797)	(5,905)

32.2 Diluted earnings (losses) per share (cont'd)

Diluted profit (loss) for the year attributable to the ordinary equity holders of the parent for the years ended December 31, 2019 and 2018 is as follows:

	2019		
	Continuing	Discontinued	Total
Profit (loss) for the year attributable to the ordinary equity holders of the parent	₩ (94,374,541,448)	₩ 413,609,857,675	₩ 319,235,316,227
Share-based expense (after tax)	-	-	-
Diluted profit (loss) for the year attributable to the ordinary equity holders of the parent	<u>₩ (94,374,541,448)</u>	<u>₩ 413,609,857,675</u>	<u>₩ 319,235,316,227</u>
	2018		
	Continuing	Discontinued	Total
Loss for the year attributable to ordinary equity holders of the parent	₩ (76,911,160,349)	₩ (12,010,230,167)	₩ (88,921,390,516)
Share-based expense (after income tax)	-	-	-
Diluted loss for the year attributable to ordinary equity holders of the parent	<u>₩ (76,911,160,349)</u>	<u>₩ (12,010,230,167)</u>	<u>₩ (88,921,390,516)</u>

Diluted weighted-average number of ordinary shares outstanding for the years ended December 31, 2019 and 2018 is as follows:

	2019	2018
Weighted-average number of ordinary shares outstanding	14,576,797	14,931,933
Exercise of stock options	-	142
Diluted weighted-average number of ordinary shares outstanding	<u>14,576,797</u>	<u>14,932,075</u>

As there are no potential ordinary shares for old-type preferred share, diluted earnings (losses) per share for old-type preferred share are equal to basic earnings per share for old-type preferred share.

32.3 Conditions for preferred shares dividends

	Par value	Number of shares issued
Old-type preferred shares(*1)	₩ 5,000	3,996,462
New-type preferred shares(*2)	5,000	893,038

(*1) Cash dividends available to ordinary shares+1%

(*2) The Company should distribute 2% of par value of preferred shares annually. In case the Company distributes more than 2% of par value for ordinary shares, preferred shares are participated in dividends for the exceeded dividends.

33. Contingencies and commitments

33.1 Notes, bills and checks offered in security

As of December 31, 2019, the Group provided 5 blank notes and 33 blank checks as collateral against financial institutions for guarantees to fulfill a contract, payment guarantees of the Group and funding arrangement.

33.2 Financial covenant

33.2.1 DI

As of December 31, 2019, DI issued 32nd foreign currency-denominated bonds for USD 300,000 thousand and 57th foreign currency-denominated bonds for USD 300,000 thousand. In addition, the issued 32nd and 57th foreign currency-denominated bond has an early redemption clause for when and if DI's guarantor, KDB, becomes privatized. In addition, 11,533,388 shares and 11,362,886 shares of Doosan Bobcat Co., Ltd. held by DI are provided as collateral for above bonds. If they do not meet the base price, additional shares or deposits equivalent to the difference should be provided as collateral.

DI has provided 16,341,780 shares of Doosan Bobcat Co., Ltd. as collateral for borrowings of ₩350,000 million from 8 companies including KDB. The share or deposit should be provided as collateral when the contracted mortgage ceiling ratio is not met in relation to the above borrowings. In addition, if the long-term credit rating given by two or more of the three domestic credit rating agencies (Nice Credit Rating Co., Ltd., Korea Credit Rating Co., Ltd. and Korea Ratings & Co.) of DI is below BB0, it includes arrangements that constitute reasons for the loss of interest on the due date. In addition, as of December 31, 2019, when DI receives a long-term credit rating of below BB + from one or more among three domestic credit rating agencies (Nice Credit Rating Co., Korea Credit Rating Co., Ltd., and Korea Corporate Rating Co., Ltd.) about 43rd bonds of ₩50,000 million issued by DI, it includes a contract that constitutes the reason for the immediate repayments.

3,650,000 shares of Doosan Bobcat Inc., a subsidiary of DI, are provided as collateral for DI's borrowings of ₩100,000 million from Standard Chartered Bank Korea Ltd. If contractual ratio of collateral limit amount of the borrowings is not fulfilled, DI should provide additional collaterals (shares or deposits) or make early redemption of part of the borrowings.

DI has signed investment agreements with Nautilus Venture Partners Fund II, L.P., ICONIQ Strategic Partners IV-B, LP., ZIGG CAPITAL I, L.P and Caffeinated Capital Opportunity Fund II, LP and the amount of agreements are USD 10,000 thousand USD 3,000 thousand, USD 5,000 thousand and USD 2,000 thousand respectively.

33.2.2 DEC

DEC entered into construction contracts with INTDC Co., Ltd. and Daewon Plus Constructions Co., Ltd. to develop Ilsan Zenith project and Haeundae Zenith project, respectively. DEC has provided guarantees to customers, who purchase the Ilsan Zenith and Haeundae Zenith apartments for the consideration paid to purchase the apartments during the repurchase guarantee years (two to three years after the date of sale), should customers apply for such guarantees (see Note 33.7). As of December 31, 2019, the Group's consolidated financial statements do not reflect the effect from such guarantees, as the Group cannot reasonably predict the number of purchasers applying for the guarantee and the related guaranteed amount.

DEC, a subsidiary, does not account for the provision due to the fact that it is not possible to make a reliable estimate of the obligation to pay and the resources to be released for the cost incurred at the end of the land use permit for the factory land lease contract with the Haiphong Department of Natural and Resources.

33.2.3 DHC

As of December 31, 2019, DHC has entered into an agreement with Namyangju Baebong District Apartment Housing, Yangsan Deokge 2nd, Gyeonju yonggang Doosan We've and Anyang Myeonghak projects to take over debt (conditional limit: ₩421,200 million) on condition that the liability is completed or not yet completed.

As of December 31, 2019, the subsidiary DHC borrowed from Standard Chartered Bank of Korea (₩78,571 million). Its agreement clause includes that a credit rating of BBB or higher to be maintained from at least two credit ratings agencies. In addition, ₩202,615 million borrowed from Mashreqbank requires additional investment within a certain year of time if it is unable to maintain the main financial indicators (debt ratio below 3.0 and interest coverage ratio above 2.5) during the borrowing period. The above borrowings include an arrangement that, if not complied with, constitutes a reason for the immediate repayments.

33.3 Transferred trade receivables

Outstanding trade receivables sold with recourse by the Group are in the amount of ₩10,013 million and ₩14,735 million as of December 31, 2019 and 2018, respectively. Because the Group retains some level of risks and rewards relating to trade receivables, the Group has recognized its carrying amount of it and cash receipt from transfer as short-term borrowings, in consolidated statements of financial position (see Note 15.4). Meanwhile, the carrying amount of the receivables recognized in the statement of financial position as of December 31, 2019, is ₩1,852 million, as it does not meet the requirement to remove financial instruments in relation to the liquidity obligation of the parent (see Note 15.6)

33.4 Litigation in progress

Details of major lawsuits are as follows (Korean won in millions):

	Claim	Claimed amount
Doosan Corporation	Claims for damages and others	₩ 1,967
DHC and its subsidiaries	Cheonggyecheon Doosan We've the Zenith Residential Apartment claims for damages and others	120,960
DI and its subsidiaries	Claims for damages and others	756,544
DEC and its subsidiaries	Claims for damages and others	123,745
		<u>₩ 1,003,216</u>

The outcome of lawsuits cannot be estimated as of December 31, 2019.

In 2011, external investors bought 20% shares of Doosan Infracore China Co., Ltd., subsidiary of DI at ₩380 billion, and they have the right to request to jointly sell the shares held by the other party to a third party according to shareholder's agreement with DI. In principle, DI should jointly sell its shares upon request by the outside investors, but it also has the right to purchase shares of outside investors at the price they are willing to sell.

In 2014, outside investors requested a due diligence report as a preliminary step to proceed with the sale process, but DI has not been able to provide due diligence materials including confidential information since the potential buyer was not confirmed yet. As a result, outside investors filed a lawsuit for the provision of due diligence to the Seoul Central District Court. Seoul Central District Court (March 2, 2015) dismissed an application for disposition of outside investors because DI did not have any obligation to provide due diligence data to outside investors.

External investors asked to buy stocks and filed a lawsuit in November 2015 seeking the payment of the proceeds from the sale of shares (foreign investors' proceeds of sale: ₩709.3 billion, lawsuit value of ₩10 billion). Seoul Central District Court (January 12, 2017) dismissed outside investor's claims for DI's non-fulfillment of the sale process. Then, Seoul High Court (February 21, 2018) recognized the obligation for the sale process and ruled that DI pay a portion of ₩709.3 billion of the proceeds from the sale which is ₩10 billion.

DI objected to the second judgment and appealed to the Supreme Court on February 26. Seoul High Court (February 28, 2018) suspended enforcement by the second judgment.

Meanwhile, external investors filed an additional lawsuit against the remaining proceeds from the sale of shares (lawsuit amount of ₩705.1 billion) in March 2018, and it is in progress in the first trial as of December 31, 2019.

DI pledged 8,288,196 ordinary shares of Doosan Bobcat Inc. and paid ₩10 billion in suspense payment for external investors, in compliance with recommendation for reconciliation issued by Seoul Central District Court in July 2018, regarding compensation procedure for ongoing litigation. If DI wins in the Supreme Court, the external investors should cancel the establishment of pledge and return the suspense payment.

33.5 Technical contract

The Group has technical license agreements with Mitsubishi Hitachi Power Systems, Ltd. and others for the year ended December 31, 2019 and the Group paid ₩1,138 million and ₩4,587 million for the years ended December 31, 2019 and 2018, respectively, as license fee.

33.6 Credit lines for borrowings

The Group has entered into bank overdraft agreements amounting to ₩9,618,225 million with various financial institutions as of December 31, 2019.

33.7 Guarantees of payment

Guarantees of payment provided by the Group as of December 31, 2019 are as follows (Korean won in millions):

Provided by	Provided to	December 31, 2019
Doosan Corporation	Doosan Electro-Materials Luxembourg Sarl and its subsidiaries and others	₩ 176,920
	KDFA	740
DHC and its subsidiaries	Namyangju Baekbong Apartment house's customers	133,861
DI and its subsidiaries	End customer	220,154
DEC and its subsidiaries	Ilisan Zenith's customers and others	976,629
		<u>₩ 1,508,304</u>

In addition to the above, according to the spin off during the current year, in accordance with Article 530-9, Paragraph 1 of the Commercial Act, the succeeding company after division (the Company) and the newly incorporated company (Doosan Fuel Cell and Doosan Solus Co., Ltd.) will be repaid in solidarity with respect to the debts of the company before the division (see Note 37). In this regard, borrowings and bonds subject to solidarity guarantee provided by the Company as of December 31, 2019 are as follows (Korean won in millions):

Provided to	Bond and borrowing
Doosan Fuel Cell Co., Ltd	₩ 99,000
Doosan Solus Co., Ltd	40,000
	<u>₩ 139,000</u>

33.7 Guarantees of payment (cont'd)

Guarantees of payment provided by third parties to the Group as of December 31, 2019 are as follows (Korean won in millions):

Provided to	Provided by	December 31, 2019
Doosan Corporation	Korea Defense Industry Association(*1)	₩ 78,897
	Seoul Guarantee Insurance(*1)	166,727
	Machinery Financial Cooperative(*1)	46,000
	Korea Software Financial Cooperative(*1,2)	1,828
	KDB	14,856
	Woori Bank and others	20,777
Doosan Robotics Co., Ltd	Seoul Guarantee Insurance	220
Doosan Mobility Innovation Inc	Seoul Guarantee Insurance	6
Doosan Logistics Solutions Co.,Ltd.	Seoul Guarantee Insurance	1,472
Doosan Mecatec Co., Ltd.	KEB Hana Bank	77,005
	Woori Bank	70,510
	KDB	39,575
	Machinery Financial Cooperative and others	210,715
Doosanbears Inc	Seoul Guarantee Insurance	106
Oricom Inc.	Seoul Guarantee Insurance	2,577
Hancomm Inc.	Seoul Guarantee Insurance	2,869
Doosan Energy Solutions America, Inc.,	KDB	14,856
DHC and its subsidiaries	Korea Exim Bank	1,010,063
	Machinery Financial Cooperative	2,202,716
	Seoul Guarantee Insurance	361,846
	Construction Guarantee Cooperative	666,122
	KEB Hana Bank	191,361
	Engineering Guarantee Insurance	221,941
	Korea Federation of Small and Medium Business	39,200
	Korea Trade Insurance Corporation	12,699
	Others	2,999,992
DI and its subsidiaries	KDB(*3)	694,680
	Seoul Guarantee Insurance	6,240
	Machinery Financial Cooperative(*4)	8,213
	Woori Bank	236
DEC and its subsidiaries	Construction Guarantee Cooperative	1,771,518
	Korea Housing Guarantee	2,707,524
	Woori bank	262
	Machinery Financial Cooperative	66,720
	Seoul Guarantee Insurance	29,233
	Others	223,830
Doosan Cuvex Co., Ltd.	Korea asset management corporation	20,000
		<u>₩ 13,983,392</u>

(*1) Some of the contracts subject to the performance guarantee were transferred to newly incorporated company Doosan Fuel Cell and Doosan Solus Co., Ltd.) according to the spin off during the current year (see Note 37).

(*2) In connection with this, as of December 31, 2019, equity share of ₩83 million is provided as collateral.

(*3) As a subsidiary, DI provides payment guarantees for 32nd foreign bonds of USD 300,000 thousand and 57th foreign bonds of USD 300,000 thousand from Korea Development Bank.

(*4) In connection with this, as of December 31, 2019, the equity share of ₩200 million of DI, a subsidiary, is provided as collateral.

33.7 Guarantees of payment (cont'd)

Guarantees of payment to DEC, and DHC for PF of developer as of December 31, 2019 are as follows (Korean won in millions):

Business name	Bond institution	The term of guarantee	Limit of guarantee	The balance	Description
Loans:					
Pohang New Port	Shinhan bank and others	2010.03.26~ 2025.12.31	₩ 3,385	₩ 3,385	Joint guarantee
Daejeon Cheonbyeon	KEB Hana Bank	2019.05.07~ 2022.05.06	1,300	1,300	Joint guarantee
			4,685	4,685	
Short-term bonds:					
Cheonan Cheongdang-dong	BNK investment securities	2019.11.28~ 2020.02.28	60,000	17,700	Joint guarantee
Cheonan Cheongdang-dong	BNK investment securities	2019.12.06~ 2020.03.02	40,000	7,400	Joint guarantee
Cheonan Cheongdang-dong	BNK investment securities	2019.12.31~ 2020.03.31	135,000	70,000	Joint guarantee
Yongin 3 ga	BNK investment securities	2019.12.27~ 2020.03.27	130,000	32,900	Joint guarantee
Yongin 3 ga	BNK investment securities	2019.12.30~ 2020.03.27		20,000	Joint guarantee
			365,000	148,000	
			₩ 369,685	₩ 152,685	

33.8 Covenant related to consolidated structured entities

The carrying amount of assets and liabilities related to the consolidated structured entities' interests in the consolidated entity, details of the financial support provided and the maximum exposure amount of the Group to structured entity's losses as of December 31, 2019 are as follows (Korean won in millions):

	Financial support for structured entities	Book value of liabilities regarding structured entities' interests	The maximum exposure amount of the Group to structured entities' losses
DEC:			
Newstartdm 7th. Co., Ltd.(*1)	₩	140,000	₩ 140,000
Pinetree City 1st Co., Ltd.(*2)		35,300	35,300
DMbest 3rd co.,ltd(*3)		90,000	90,000
Newstartdm 8th. Co., Ltd.(*4)	The duty to replenishment of principal and interest of borrowings and others	122,000	122,000
Greatgm 4th. Co. Ltd.(*5)		65,000	65,000
Doosan E&C 4th Co., Ltd.(*6).		95,000	95,000
DHC:			
KDPP 3rd Co., Ltd.(*7)		40,000	40,000
KDPP 5th Co., Ltd.(*8)		169,000	219,700
U BEST 5th Co., Ltd.(*9)		190,000	190,000
Doosanbears Inc:			
Sunny Russel 8th Co., Ltd.(*10)		5,000	5,000
Doosan corporation Inc:			
D-Pay 1st Co., Ltd.(*11)		150,000	180,000

33.8 Covenant related to consolidated structured entities (cont'd)

Details of securitization assets and method are as follows:

	Securitization assets and method
(*1)	The Newstartdm 7th. Co., Ltd. is a company established with the aim of liquidating future construction bonds for Goyang Hyang-dong section 4 and seven other contractors held by DEC, a subsidiary, and is financed mainly by issuing ABS bonds from financial institutions. As of December 31, 2019, the amount of underlying assets is ₩140,000 million based on the book amount of the securitized company's financial statements.
(*2)	Pinetree City 1st Co., Ltd. is a company established with the aim of implementing loans by receiving the Changwon 2 plant, owned by DEC, a subsidiary, as subordinated collateral, and it is funded mainly by issuing ABS bonds from financial institutions. Its underlying asset is ₩35,300 million based on the book amount of the securitized company's financial statements as of December 31, 2019. DEC provides part of the property, plant and equipment as collateral to fulfill the financial support obligation for Pinetree City 1st Co., Ltd.
(*3)	DM BEST 3rd Co., Ltd. is a company established with the aim of liquidating future construction bonds for Hanam Line section 2 and eight other contractors held by DEC, a subsidiary, and is financed mainly by issuing ABS bonds from financial institutions. As of December 31, 2019, the amount of underlying assets is ₩90,000 million based on the book amount of the securitized company's financial statements.
(*4)	Newstartdm 8th. Co., Ltd. is a company established with the aim of liquidating future construction bonds for Seoul-Munsan highway Co., Ltd. and four other contractors held by DEC, a subsidiary, and is financed mainly by issuing ABS bonds from financial institutions. As of December 31, 2019, the amount of underlying assets is ₩122,000 million based on the book amount of the securitized company's financial statements.
(*5)	Greatgm 4th Co., Ltd. is a company established with the aim of liquidating future construction bonds for Pusan District and four other contractors held by DEC, a subsidiary, and is financed mainly by issuing ABS bonds from financial institutions. As of December 31, 2019, the amount of underlying assets is ₩65,000 million based on the book amount of the securitized company's financial statements.
(*6)	Doosan E&C 4th Co., Ltd. is a company established with the aim of implementing fluidization by receiving future construction bonds for Saemanguem ~ Jeonju District 8 and three other contractors and the Changwon 2 plant, owned by DEC, a subsidiary, as senior collateral and is funded mainly by issuing ABS bonds from financial institutions. Its underlying asset is ₩95,000 million based on the book amount of the securitized company's financial statements as of December 31, 2019. The Group provides part of the property, plant and equipment as collateral to fulfill the financial support obligation for Doosan E&C 4th Co., Ltd.
(*7)	KDPP 3rd Co., Ltd. is a company established with the aim of liquidating ordinary shares and convertible preferred shares of subsidiaries held by DEC, a subsidiary, and is financed mainly by issuing ABCPs from financial institutions. As of December 31, 2019, the amount of underlying assets is ₩40,000 million based on the book amount of the securitized company's financial statements.
(*8)	KDPP 5th Co., Ltd. is companies established with the aim of liquidating future construction bonds held by DHC, a subsidiary, and is financed mainly by issuing ABSTB and others from financial institutions. As of December 31, 2019, the amount of underlying assets is ₩169,000 million based on the book amount of the securitized company's financial statements.
(*9)	U BEST 5th Co., Ltd. is a company established with the aim of liquidating new issuance bonds of the Group and is financed mainly by issuing ABCPs from financial institutions. As of December 31, 2019, the amount of underlying assets is ₩190,000 million based on the book amount of the securitized company's financial statements.
(*10)	Sunny Russel 8th Co., Ltd. is a company established with the aim of liquidating future sales bonds of Doosanbears, Inc., a subsidiary, and is financed mainly by issuing ABLs from financial institutions. As of December 31, 2019, the amount of underlying assets is ₩5,000 million based on the book amount of the securitized company's financial statements.
(*11)	D-Pay 1st Co., Ltd. is a company established with the aim of liquidating future sales bonds of Duty BG of Doosan corporation and is financed mainly by issuing ABLs from financial institutions. As of December 31, 2019, the amount of underlying assets is ₩150,000 million based on the book amount of the securitized company's financial statements.

33.9 Joint liability for contract execution

As of December 31, 2019, the Group provides joint and several guarantees amounting to ₩362,573 million for the performance of construction contracts to other construction companies. In addition, the Group provides joint and several guarantees for construction performance to Korea Housing & Finance Corporation related to the guarantee for housing sales, which was provided by Korea Housing Finance Corporation to the developers and provides conditional debt collection agreements (total limit: ₩1,214,100 million), if Gwangmyeong Medical Complex Construction and two projects are not fulfilled. And, investors associated with SOC business have an agreement of providing for an insufficient fund when the agreement is terminated or insufficient to repay the loan principal and interest by buy price or payment arising from purchase requirement from authorities.

34. Pledged assets

The Group pledged certain assets as collateral for its long-term and short-term borrowings as of December 31, 2019 as follows.

As of December 31, 2019, the Group is committed to liability for ₩375,000 million of the PF loan contract signed by its subsidiary, DBC Co., Ltd, to build the Doosan Bundang Center and provides 1,723,560 shares of DBC Co., Ltd's stock held by the Group (₩86,526 million in collateral) and rights to claim for construction insurance (₩252,300 million in collateral) as collaterals.

As of December 31, 2019, DHC, a subsidiary of the Group, signed a share exchange claim agreement with Korea Exim Bank regarding hybrid bonds issued by Doosan Power Systems S.A, a subsidiary of DHC. Accordingly, DHC is obliged to settle the cash upon request from Korea Exim Bank in case when the bank holds hybrid bonds as the investors exercise put option. In this regard, DHC provides the Korea Exim Bank 75,509,366 shares (₩1,483,471 million in collateral) of DI as collateral.

As of December 31, 2019, DHC, a subsidiary, also has confirmed its responsibility in connection with the construction project for the Samcheok Thermal Power Plant Unit 1 and 2 and provides 1,193,066 shares (₩43,568 million in collateral) of Pospower Co., Ltd. as collateral.

Clark Equipment Co., a subsidiary of DI, repaid all borrowings it borrowed jointly with Doosan Holdings Europe Ltd. on May 28, 2014. It newly borrowed USD 1,345,000 thousand and entered into a borrowing agreement with the limit of USD 150,000 thousand on May 18, 2017. Doosan Bobcat Inc. as collaterals, provided all shares in Clack Equipment Co., Doosan Bobcat EMEA s.r.o. and Doosan Bobcat Singapore Pte. Ltd. and provided major tangible and intangible assets of Clack Equipment Co., and its subsidiaries. The related borrowings as of December 31, 2019 are USD 657,013 thousand and total amount in collateral USD 1,495,000 thousand.

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34. Pledged assets (cont'd)

The Group pledged certain assets as collateral for its financial liabilities as of December 31, 2019 as follows (Korean won in millions):

Provided by	Pledged assets	Institution	Financial liabilities	Pledged amount
Doosan Corporation	Short-term financial instruments, property, plant and equipment, investment properties, financial Asset at fair value through OCI and others	KDB and others	₩ 462,980	₩ 996,440
DLI Corporation	Investment properties(*2)	KEB Hana Bank and others	28,500	32,276
Doosan Material Handling Solutions LLC.,	Property, plant and equipment	US Bank	3,242	3,242
Doosan Mecatec Co., Ltd.	Inventories	Korea Exim Bank	15,000	19,500
Doosan Electro-Materials (Changshu) Co., Ltd.	Property, plant and equipment	China Citic Bank	13,259	13,259
Doosan Industrial Vehicle Yantai Co., Ltd.	Property, plant and equipment	Woori Bank	2,486	7,034
Doosanbears Inc	Property, plant and equipment	KEB Hana Bank	19,500	48,700
DHC and its subsidiaries	Property, plant and equipment	KDB and others	1,197,691	1,674,749
	Shares contributed	Construction Guarantee Cooperative and others	406,811	507,195
DI and its subsidiaries	Property, plant and equipment(*1)	KDB and others	297,110	642,938
	Inventories(*1)	Korea Exim Bank and others	80,000	195,000
DEC and its subsidiaries	Property, plant and equipment(*3)	KDB and Others	130,300	208,000
	Short-term financial instruments	IBK	-	2,000
	Subsidiary investment securities and beneficiary right(*4)	Woori Bank	12,000	234,055
	Equity share	Construction Guarantee Cooperative	27,039	36,517
Doosan Cuvex Co., Ltd	Beneficiary right(*5)	Saeng bo estate trust Co., Ltd	53,000	63,600
			₩ 2,748,918	₩ 4,684,505

(*1) Benefit entitlement on property, plant and equipment and inventories has been provided as collateral to KDB and others.

(*2) As of December 31, 2019, the Group has established the real estate beneficiary certificates of land and buildings for the loan agreements with KDB Capital Corporation and others.

(*3) As of December 31, 2019, part of the property, plant and equipment of the Group's subsidiary, DEC, is provided to KDB and others (amount collateralized: ₩97,000 million) as collateral for the borrowings of the Group's subsidiary, Doosan Mecatec Co., Ltd.

(*4) It includes collateral(₩107,796 million) for property, plant and equipment provided by the Group's subsidiary, Valueworks Co.,Ltd.

(*5) This is a real estate security beneficiary right for property, plant and equipment.

34. Pledged assets (cont'd)

Details of collateral provided by the Group for third parties are as follows (Korean won in millions):

Provided by	Pledged assets	Book value	Institution	Provided to
DHC	Long-term investment securities and others	₩ 21,596	Kookmin Bank and others	Inchen-Kimpo express highway Co., Ltd. and others
DEC	Long-term investment securities	64,978	KDB and others	Metropolitan West Highway and others
	Investments in associates and joint ventures	7,219	KDB and others	New Seoul Railroad Co., Ltd and others
		72,197		
		₩ 93,793		

35. Related party transactions

The details related to the disclosure of related parties as of December 31, 2019 and 2018 are as follows:

	December 31, 2019	December 31, 2018	Remarks
Associates	The HS-Urban highway Pospower Co., Ltd.	The HS-Urban highway Pospower Co., Ltd.	(*1)
	Daejeong Marine Wind Power Plant Co., Ltd.	Daejeong Marine Wind Power Plant Co., Ltd.	(*1, 2)
	Potenit Co., Ltd	Potenit Co., Ltd	
	New Bundang Line Co., Ltd.	New Bundang Line Co., Ltd.	(*1)
	Gyeonggi Railway Co., Ltd.	Gyeonggi Railway Co., Ltd.	(*1), (*2)
	Neo Trans Co., Ltd.	Neo Trans Co., Ltd.	
	New Seoul Railroad Co.	New Seoul Railroad Co.	(*1), (*2)
	KIAMCO Gyeonggi Railway Investment Private Equity Investment Trust	KIAMCO Gyeonggi Railway Investment Private Equity Investment Trust	(*1)
	Incheon Furecell Co.,Ltd.	Incheon Furecell Co.,Ltd.	
	-	Dongbuk LRT	(*6)
	-	Daesan Green Energy Co. Ltd.	(*9)
	Geaenzymes	Geaenzymes	(*2)
	NewWave #5 Start-up Investment	NewWave #5 Start-up Investment	
	-	KoFC-Neoplux Pioneer Champ 2010-7 Venture Capital Fund	(*10)
	2010 KIF-Neoplux IT Venture Fund	2010 KIF-Neoplux IT Venture Fund	
	KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund	KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund	(*4)
	Future-Creation Neoplux Venture Capital Fund	Future-Creation Neoplux Venture Capital Fund	(*4)
	Neoplux Technology Valuation Investment Fund	Neoplux Technology Valuation Investment Fund	(*4)
	Neoplux Market Frontier Secondary Fund	Neoplux Market Frontier Secondary Fund	(*4)
	Gyeonggi-Neoplux Superman Fund	Gyeonggi-Neoplux Superman Fund	(*4)
	Shinhan-Neoplux Energy Newbiz Fund	Shinhan-Neoplux Energy Newbiz Fund	(*4)
	New Wave 6th Investment Union	-	(*5)
	-	Neoplux No. 1 Private Equity Fund	(*10)
	KTC-NP-Growth Champ 2011-2 PEF	KTC-NP-Growth Champ 2011-2 PEF	(*4)
	Neoplux No.3 Private Equity Fund	Neoplux No.3 Private Equity Fund	(*4)

35. Related party transactions (cont'd)

	December 31, 2019	December 31, 2018	Remarks
	Prestolite Asia LTD.	Prestolite Asia LTD.	
	Wise Fashion, Co., Ltd.	Wise Fashion, Co., Ltd.	(*2, 5)
	ReCarbon, Inc.	ReCarbon, Inc.	(*5)
	KDDI Korea Corporation	KDDI Korea Corporation	(*2)
Joint ventures	Sichuan Kelun-Doosan Biotechnology Company Limited	Sichuan Kelun-Doosan Biotechnology Company Limited	
	Doosan Babcock BlackCat W.L.L	Doosan Babcock BlackCat W.L.L	
	Haman Industrial Complex Co., Ltd.	Haman Industrial Complex Co., Ltd.	(*1, 3)
	Doosan PSI LLC	Doosan PSI LLC	
	Doosan Infracore Liaoning Machinery Sales Co., Ltd	Doosan Infracore Liaoning Machinery Sales Co., Ltd	
	Tianjin Lovol Doosan Engine Co., Ltd.	Tianjin Lovol Doosan Engine Co., Ltd.	
Other related parties	Doosan Fuel Cell Co., Ltd.	-	(*7)
	Doosan Solus Co., Ltd.	-	(*7)
	Doosan Electro-Materials Luxembourg Sarl and its subsidiaries	-	(*8)
	Doosan Corporation Europe Kft. and its subsidiaries	-	(*8)
	Yeongang Foundation	Yeongang Foundation	
	Chung-Ang University	Chung-Ang University	
	Doosan Credit Union	Doosan Credit Union	
	Dongdaemun Future Foundation and others	Dongdaemun Future Foundation and others	

(*1) Provided as collateral for project financing.

(*2) Although the Group has less than 20% shares of the entity, it is classified as an associate since the Group can exercise voting rights in its Board of Director's meeting.

(*3) Although the Group has more than 50% shares of the entity, it is classified as a joint venture since the Group has no control due to the inter-shareholder agreement.

(*4) The Group classified Neoplux Co.,Ltd., which is a subsidiary, as an associate because it can exercise significant influence as a business executive member.

(*5) During the current year, the Group newly acquired it.

(*6) During the current year, the Group disposed it.

(*7) During the current year, it was newly established as a result of the spin off.

(*8) They are subsidiaries of Doosan Solus Co., Ltd., which was newly established as a result of the spin off during the year (see Note 37).

(*9) They are associates of Doosan Fuel Cell Co., Ltd., which was newly established as a result of the spin off during the year (see Note 37).

(*10) During the current year, the Group liquidated it.

35. Related party transactions (cont'd)

Significant transactions for the years ended December 31, 2019 and 2018, between the Group and related parties are as follows (Korean won in millions):

	Related parties	2019			
		Sales	Other income	Purchases	Other expenses
Associates	Gyeonggi Railway New Bundang Line Co., Ltd.	₩ -	₩ -	₩ -	₩ -
	Tamra Offshore Wind Power Co., Ltd.	-	-	-	-
	New Seoul Railroad Co.	43,530	-	-	-
	Neo Trans Co., Ltd.	8,601	-	-	-
	Pospower Co., Ltd.	124,523	-	-	-
	KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund	402	1	-	-
	Future-Creation Neoplux Venture Capital Fund	596	2	-	-
	Neoplux No. 1 Private Equity Fund	3,364	-	-	-
	KTC-NP-Growth Champ 2011-2 PEF	527	9	-	-
	Neoplux Market Frontier Secondary Fund	1,469	-	-	-
	Neoplux Technology Valuation Investment Fund	926	-	-	-
	Neoplux No.3 Private Equity Fund	2,802	-	-	-
	Prestolite Asia LTD.	-	-	-	-
	Daesan Green Energy Co. Ltd	105,987	-	-	-
	Others	3,686	-	-	158
		296,413	12	-	158

35. Related party transactions (cont'd)

	Related parties	2019			
		Sales	Other income	Purchases	Other expenses
Joint ventures	Tianjin Lovol				
	Doosan Engine Co. Ltd.	₩ -	₩ -	₩ -	₩ -
Other related parties		-	-	-	-
	Chung-Ang University	105	-	1,669	10,787
	Doosan Credit Union	-	-	-	-
	Doosan Yonkang Foundation	1,506	44	3,515	1,086
	Doosan Fuel Cell Co., Ltd.	12,799	14	-	155
	Doosan Solus Co., Ltd.	5,612	750	14,659	-
	Others	522	165	-	-
		20,544	973	19,843	12,028
		₩ 316,957	₩ 985	₩ 19,843	₩ 12,186

35. Related party transactions (cont'd)

	Related parties	2018			
		Sales	Other income	Purchases	Other expenses
Associates	Gyeonggi Railway	₩ 17,007	₩ -	₩ -	₩ -
	New Bundang Line Co., Ltd.	-	-	5	-
	Tamra Offshore Wind Power Co., Ltd.	7,096	-	432	-
	New Seoul Railroad Co.	29,476	-	-	-
	Neo Trans Co., Ltd.	8,648	-	-	-
	Pospower Co., Ltd.	-	-	-	-
	KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund	568	-	-	-
	Future-Creation Neoplux Venture Capital Fund	715	-	-	-
	Neoplux No. 1 Private Equity Fund	234	-	7	-
	KTC-NP-Growth Champ 2011-2 PEF	662	-	-	-
	Neoplux Market Frontier Secondary Fund	1,231	-	-	-
	Neoplux Technology Valuation Investment Fund	1,067	-	-	-
	Neoplux No.3 Private Equity Fund	-	-	-	-
	Prestolite Asia LTD.	-	-	4,474	-
	Daesan Green Energy Co. Ltd	-	-	-	-
	Others	5,331	-	-	100
		72,035	-	4,918	100

35. Related party transactions (cont'd)

		2018			
	Related parties	Sales	Other income	Purchases	Other expenses
Joint ventures	Tianjin Lovol				
	Doosan Engine Co. Ltd.	₩ -	₩ 6,147	₩ -	₩ -
		-	6,147	-	-
Other related parties	Chung-Ang University	105	-	3,661	4,600
	Doosan Credit Union	202	-	1	-
	Doosan Yonkang Foundation	1,346	16	2,702	1,949
	Others	728	-	-	-
		2,381	16	6,364	6,549
		₩ 74,416	₩ 6,163	₩ 11,282	₩ 6,649

The transaction details above include carrying amount classified as the profit or loss from discontinued operations on consolidated statements of income.

35. Related party transactions (cont'd)

Significant balances related to the transactions between the Group and related parties as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	Related parties	December 31, 2019				
		Trade receivables	Other receivables	Loans	Trade payables	Other payables
Associates	Gyeonggi Railway	₩ 792	₩ -	₩ 36,521	₩ -	₩ -
	New Bundang Line Co., Ltd.	11,023	-	32,574	-	-
	Neo Trans Co., Ltd.	937	-	-	-	152
	KoFC-Neoplux Pioneer Champ 2010-7 Venture Capital Fund	-	-	-	-	-
	KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund	410	2,501	-	-	-
	Future-Creation Neoplux Venture Capital Fund	1,012	3,602	-	-	-
	Neoplux No. 1 Private Equity Fund	-	-	-	-	-
	KTC-NP Growth Champ 2011-2 Private Equity Fund	98	4,509	-	-	-
	Neoplux Market Frontier Secondary Fund	1,469	-	-	-	-
	Neoplux Technology Valuation Investment Fund	961	-	-	-	-
	Neoplux No.3 Private Equity Fund	2,061	-	-	-	-
	New Seoul Railroad Co.	-	9	-	-	-
	Others	17	-	-	-	-
		18,780	10,621	69,095	-	152

35. Related party transactions (cont'd)

		December 31, 2019					
	Related parties	Trade receivables	Other receivables	Loans	Trade payables	Other payables	
Joint ventures	Haman Industrial Complex	₩ 1347	₩ -	₩ -	₩ -	₩ -	-
		1347	-	-	-	-	-
Other related parties	Chung-Ang University	158	3	-	30	550	
	Doosan Credit Union	-	-	-	-	-	
	Doosan Yonkang Foundation	136	1,515	-	-	381	
	Doosan Fuel Cell Co., Ltd.	3,952	-	-	13,398	700	
	Doosan Solus Co., Ltd.	14,219	3,671	-	7,603	5,212	
	Others	29	-	-	-	83	
		18,494	5,189	-	21,031	6,926	
		₩ 38,621	₩ 15,810	₩ 69,095	₩ 21,031	₩ 7,078	

35. Related party transactions (cont'd)

		December 31, 2018				
	Related parties	Trade receivables	Other receivables	Loans	Trade payables	Other payables
Associates	Gyeonggi Railway	₩ 792	₩ -	₩ 30,362	₩ -	₩ -
	New Bundang Line Co., Ltd.	11,023	-	32,573	-	-
	Tamra Offshore Wind Power Co., Ltd.	-	-	-	-	-
	Neo Trans Co., Ltd.	989	-	-	248	152
	KoFC-Neoplux Pioneer Champ 2010-7 Venture Capital Fund	-	-	-	-	-
	KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund	567	-	-	-	-
	Future-Creation Neoplux Venture Capital Fund	715	-	-	-	-
	Neoplux No. 1 Private Equity Fund	2,754	-	-	-	-
	KTC-NP Growth Champ 2011-2 Private Equity Fund	152	-	-	-	-
	Neoplux Market Frontier Secondary Fund	14	-	-	-	-
	Neoplux Technology Valuation Investment Fund	1,065	-	-	-	-
	New Seoul Railroad Co.	-	9	-	-	-
	The HS-City Expressway Co., Ltd	-	-	-	-	-
	Others	663	-	-	-	-
		18,734	9	62,935	248	152

35. Related party transactions (cont'd)

		December 31, 2018					
	Related parties	Trade receivables	Other receivables	Loans	Trade payables	Other payables	
Joint ventures	Haman Industrial Complex	₩ 826	₩ 3,002	₩ -	₩ -	₩ -	-
		826	3,002	-	-	-	-
Other related parties	Chung-Ang University	61	-	-	85		390
	Doosan Credit Union	18	-	-	-		84
	Doosan Yonkang Foundation	24	1,643	-	99		308
	Others	18	-	-	-		-
		121	1,643	-	184		782
		₩ 19,681	₩ 4,654	₩ 62,935	₩ 432	₩	934

The transaction details above include carrying amount classified as profit or loss from discontinued operations on consolidated statements of income.

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35. Related party transactions (cont'd)

Fund and equity transactions for the years ended December 31, 2019 and 2018, between the Group and related parties are as follows (Korean won in millions):

	Related parties	2019					
		Loan		Contribution		Dividend	
		Loans	Repayment	Received	Provided	Income	Paid
Associates	Gyeonggi Railway	₩ 6,159	₩ -	₩ -	₩ -	₩ -	₩ -
	Dongbuk LRT	-	-	-	(1,665)	-	-
	KoFC-Neoplux Pioneer Champ	-	-	-	-	-	-
	2010-7 Venture Capital Fund	-	-	-	(1,571)	(62)	-
	KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund	-	-	-	(1,547)	855	-
	2010 KIF-Neoplux IT Venture Fund	-	-	-	(631)	-	-
	Neoplux Technology Valuation Investment Fund	-	-	-	(748)	-	-
	Neoplux Market Frontier Secondary Fund	-	-	-	1,711	659	-
	NewWave #5 Start-up Investment	-	-	-	(402)	435	-
	Gyeonggi-Neoplux Superman Fund	-	-	-	1,836	-	-
	Shinhan-Neoplux Energy Newbiz Fund	-	-	-	1,500	-	-
	New Wave 6th Investment Union	-	-	-	2,000	-	-
	Neoplux No.3 Private Equity Fund	-	-	-	2,140	-	-
	KTC-NP Growth Champ 2011-2 Private Equity Fund	-	-	-	(1,844)	7	-
	KDDI Korea Corporation	-	-	-	-	149	-
	ReCarbon, Inc.	-	-	-	8,473	-	-
	Wise Fashion, Co., Ltd.	-	-	-	3,000	-	-
Joint ventures	Tianjin Lovol Doosan Engine Co. Ltd.	-	-	-	12,913	-	-
	Sichuan Kelun-Doosan Biotechnology Co., Ltd.	-	-	-	-	603	-
Other related parties	Doosan Yonkang Foundation	-	-	-	-	-	8,952
	Dongdaemun Future Foundation	-	-	-	-	-	489
		₩ 6,159	₩ -	₩ -	₩ 25,165	₩ 2,646	₩ 9,441

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35. Related party transactions (cont'd)

		2018							
		Loan		Contribution		Dividend			
	Related parties	Loans	Repayment	Received	Provided	Income	Paid		
Associates	Gyeonggi Railway	₩ 21,012	₩ -	₩ -	₩ -	₩ -	₩ -		
	KDDI Korea Corporation	-	-	-	-	23	-		
	Daesan Green Energy Co. Ltd.	-	-	-	5,100	-	-		
	Geaenzymes	-	-	-	-	-	-		
	KIAMCO Gyeonggi Railway Investment Private Equity Investment Trust	-	-	-	3,273	-	-		
	Incheon Furecell Co., Ltd.	-	-	-	4,700	-	-		
	Potenit Co., Ltd.	-	-	-	5,333	-	-		
	Pospower Co., Ltd.	-	-	-	43,568	-	-		
	Daejeong Marine Wind Power Plant Co., Ltd.	-	-	-	2,827	-	-		
	Dongbuk LRT	-	-	-	1,694	-	-		
	NewWave #5 Start-up Investment	-	-	-	(522)	-	-		
	KoFC-Neoplux Pioneer Champ 2010-7 Venture Capital Fund	-	-	-	(1,008)	-	-		
	KoFC-Neoplux R&D-Biz Creation 2013-1 Venture Capital Fund	-	-	-	(1,653)	-	-		
	Future-Creation Neoplux Venture Capital Fund	-	-	-	(2,359)	-	-		
	Neoplux Technology Valuation Investment Fund	-	-	-	2,700	-	-		
	Neoplux Market Frontier Secondary Fund	-	-	-	2,557	1,650	-		
	Gyeonggi-Neoplux Superman Fund	-	-	-	918	-	-		
	Shinhan-Neoplux Energy Newbiz Fund	-	-	-	1,000	-	-		
	KTC-NP Growth Champ 2011-2 Private Equity Fund	-	-	-	(1,306)	7	-		
	Neoplux No.3 Private Equity Fund	-	-	-	7,030	-	-		
Joint ventures	Tianjin Lovol Doosan Engine Co. Ltd.	-	-	-	12,727	-	-		
	Sichuan Kelun-Doosan Biotechnology Co., Ltd.	-	-	-	-	1,531	-		
Other related parties	Doosan Yonkang Foundation	-	-	-	-	-	15,456		
	Dongdaemun Future Foundation	-	-	-	-	-	846		
		₩ 21,012	₩ -	₩ -	₩ 86,579	₩ 3,211	₩ 16,302		

The transaction details above include carrying amount classified as profit or loss from discontinued operations on consolidated statements of income.

The Group provides guarantees of payment and others for related parties as of December 31, 2019 (see Notes 33 and 34).

35. Related party transactions (cont'd)

The Group provides guarantees of payment and others for related parties as of December 31, 2019 (see Notes 33 and 34).

Compensation to key management personnel of the Group for the years ended December 31, 2019 and 2018 is as follows (Korean won in millions):

	2019	2018
Employee benefits	₩ 81,634	₩ 83,221
Pension costs	6,013	5,760
	<u>₩ 87,647</u>	<u>₩ 88,981</u>

36. Cash generated from (used in) operations

The adjustments and changes in cash generated from operating activities in the consolidated statements of cash flows for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019	2018
Adjustments for:		
(Reversal of) bad debt expenses	₩ (6,628)	₩ 69,446
Cost of sales (write-down of inventories)	18,306	(6,036)
Depreciation	500,490	400,648
Amortization	190,479	222,219
Pension costs	122,848	138,151
Interest income	(61,289)	(47,913)
Dividend income	(1,296)	(2,539)
Gain on foreign currency translation	(95,774)	(82,704)
Gain on valuation of derivatives	(85,279)	(99,011)
Gain on valuation of firm commitment	(67,883)	(83,889)
Financial guarantee income	(193)	(545)
Interest expense	613,219	594,288
Loss on foreign currency translation	133,014	131,191
Loss on valuation of derivatives	114,984	108,152
Loss on valuation of firm commitment	23,778	20,901
Loss on repayment of bonds	7,482	7,606
Financial guarantee expenses	10,522	70,331
Increase in provisions	248,162	73,607
Gain on disposal of short-term investment securities	(558)	(1,277)
Gain on disposal of long-term investment securities	(3,115)	(1,556)
Gain on valuation of short-term financial assets	(8,242)	(10,232)
Gain on disposal of property, plant and equipment	(3,089)	(2,248)
Gain on disposal of intangible assets	(90)	(1,021)
Loss on disposal of trade receivables	24,279	23,257
Gain on valuation of investment properties	(9,318)	(4,330)
Reversal of impairment loss on property, plant and equipment	(2,237)	(18)
Reversal of impairment loss on intangible assets	(2,054)	(19)
Gain (loss) on transfer of business	234	(1,235)
Loss on disposal of long-term investment securities	194	4
Impairment loss (reversal) on long-term investment securities	-	(1,635)
Loss on disposal of property, plant and equipment	34,461	11,316
Loss on disposal of intangible assets	203	291
Loss on disposal of investment properties	1,188	1,273
Loss on valuation of investment properties	4,235	3,726
Loss on land revaluation	451	-
Impairment loss on property, plant and equipment	48,752	4,873
Impairment loss on intangible assets	30,022	57,362
Impairment loss on associate investment securities	4,156	-
Other bad debt expenses	158,372	346,567
Share of loss of associates and joint ventures accounted for using the equity method	8,589	27,918
Income tax expenses	245,541	276,917
Gain on discontinued operation	(595,251)	-
Other expenses	21,971	50,740
	<u>₩ 1,623,636</u>	<u>₩ 2,294,576</u>

36. Cash generated from (used in) operations (cont'd)

	2019		2018
Changes in operating assets and liabilities:			
Increase in trade receivables	₩ (15,227)	₩	(273,788)
Decrease (increase) in other receivables	12,036		(251,464)
Decrease in due from customers for contract work	28,129		17,472
decrease in derivative assets (liabilities)	35,238		(48,734)
Increase in inventories	(296,227)		(387,368)
Increase in other current assets	(1,116)		(12,772)
Increase in long-term other receivables	(371)		(19,447)
Decrease in other non-current assets	86,319		49,908
Increase (decrease) in trade payables	(515,038)		283,466
Increase in other payables	246,388		57,946
Increase in due to customers for contract work	193,229		389,562
Decrease in provisions	(99,129)		(62,047)
Increase (decrease) in other current liabilities	(28,769)		56,620
Increase in long-term other payables	4,340		43,173
Decrease in other non-current liabilities	(3,175)		42,685
Retirement benefits paid	(35,251)		(69,272)
Increase in plan assets	(156,148)		(91,388)
Changes in other assets and liabilities related to operating activities	4,012		(24,211)
	<u>₩ (540,760)</u>	₩	<u>(299,659)</u>

Significant non-cash transactions for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019		2018
Reclassification of construction in progress to property, plant and equipment and others	₩ 209,446	₩	111,763
Decrease due to spin off	99,598		-

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36. Cash generated from (used in) operations (cont'd)

Details of changes in liabilities arising from financing activities for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019						
	January 1	Financing activities	Change due to spin off(see Note 37)	Exchange rate change	Current portion of long-term borrowings	Others(*1)	December 31
Short-term borrowings	₩ 3,187,563	₩ 1,434,540	₩ (26,076)	₩ 18,041	₩ -	₩ -	₩ 4,614,068
Asset-backed loans	491,372	(109,900)	-	-	-	102	381,574
Current portion of long-term asset-backed loans	168,033	(259,444)	-	-	313,131	6,125	227,845
Current portion of long-term borrowings	868,681	(919,527)	(30,000)	30,804	1,161,917	(2,603)	1,109,272
Current portion of bonds	1,409,157	(1,440,777)	-	25,405	2,423,498	6,215	2,423,498
Current portion of lease liabilities	-	(107,696)	-	1,810	121,378	70,949	86,441
Long-term borrowings	3,667,600	(235,692)	(115,598)	93,936	(1,161,917)	10,484	2,258,813
Bonds	2,502,808	1,096,020	(98,732)	6,853	(2,423,498)	50,382	1,133,833
Long-term asset-backed loans	248,788	353,254	-	-	(313,131)	3,379	292,290
Lease liabilities(*1)	-	-	(3,071)	3,491	(121,378)	336,872	215,914
Finance lease liabilities(*1)	12,447	-	-	-	-	(12,447)	-
	₩ 12,556,449	₩ (189,222)	₩ (273,477)	₩ 180,340	₩ -	₩ 469,458	₩ 12,743,548

(*1) It includes account reclassification and effect of adoption of new accounting standards in accordance with KIFRS 1116 Leases.

	2018						
	January 1	Financing activities	Business combination /disposal	Exchange rate change	Current portion of long-term borrowings	Others	December 31
Short-term borrowings	₩ 4,349,943	₩ (1,124,794)	₩ (65,738)	₩ 1,674	₩ 1,214	₩ 25,264	₩ 3,187,563
Asset-backed loans	795,104	180,531	-	-	(80,000)	(155,475)	740,160
Current portion of long-term asset-backed loans	-	-	-	-	80,000	88,033	168,033
Bonds	2,878,122	1,074,654	-	51,036	(1,622,030)	121,026	2,502,808
Current portion of bonds	1,325,199	(1,343,059)	(219,240)	3,879	1,622,030	20,348	1,409,157
Current portion of convertible bonds	6,770	-	-	-	-	(6,770)	-
Long-term borrowings	2,270,385	2,393,450	-	36,370	(992,946)	(39,659)	3,667,600
Current portion of long-term borrowings	999,491	(1,101,492)	(30,000)	8,708	991,732	242	868,681
Finance lease liabilities	17,220	(11,503)	-	-	-	6,730	12,447
	₩ 12,642,234	₩ 67,787	₩ (314,978)	₩ 101,667	₩ -	₩ 59,739	₩ 12,556,449

37. Spin off

In accordance with the resolution of the shareholders' meeting dated August 13, 2019, the Company completed the division of the company by dividing the fuel cell business unit into Doosan Fuel Cell Co., Ltd. and the electro-material business unit to establish Doosan Solus Co., Ltd.

The details of the split ratio are as follows:

Company name	Division company	Newly incorporated company	
	Doosan Inc.	Doosan solus Co., Ltd	Doosan fuel cell Co., Ltd
Split ratio	0.9060062	0.0333998	0.0605940

37. Spin off (cont'd)

The details of the assets and liabilities of the fuel cell and material business units carried over to newly incorporated company are as follows (Korean won in millions):

Assets	Book amount	Liabilities	Book amount
Cash and cash equivalents	₩ 166,603	Trade payables and other debts	₩ 63,114
Trade receivables and other receivables	87,329	Short-term borrowings	26,076
Inventory	212,305	Current portion of long-term borrowings	30,000
Investment in subsidiaries, associates and joint ventures	2,570	Bond	98,732
Property, plant and equipment	180,900	Long-term borrowings	115,598
Intangible assets	35,859	Lease liabilities	3,071
Investment property	5,136	Net defined benefit liability	6,327
Deferred income tax assets	10,532	Other liabilities	141,416
Other assets	49,301		
	<u>₩ 750,535</u>		<u>₩ 484,334</u>

On the other hand, in accordance with KIFRS 2117 *Distribution of Non-Cash Assets to Owners*, if all owners with the same kind of equity instruments are treated equally in distributing non-cash assets free of charge, before and after the distribution, and are not ultimately controlled by the same party or parties, the Group shall declare the distribution and shall recognize a non-cash dividend (when approved by the shareholders' meeting).

The Group measured the dividend payable at the date of settlement at ₩865,554 million, the fair value of the above assets and liabilities, and recognized the difference from the carrying amount, as profit from the disposal of discontinuing operations in the current income statement (see Note 38).

The discount and permanent growth rates used to measure the fair value of the assets and liabilities above are as follows:

	Doosan Solus Co., Ltd	Doosan Fuel Cell Co., Ltd
Discount rate	9.51%~13.40%	10.97%
Permanent growth rate	0.00%	0.00%

According to the spin off, the shares held by the Company before the division were removed from the other capital items in the Group's consolidated financial statement and long-term investment was recognized. The long-term investment was classified as a fair value through other comprehensive income financial asset and measured at the fair value of ₩145,260 million at the split date (see Note 6). In addition, ₩126,126 million, which is the difference from the carrying amount of ₩19,134 million, was recognized as other capital surplus in the statement of consolidated financial position as of the end of the current year.

Under Article 530-9 paragraph 1 of the Commercial Act, the succeeding company after division and the newly incorporated company shall be responsible for jointly repaying the company's debts before the split.

The performance of the fuel cell and material business carried forward to and the newly incorporated company is indicated as a discontinued operation, and the comparative statement of prior year's consolidated statements of income has been restated (see Note 38).

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38. Discontinued operations

Details of discontinued operations as of December 31, 2019 and 2018 are as follows:

	2019		
	Fuel cell and Materials business unit(see Note 37)	Duty-free business unit(*1)	HRSB business unit(*2)
Main business	Manufacturing and sales of fuel cell and OLED and others	Sales of duty-free goods	Production and installation of power equipment
Method	Spin off	Transfer of business	Transfer of business

	2018	
	DE business unit(*3)	HRSB business unit(*2)
Main business	Manufacturing of internal combustion engine	Production and installation of power equipment
Method	Transfer of business	Transfer of business

(*1) The Group has decided to suspend the duty-free business at its board meeting on October 29, 2019. On December 30, 2019, the company signed a contract with Hyundai Department Store Duty Free Co. to transfer part of its inventory and tangible and intangible assets in its duty-free business and were sold as of February 13, 2020 (transferring price: ₩35.9 billion). As of December 31, 2019, the assets of the duty-free business units subject to the transfer contract were classified as held for sale in the consolidated statement of financial position.

(*2) During the previous year, the Group completed the sale of its HRSB business unit owned by the Group's subsidiaries, DEC and Doosan Heavy Industries Vietnam Co., Ltd..

(*3) As of June 8, 2018, the Group completed the sale of its subsidiary Doosan Engine Co., Ltd. to the Sourious Well-to-Consortium (transfer price: ₩ 76.5 billion).

Details of profit or loss from discontinued operations as of December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019			
	Fuel cell and Materials business unit	Duty-free business unit	HRSB	Total
Sales	₩ 305,994	₩ 451,359	₩ 258	₩ 757,611
Cost of sales	240,617	282,561	120	523,298
Selling and administrative expenses	42,700	218,534	16,609	277,843
Operating profit (loss)	22,677	(49,736)	(16,471)	(43,530)
Non-operating loss	(12,745)	(10,436)	(3,689)	(26,870)
Loss/gain before income tax expenses	9,932	(60,172)	(20,160)	(70,400)
Income tax loss(benefit)	6,973	(14,561)	-	(7,588)
Loss/gain on discontinued operations	2,959	(45,611)	(20,160)	(62,812)
Gain on disposal of discontinued operations before income tax expenses	596,251	-	-	596,251
Tax expenses related to disposal of discontinued operations	13,311	-	-	13,311
Gain on disposal of discontinued operations	582,940	-	-	582,940
Impairment loss before income tax recognized as a measure of net fair value	-	(20,201)	-	(20,201)
Tax profits related to disposal of discontinued operations	-	(4,889)	-	(4,889)
Impairment loss	-	(15,312)	-	(15,312)
Loss/gain from discontinued operations	₩ 585,899	₩ (60,923)	₩ (20,160)	₩ 504,816
Loss/gain attributable to:				
Equity holders of the parent	585,899	(60,923)	(6,167)	518,809
Non-controlling interests	-	-	(13,993)	(13,993)

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38. Discontinued operations (cont'd)

	2018				
	Fuel cell and Materials business unit	Duty-free business unit	DE business unit	HRSG	Total
Sales	₩ 327,468	₩ 395,399	₩ 178,362	₩ 330	₩ 901,559
Cost of sales	247,723	206,800	187,285	242	642,050
Selling and administrative expenses	41,150	187,689	15,471	13,206	257,516
Operating loss	38,595	910	(24,394)	(13,118)	1,993
Non-operating loss	(7,889)	(12,718)	(7,370)	(4,855)	(32,832)
Profit(loss) before income tax expenses	30,706	(11,808)	(31,764)	(17,973)	(30,839)
Income tax expenses(benefit)	11,690	(2,857)	(2,095)	-	6,738
Loss/gain on discontinued operations	19,016	(8,951)	(29,669)	(17,973)	(37,577)
Loss on disposal of discontinued operations before income tax expenses	-	-	(24,411)	-	(24,411)
Tax expenses related to disposal of discontinued operations	-	-	20,156	-	20,156
Loss on disposal of discontinued operations	-	-	(44,567)	-	(44,567)
Loss from discontinued operations	₩ 19,016	₩ (8,951)	₩ (74,236)	₩ (17,973)	₩ (82,144)
Loss/gain attributable to:					
Equity holders of the parent	19,016	(8,951)	(20,926)	(4,173)	(15,034)
Non-controlling interests	-	-	(53,310)	(13,800)	(67,110)

Cash flows from discontinued operations for the years ended December 31, 2019 and 2018 are as follows (Korean won in millions):

	2019			
	Fuel cell and Materials business unit	Duty-free business unit	HRSG	Total
Net cash inflows (outflows) from operating activities	₩ 64,689	₩ (38,587)	₩ (32,343)	₩ (6,241)
Net cash outflows from investing activities	(71,675)	(4,763)	(2)	(76,440)
Net cash inflows from financing activities	67,019	-	32,345	99,364
Effect of exchange rate changes	3,738	-	-	3,738
Net increase (decrease) in cash flows from discontinued operations	₩ 63,771	₩ (43,350)	₩ -	₩ 20,421

	2018				
	Fuel cell and Materials business unit	Duty-free business unit	DE business unit	HRSG	Total
Net cash inflows (outflows) from operating activities	₩ (12,075)	₩ (22,536)	₩ 21,416	₩ (13,980)	₩ (27,175)
Net cash inflows (outflows) from investing activities(*1)	(2,784)	4,681	(40,457)	-	(38,560)
Net cash inflows (outflows) from financing activities	-	(8,700)	8,771	13,980	14,051
Effect of exchange rate changes	-	713	620	-	1,333
Net decrease in cash flows from discontinued operations	₩ (14,859)	₩ (25,842)	₩ (9,650)	₩ -	₩ (50,351)

(*1) Net cash flows of investing activities include cash flows include cash flow of the disposal of discontinued operations.

39. Assets held for sale

As described in Note 38 on the financial statements, as of the end of the current year, the Group classifies some assets of the tax-free business units that are to be sold as held for sale in the consolidated financial statements. The details of assets held for sale as of the end of the current year are as follows (Korean won in millions)

	December 31, 2019		
	Book value before impairment	Impairment loss(*1)	Fair value less costs to sell
Advanced payments	₩ 7,265	₩ (4,400)	₩ 2,865
Inventory	26,793	(5,932)	20,861
Property, plant and equipment	11,671	(2,750)	8,921
Intangible Assets	9,793	(7,119)	2,674
	₩ 55,522	₩ (20,201)	₩ 35,321

(*1) It is classified as profit or loss from discontinued operations in the consolidated statement of income.

40. Events after the reporting year

In accordance with the Board of Directors' resolution of December 5, 2019, the Group decided to make a spot investment in 100 percent of the common shares of Doosan Mecatec Co., Ltd., which the Group hold in DHC. Details are as follows:

	Details
Investment due date	Feb 5, 2020
Investment object	44,102,845 common shares of DHC
The amount of investment	₩238,199 million

40.1 Acquisition of shares of DEC by comprehensive exchange of shares

DHC acquired shares held by external shareholders of DEC, a subsidiary, and treasury stocks held by DEC on March 10, 2020, according to a resolution by the board of directors on December 12, 2019. And in return, issued 6,891,058 common shares of DHC to external shareholders of DEC.

40.2 DHC and its subsidiaries' financial structure improvement plan

DHC and its subsidiaries of the Group face financial difficulties due to the deterioration of the global power generation market and changes in the external environment.

DHC and its subsidiaries are preparing for a plan to improve profitability, including manpower restructuring, and to streamline subsidiaries' management rationalization, and plan to implement a phased financial structure improvement plan, such as reducing borrowings through capital expansion. Accordingly, DHC decided on a workforce restructuring plan to secure financial soundness on the board of directors held on February 14, 2020. On March 10, 2020, DHC was announced the suspension of limited idle workforce at a level that doesn't interfere with the operation.

41. Uncertainty of going concern

The Group's consolidated financial statements are based on the assumption that the Group will continue to exist as a Group. Therefore, assets and liabilities have been accounted for under the assumption that they can be recovered or repaid at book value through the normal course of business activities. However, as of December 31, 2019, accumulated losses since 2014 in DHC and its subsidiaries, component of the Group have current borrowings of ₩7,414,329 million, and current liabilities exceed current assets by ₩4,421,614 million. In addition, net loss for the current year is ₩104,367 million. This situation casts a significant doubt about the ability of DHC and its subsidiaries to continue as a going concern.

Under the circumstances where significant doubts were raised about the feasibility of the going concern assumption premised to the consolidated financial statements of the Group. Considering the financing plan necessary for debt repayments and other demands of DHC and its subsidiaries take the success or failure outcome of the financial and management improvement plan to achieve stable ordinary profits, cast significant uncertainty that depends on the existence of DHC and its subsidiaries.

If such plans are disrupted, the assets and liabilities of DHC and its subsidiaries of the Group's divisions may not be recovered or repaid at book value through the normal operating activities. The financial statements of the Group do not currently reflect the potential adjustments to the amounts and classification of assets and liabilities and related profits and losses that may arise from these uncertainties.