

# Emission of Carbon Dioxide of Selected Retailers

**LUKIC Radojko<sup>23</sup>**

## Abstract

Increased attention has been paid recently to the analysis of the effects of applying the concept of sustainable development in retail. In that context we have particularly considered greenhouse gases emission in retail. This is achieved through the use of modern ecological technology in business – through the whole value chain. The ultimate goal is to achieve the planned reductions of carbon dioxide in retail, which positively reflects the overall performance of retailers, environmental in particular. The costs of carbon dioxide emission reduction affect the performance of retailers. Continuous empirical research shows that almost all global retailers achieve a significant reduction in carbon dioxide emissions from year to year.

Empirical research conducted in this paper on the example of global retailers in the United States, Europe and the European Union, the United Kingdom, Mexico, China, Croatia and Serbia shows significant and planned reduction of carbon dioxide emissions in retail, especially in countries with developed market economies. This empirical research is mainly based on the analysis of the original sustainable (environmental and ecological) reports officially disclosed by selected retailers, primarily from the countries of a developed market economies, which they started to publish with regular annual financial statements. They are now an integral part of the so-called integrated reporting on performance of global retailers. Due to the general importance, harmonized regulations on sustainable retail reporting are being increasingly applied as a data source for more efficient environmental management. In perspective, this will ease the comparative analysis of the carbon dioxide emission of global and other retailers.

*Keywords: greenhouse gas emissions, carbon dioxide, CO<sub>2</sub> emission sources, renewable energy sources, sustainable reporting*

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## Introduction

Close attention has been recently devoted to the analysis of environmental performance in all sectors, including wholesale and retail trade. Within this, greenhouse gases emission (GHG) in retail is briefly considered. The overall goal of global retailers is to reduce carbon dioxide emissions through the entire value chain. The costs of carbon dioxide emission reduction are significant and affect the performance of retailers.

The subject of research in this paper is the significance and trend of carbon dioxide emissions in retail. Based on a comparative analysis of the original officially disclosed sustainable reports of global selective retailers, the aim of the research is to comprehensively examine the problem of carbon dioxide emissions in retail through an entire value chain and to

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<sup>23</sup> Faculty of Economics, Belgrade, University of Belgrade, Serbia, rlukic@ekof.bg.ac.rs

take appropriate measures to achieve the target reduction. The effects of this are the improvement of the overall, especially environmentally-friendly performances of retailers. In this we find the scientific and professional contribution of this work, due to the fact that there is scarce literature fully devoted to the issue of carbon dioxide emissions in retail.

Numerous factors undoubtedly influence carbon dioxide emissions in retail, and these are: type of store, product category, nature of the item itself, sales, location and distance (type of settlement: urban, suburban and rural), carbon policy (Wang *et al.*, 2017), as well as energy sources, type of ventilation and heating of sales and other premises, cooling devices, mode of transport (logistics), waste treatment, and others. Taxation is also a factor in carbon dioxide emissions in all sectors, including retail (Qin, 2015). Regarding retail formats (types of stores, classical or modern – Internet shops) on-line sales have insignificant carbon dioxide emissions and, viewed through a value chain, it occurs only in warehousing, while in distribution and in the store, equals zero, contrary to the other types of stores (Seebauer *et al.*, 2016). Carbon dioxide emissions vary by product category (food and non-food products) and within one product category, by individual articles, depending on their nature (Linda, 2014; Eriksson, 2017).

All in all, the main sources of carbon dioxide emissions in retail are: electricity, transport, ventilation and heating, refrigeration and waste. Effective control of the factors that influence the emission of carbon dioxide can significantly affect the improvement of economic, social and, in particular, environmental performance in retail. For these reasons, it is necessary to know the size and intensity of carbon dioxide emissions in modern retail, which is the focus of this work.

There is voluminous literature devoted to analyzing the way company's performance is affected by general problems and effects of carbon dioxide emission reduction through the whole chain (Jones, 2005; Martinuzzi, 2011; Kahn, 2014; Congcong, 2016; Li, 2016; Seebauer *et al.*, 2016; Bazan, 2017, Clune, 2017), as well as consumer preferences (Ji, 2017). In other words, it is generally known that carbon dioxide reduction increases the economic performance of companies (Cusshiella, 2017), the profitability of producers and retailers, as well as consumer preferences (Eagle, 2017). In view of the significance of the problem of carbon dioxide emissions, generally speaking, as far as we know, the number of papers dedicated to the specificities and impacts of carbon dioxide emission reduction on the performance of retail companies is modest (Patten, 2014; Makarov, 2015; Riboldazzi, 2016; Sullian, 2016).

In Serbian literature this issue is only partially considered in some works (Lukic, 2011a, b, 2012, 2014, 2016a, b, c, 2017). For that reason, this paper attempts to make thorough analysis of specific issues of carbon dioxide emissions in the retail sector, firstly on the example of global retailers from different countries, primarily developed market economies, which, due to the general importance of the matter, publish reports on sustainable development with regular annual financial reports. This practice of global retailers provides them with more reliable information base for efficient management of carbon dioxide emissions through the whole value chain. This is particularly true for retailers in Serbia whose practice of making the reports on environment and sustainable development publicly available is at the very beginning.

The general research hypothesis in this paper is that the reduction of carbon dioxide emissions positively reflects on overall (integrated, especially environmental) performance of retailers. The methodology of the study of the given hypothesis is primarily based on the comparative analysis of the carbon dioxide emission of global selected retailers from various comparable countries of the developed market economy. The problem of comprehensiveness of the research on carbon dioxide emissions in retail is that, at the time being, there is no unified system of sustainable (environmental) reporting for all retailers. In addition, many retailers still do not publish this report, what as a consequence, has an incomplete “comparability” of data on carbon dioxide emissions by individual retailers. Nevertheless, knowledge of the importance and trend of carbon dioxide emissions from global retailers is very important in order to manage overall, integrated and, in particular, environmental performance in (concrete) retail. In view of

the global, other retailers will increasingly publish reports on sustainable development (with data on carbon dioxide emissions). In this way, they will increase its information base for more efficient management of total business, including environmental protection. This will have a positive impact on the achievement of the target profit.

Main data sources for the research of the treated problem in this paper are literature, articles, publications, studies, OECD, Eurostat and, in particular, officially disclosed annual financial and sustainable reports of (global) retailers. They were processed in such a way that is easy to comprehend the significance and trend of carbon dioxide emission in retail.

### Carbon dioxide emissions in retail companies

Different is the carbon dioxide emissions of individual retailers. This is shown by the results of the research in this paper.

At WalMart (United States of America, Dominant operational format: Hypermarket/Supercenter/Superstore), a great significance is given to reducing carbon dioxide emissions (Table 1). This is achieved by: investing in renewable energy sources, reducing energy demand, improving energy efficiency, improving refrigeration in stores and maximizing the efficiency of the vehicle fleet.

**Table 1.** Carbon dioxide emission (Scope 1 and 2) and retail area at WalMart, 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Carbon dioxide emission (million-ton CO <sub>2e</sub> )	18,9	19,3	20,1	20,8	20,3	20,6	20,8	21,2	21,0	21,9
Retail area (million square meters)	740	805	867	921	952	985	1,037	1,072	1,102	1,134
Carbon dioxide intensity (million tons CO <sub>2e</sub> /million m <sup>2</sup> )*	0,025	0,024	0,023	0,022	0,021	0,021	0,020	0,020	0,019	0,019

*Note: \*Calculations performed by the author*

*Source: Wal-Mart Stores, Inc. 2016 Global Responsibility Report,*

*<https://cdn.corporate.walmart.com/9c/73/3f9abcef444397f2c771e081e095/2016-global-responsibility-report.pdf#page=58&zoom=auto,-130,628>*

In generating greenhouse gas emissions, WalMart participates with: electricity supply 69%, refrigeration 18%, fuel transport 5.9%, fuel on the site 7% and mobile refrigerators with 0.1 % (Wal-Mart Stores, Inc. 2016 Global Responsibility Report, <https://cdn.corporate.walmart.com/9c/73/3f9abcef444397f2c771e081e095/2016-global-responsibility-report.pdf#page=58&zoom=auto,-130,628>). Therefore, the main source of greenhouse gas emissions in WalMart is electricity supply. With the increased application of the ecological operation principles, WalMart reduced carbon dioxide emissions from year to year, which reflects favourably on its overall performance, especially environmental.

In **Kroger** (United States, Dominant operational format: Hypermarket/Supercenter/Superstore) carbon dioxide emissions amounted to 32.9 (tonnes of CO<sub>2e</sub>/1,000 sq ft) in 2015, and 36.3 in 2006. This means that there was a 9.3% reduction achieved (2016 Sustainability Report/Kroger, <http://sustainability.kroger.com/environment-energy-carbon.html>). The effects of this decrease are the improvement of environmental and overall performance in the company Kroger.

In **Best Buy** (United States, Dominant operational format: Electronics Specialty), considerable attention is paid to the reduction of greenhouse gas emissions. This is shown in Table 2.

**Table 2.** Energy and greenhouse gas emissions at Best Buy

Key performance indicators	Data
Energy consumption within organisation	Fuel consumption: 2,883,506,400,000,000 joules Electric energy consumption: 1,074,586 MWh Total Scope 1&2: 1,975,560 MWh
Energy intensity	0,0332275 MWh/Sq Ft
Energy consumption reduction	34,415 MWh or 1,8% reductions from year to year
Direct emission of greenhouse gasses (GHG) (Scope 1)	219,869 MT CO <sub>2e</sub>
Indirect emission of greenhouse gasses (GHG) (Scope 2)	*354,451 MT CO <sub>2e</sub>
Other indirect emission of greenhouse gasses (GHG) (Scope 3)	1,019,791 MT CO <sub>2e</sub>
Green House Gasses emission (GHG) intensity	0.01017468 MT CO <sub>2e</sub> /Sq Ft
Green House Gasses emission reduction (GHG)	*120,444 MT CO <sub>2e</sub> , or 17,3% reductions from year to year

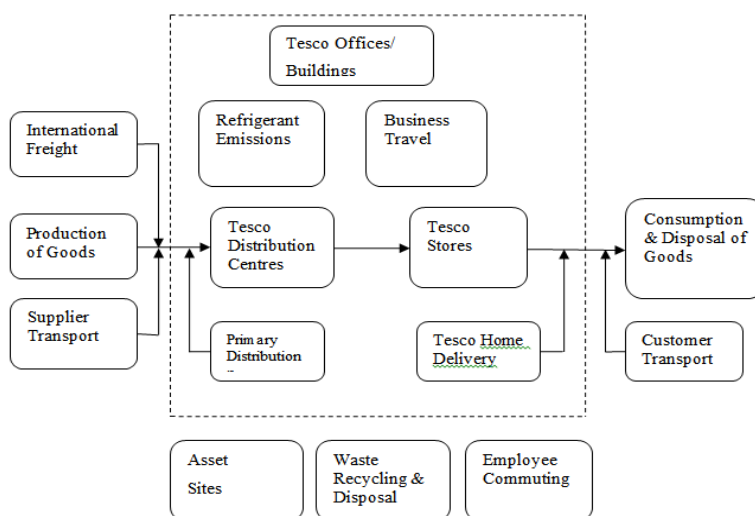
Note: \*RECs (Renewable Energy Credits) not included

Source: Best Buy Fiscal Year 2016 Corporate Responsibility & Sustainability Report, <https://corporate.bestbuy.com/wp-content/uploads/2016/06/fy16-full-report-final.pdf>

The data in the given table show that it is planned to achieve a significant reduction in emission of greenhouse gasses in Best Buy primarily by using renewable energy sources.

At **Tesco** (United Kingdom, Dominant operational format: Hypermarket/Supercenter/Superstore), as with WalMart, considerable attention is paid to the research and control of carbon dioxide emissions. This positively reflects on its overall performance, including the surrounding ones. In Figure 1, an illustration of the specificity of carbon dioxide emissions measurement at Tesco is shown.

Boundary for Direct Carbon Footprint



**Fig. 1.** Tesco's emission limit

Source: Carbon Footprint 101: A Guide for Food Retailers, <https://www.fmi.org/docs/sustainability/carbon-footprint-101-a-guide-for-food-retailers.pdf?sfvrsn=4#page=11&zoom=auto,-121.85>

Table 3 and Figure 2 show the greenhouse gas emissions in Tesco.

**Table 3.** Emission of greenhouse gases in Tesco

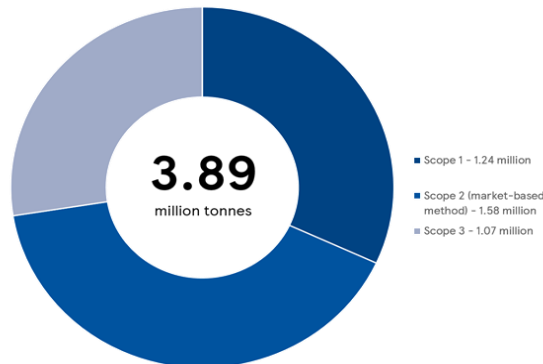
	Total ton CO <sub>2e</sub>		
	2016/17	2015/16	Base year

			2006/07
Scope 1	1,236,980	1,301,746	1,345,507
Scope 2			
Market-based method	1,582,275	2,004,992	Not available
Location-based method	2,357,245	2,528,323	2,259,984
Scope 1 and 2 carbon dioxide intensity (kgCO <sub>2e</sub> /sq ft of stores and distributive centres)	22,95	26,33	51,14
Scope 3	1,073,721	1,097,491	1,064,460
Total gross emission	3,892,977	4,404,230	4,669,951
CO <sub>2e</sub> from renewable energy exported to the grid	1,154	1,513	-
Total net emissions	3,891,822	4,402,717	4,669,951
Overall net carbon intensity (total net emissions kgCO <sub>2e</sub> /sq ft of stores and distributive centres)	31,69	35,06	66,23

Source: Tesco PLC Annual Report and Financial Statements 2017,  
[https://www.tescopl.com/media/392373/68336\\_tesco\\_ar\\_digital\\_interactive\\_250417.pdf](https://www.tescopl.com/media/392373/68336_tesco_ar_digital_interactive_250417.pdf)

The data in the given table show that the intensity of carbon dioxide emissions in Tesco is decreasing from year to year.

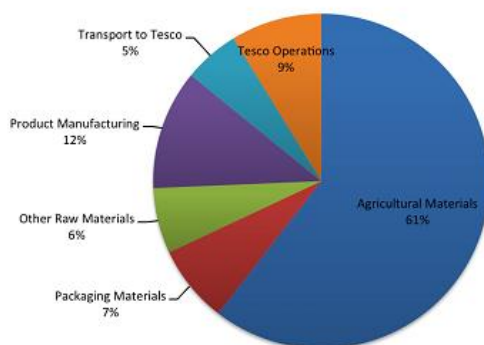
#### 2016/17 total carbon footprint (million tonnes CO<sub>2e</sub>)



**Fig. 2.** Total carbon dioxide (million tonnes of CO<sub>2e</sub>) in Tesco 2016/2017

Source: Tesco – Our carbon footprint, <https://www.tescopl.com/tesco-and-society/sourcing-great-products/reducing-our-impact-on-the-environment/our-carbon-footprint/>

Figure 3 shows sources of carbon dioxide emission throughout the value chain, with an emphasis on Tesco's participation in carbon footprint.



**Fig. 3.** Emissions of carbon dioxide by source in Tesco

Source: Tesco – Our Carbon Footprint, <https://www.tescopl.com/tesco-and-society/sourcing-great-products/reducing-our-impact-on-the-environment/our-carbon-footprint/>

Therefore, Tesco participated in total emission of carbon dioxide through entire value chain with 9%. Table 4 shows ecological performances at Tesco.

**Table 4.** Global ecological performances at Tesco

	2016/17	2015/16	2014/15	2013/14
Carbon dioxide (million-ton CO <sub>2e</sub> )	3,9	5,1	5,26	-
Emission of CO <sub>2</sub> reduction (stores and distributional centres) compared to 2006/07	40,5%	39,5%	38,3%	-
Emission of CO <sub>2</sub> reduction (distribution) compared to 2011/12	19,7%	17,4%	14,47%	7,8%
Direct water consumption (million m <sup>3</sup> )	23,5	25,5	32,6	32,9
Waste percentage (food and non-food) which is recycled, used again or turn into energy	93%	88%	84%	86%

Source: Reducing our impact on the environment, <https://www.tescopl.com/tesco-and-society/sourcing-great-products/reducing-our-impact-on-the-environment/>

Tesco has tendency to improve ecological performances (carbon dioxide emission reduction, direct water consumption reduction and waste treatment improvement). This reflects favourably on its market, economic and financial performances.

Due to the increasing importance, special attention is paid to carbon dioxide emissions in **Marks & Spencer (M & S)** (United Kingdom, Dominant Operating Format: Department Store), as shown in Table 5.

**Table 5.** Emission of carbon dioxide in Marks & Spencer

	Plan A baseline 2006/7 (000 tCO <sub>2e</sub> )	Legal baseline 2013/14 (000 tCO <sub>2e</sub> )	Last year 2014/15 (000 tCO <sub>2e</sub> )	2015/16 000 tCO <sub>2e</sub>	Achievement in relation to 2006/7
Total gross/location-based emission CO <sub>2e</sub>	732	567	592	566	-23%
Total carbon intensity measure (per 1000 sq ft of sales floor (ton CO <sub>2e</sub> /1,000 sq ft)	46	30	30	29	-47%

Source: M & S Plan Report 2016, [http://annualreport.marksandspencer.com/M&S\\_PlanA\\_Report\\_2016.pdf](http://annualreport.marksandspencer.com/M&S_PlanA_Report_2016.pdf)

At Marks & Spencer, a decrease in carbon dioxide emissions was recorded in 2014/15 in relation to 2006/7. Reduction was achieved by improving energy efficiency using the so-called “green energy” through the whole value chain. In **Kingfisher** (United Kingdom, Dominant operational format: Home improvement), significant attention is paid to carbon dioxide emissions. Table 6 shows the dynamics of greenhouse gas emissions at Kingfisher.

**Table 6.** Emission of greenhouse gases in Kingfisher (tons of CO<sub>2</sub>e)

	2010/1	2013/14	2014/15	2015/16
Carbon footprint from fuel combustion and factories (scope 1)	157,590,10	164,172,96	146,806,65	156,062
Carbon footprint from electricity, heating and steam (scope 2)	247,774,97	230,759,93	258,392,29	246,775
Absolute carbon footprint (scope 1 and 2) (aimed at 25% reduction until 2020)	405,365,07	394,932,89	405,198,94	402,837
Carbon footprint per m <sup>2</sup> of sales area	61,00	56,27	53,26	51,9

Source: Kingfisher – Sustainability Report 15/16,

[http://www.kingfisher.com/sustainability/files/reports/cr\\_report\\_2016/2016\\_Sustainability\\_Report.pdf](http://www.kingfisher.com/sustainability/files/reports/cr_report_2016/2016_Sustainability_Report.pdf)

Company Kingfisher achieved a reduction of greenhouse gas emissions by 5% 2015/16 compared to 2010/11. Their goal is to achieve a reduction of up to 25% by 2020. Kingfisher has been decreasing greenhouse gas emissions from year to year. In **IKEA** company (Sweden, Dominant operational format: Other Specialty) that operates with furniture, considerable attention is paid to improving the research methodology and the greenhouse gas emission control system. This is shown in Table 7.

**Table 7.** Emissions of carbon dioxide in IKEA, 2016

	FY2016
Carbon footprint (tonnes CO <sub>2</sub> )	
Scope 1	209,484
Scope 2	621,932
Scope 3	39,161,131
Total	39,992,548
Carbon footprint at each stage of value chain (tonnes CO <sub>2</sub> )	
Raw material	16,562,759
Production and distribution	3,142,796
Suppliers (home furnishing and catalogue)	2,199,035
Goods transport	943,761
IKEA Group operations	1,020,366
Scope 1 and 2 from IKEA operations	831,416
Business travel	52,368
Co-worker commuting	136,582
Shopping centre tenants	172,373
Customers	18,162,615
Transportation to stores	3,480,107
Product use (light sources and appliances)	14,682,507
Products’ “end of life”	931,639
Total	39,992,548

Source: IKEA Group – Sustainability Report FY16,

[http://www.ikea.com/ms/en\\_US/img/ad\\_content/IKEA\\_Group\\_Sustainability\\_Report\\_FY16.pdf](http://www.ikea.com/ms/en_US/img/ad_content/IKEA_Group_Sustainability_Report_FY16.pdf)

Table 8 shows the efficiency of carbon footprint in IKEA.

**Table 8.** Carbon efficiency in the company IKEA

Carbon efficiency for Scope 1 and 2 emissions					
	FY10	FY14	FY15	FY16 (excluding IKEA centres)	FY16 (including IKEA centres)
Kg CO <sub>2</sub> per m <sup>3</sup> product sold	34,3	27,5	24,4	17,5	32,8
Carbon efficiency (% improvement against FY10 baselines)					
	FY10	FY14	FY15	FY16	FY20 goal
Retail		37,8	39,6	48,0	50
Distribution centres		51,2	54,1	58,2	50
IKEA Industry Group Divisions flat line and Solid Wood		18,3	30,9	71,0	50
IKEA Industry Group Division Board		3,0	18,7	36,4	50
IKEA components (base year FY13)		7,8	33,8	35,8	50
Total		19,8	28,9	49,0	50
IKEA Carbon footprint from consumed electricity in FY16					FY16
Consumed electricity (MWh)					3,008,893
Location based emissions (tonnes CO <sub>2</sub> )					1,266,578
Market based emissions (tonnes CO <sub>2</sub> )					578,551
Footprint reduction from using electricity from renewable sources (%)					54,3

Source: IKEA Group – Sustainability Report FY16,

[http://www.ikea.com/ms/en\\_US/img/ad\\_content/IKEA\\_Group\\_Sustainability\\_Report\\_FY16.pdf](http://www.ikea.com/ms/en_US/img/ad_content/IKEA_Group_Sustainability_Report_FY16.pdf)

In IKEA, significant reduction in carbon footprint is achieved through the growing use of renewable energy. The share of renewable resources in the total consumption of electricity in IKEA year after year was as follows: FY14 – 40%, FY15 – 53.4% and FY16 – 71.0% (IKEA Group – Sustainability Report FY16, [http://www.ikea.com/ms/en\\_US/img/ad\\_content/IKEA\\_Group\\_Sustainability\\_Report\\_FY16.pdf](http://www.ikea.com/ms/en_US/img/ad_content/IKEA_Group_Sustainability_Report_FY16.pdf)). Increased consumption of the so-called “green energy” has had a positive impact on the IKEA’s environmental and overall performance. Also, company IKEA pays significant attention to improving the transport system (logistics) in order to reduce carbon dioxide emissions. This is shown in Table 9.

**Table 9.** Product transport efficiency (impact on carbon dioxide emissions) in IKEA

	FY14	FY15	FY16	FY20 goal
CO <sub>2</sub> per cubic meter of products transported	32,7	28,2	26,6	-
Reduction in CO <sub>2</sub> per cubic meter of products transported compared with FY11 (%)	12,3	24,4	26,7	30

Source: IKEA Group – Sustainability Report FY16,

[http://www.ikea.com/ms/en\\_US/img/ad\\_content/IKEA\\_Group\\_Sustainability\\_Report\\_FY16.pdf](http://www.ikea.com/ms/en_US/img/ad_content/IKEA_Group_Sustainability_Report_FY16.pdf)

It is a general conclusion that IKEA has increased reduction of carbon dioxide emissions, which reflects favourably on its overall performance, in particular its environment.

At **H & M Group** (Sweden, Dominant operational format: Apparel/Footwear Specialty), considerable attention is paid to the reduction of carbon dioxide emissions. This is shown in Table 10.

**Table 10.** Carbon dioxide emission at H & M Group

	2012	2013	2014	2015	2016
Carbon emissions per million SEK sales turnover including VAT (constant exchange rate)	2,04t	2,05t	1,72t	0,69t	0,36t
Total CO <sub>2e</sub> emissions to previous year in % (Scope 1 and 2) versus growth in sales (in local currencies)					
Net sales		9%	14%	11%	7%
Emissions		356,373t	341,675t	151,753t	80,54t

Note: SEK – Swedish crown

Source: The H & M Group sustainability report 2016,

[http://sustainability.hm.com/content/dam/hm/about/documents/en/CSR/Report%202016/HM\\_group\\_SustainabilityReport\\_2016\\_FullReport\\_en.pdf](http://sustainability.hm.com/content/dam/hm/about/documents/en/CSR/Report%202016/HM_group_SustainabilityReport_2016_FullReport_en.pdf)

In 2016, H & M made a reduction of carbon dioxide emissions by 47% compared to 2015.

In **Inditex Group** (Spain, Dominant Operating Format: Apparel/Footwear Specialty), to which Zara also belongs, considerable attention is paid to research on carbon dioxide emissions and its reduction. This is shown in Table 11.

**Table 11.** Emission of greenhouse gases in Inditex

	2012	2013	2014	2015
Scope 1 (tCO <sub>2eq</sub> )	24,479	22,528	21,347	22,996
Scope 2 (tCO <sub>2eq</sub> )	589,758	627,982	666,188	622,879
Number of clothes sold on the market	869,167,058	948,745,988	1,018,995,911	1,177,784,343
CO <sub>2</sub> per item sold on market	706,70	685,65	674,72	548,38
Avoided emissions by using generators of thermal energy (tCO <sub>2eq</sub> )	NA	NA	NA	5,339,59
Scope 3 Downstream transportation (tCO <sub>2eq</sub> )	398,168	462,120	596,316	672,307
Scope 3 Upstream transportation (tCO <sub>2eq</sub> )	NA	NA	NA	42,258
Scope 3 Franchise stores (tCO <sub>2eq</sub> )	100,143	108,035	113,094	94,262

Note. NA – not available

Source: Inditex – Annual Report 2015

<https://www.inditex.com/documents/10279/205236/Inditex+Annual+Report+2015+web.pdf/9979097b-9e63-489a-ad16-a141b6b665b4>

Therefore, the result of efficient management is the reduction of carbon dioxide emissions in Inditex.

In 2015, **Carefour** (France, Dominant operational format: Hypermarket/Supercenter/Superstore) emitted 3.61 million tonnes of CO<sub>2e</sub>. In 2015, carbon dioxide emissions were reduced by 29.7% compared to 2010. The aim is to achieve a reduction in carbon dioxide emissions by 40% until 2025 and 70% until 2050 (Unique and Multiple/2015 Annual Activity and Responsible Commitment Report, [http://www.carrefour.com/sites/default/files/carrefour\\_2015\\_annual\\_activity\\_and\\_responsible\\_commitment\\_report.pdf](http://www.carrefour.com/sites/default/files/carrefour_2015_annual_activity_and_responsible_commitment_report.pdf). This will have a positive impact on Carefour's environmental and overall performance).

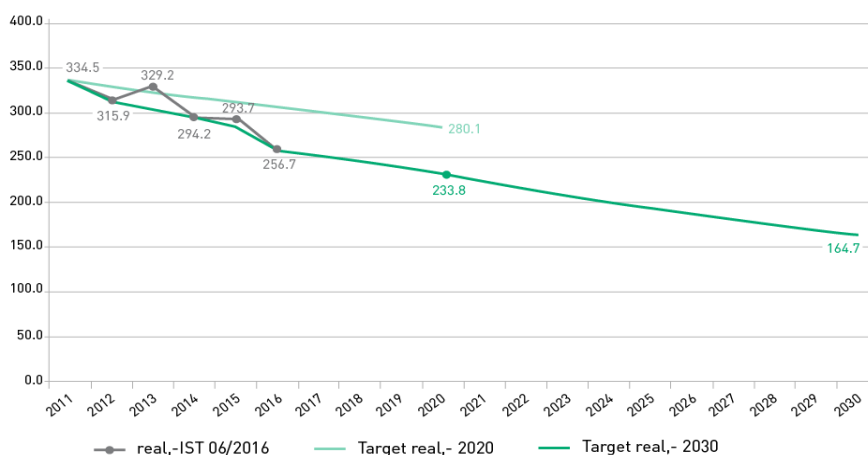
**Metro Group** (Germany, Dominant operational format: Cash & Carry/Warehouse Club) regularly discloses reports on corporate responsibility, in which carbon dioxide emissions are represented in particular, as shown in the Table 12.

**Table 12.** Greenhouse gas emissions in Metro Group (tonnes of CO<sub>2</sub>e)

	Year of reference 2011	2013/14	2014/15	2015/16
Scope 1 – direct emission of greenhouse gasses	1,084,509	1,015,598	871,837	760,186
Scope 2 – indirect emission of greenhouse gasses	2,432,102	1,786,594	1,495,710	1,416,418
Scope 3 – other indirect emission of greenhouse gasses	6,113,122	5,562,362	5,151,775	4,589,161
Total emission of greenhouse gasses	9,629,733	8,364,553	7,519,322	6,765,764

Source: Metro Group – Corporate Responsibility Report 2015/16 – Key Performance Indicators and Goals, <https://www.metrogroup.de/.../reports/metro-group-corporate-responsibility-report-2015>

Data in this table show that Metro Group reduces emissions of greenhouse gases from year to year. The intensity of carbon dioxide emissions is reduced from year after year (Fig. 4). This reflects favourably on its overall performance, including environmental.



**Fig. 4.** Emission of carbon dioxide in Metro Group (kgCO<sub>2</sub>/m<sup>2</sup> of sales area (referring to total sales space 2,003,960 m<sup>2</sup>))

Source: Metro Group - Corporate Responsibility Report 2015/16 - Key Performance Indicators and Goals, <https://www.metrogroup.de/.../reports/metro-group-corporate-responsibility-report-2015>

**Aldi** (Germany, Dominant operational format: Discount Store) also publishes reports on sustainable development, in which special attention is paid to the emission of carbon dioxide. Table 12 shows the greenhouse gas emissions at Aldi.

**Table 12.** Greenhouse gases emission in Aldi (tons CO<sub>2</sub>e)

	2014	2015
Scope 1	284,831	312,940
Scope 2	369,961	567,424
Total	654,792	680,364

Source: Aldi – Sustainability Report 2015, [https://www.cr-aldinord.com/2015/wp-content/uploads/sites/2/2016/04/ALDI\\_North\\_Group\\_NHB\\_Sustainability\\_Report\\_2015.pdf](https://www.cr-aldinord.com/2015/wp-content/uploads/sites/2/2016/04/ALDI_North_Group_NHB_Sustainability_Report_2015.pdf)

At Aldi, greenhouse gases emissions by sectors (in percent) in 2015 were as follows: electricity 53.1%, cooling equipment 20.0%, heating energy 14.3% and logistics 12.6% (Aldi – Sustainability Report 2015, [https://www.cr-aldinord.com/2015/wp-content/uploads/sites/2/2016/04/ALDI\\_North\\_Group\\_NHB\\_Sustainability\\_Report\\_2015.pdf](https://www.cr-aldinord.com/2015/wp-content/uploads/sites/2/2016/04/ALDI_North_Group_NHB_Sustainability_Report_2015.pdf)).

In order to reduce greenhouse gas emissions, special attention is paid to the use of energy from renewable sources (LED lamps).

At **Ahold** (Germany, Dominant operational format: Supermarket), considerable attention is paid to the reduction of carbon dioxide emissions. This is shown in Table 13.

**Table 13.** Carbon dioxide emission at Ahold

	2008	2009	2010	2011	2012	2013	2014	2015
Carbon dioxide emissions (thousand tons)				2,176	2,106	2,107	2,090	2,019
Carbon dioxide emissions (kg CO <sub>2</sub> /m <sup>2</sup> sales area)	567	574	543	507	480	473	465	420
Sources (%)								
Electricity								49%
Refrigerant appliances								29%
Fuel								12%
Gas								10%

Source: Ahold – Responsible Retailing Report 2015,

<https://www.aholddelhaize.com/media/1934/ahold-responsible-retailing-report-2015.pdf>

Carbon dioxide emissions at Ahold has been decreasing year after year. Since 2016, Ahold has been operating under the name of Ahold Delhaize. In view of this, Table 14 shows data on carbon dioxide emissions for Ahold Delhaize (Belgium, Dominant operational format: Supermarket) in 2016.

**Table 14.** Carbon dioxide emission at Ahold Delhaize

	2016 Actuals	2020 Target
% reduction in CO <sub>2</sub> equivalent emissions per m <sup>2</sup> of sales area (from 2008 baseline)	-22%	-30%
Total CO <sub>2</sub> equivalent emissions per m <sup>2</sup> of sales area – location-based approach	496	n/a
Total CO <sub>2</sub> equivalent emissions (thousand tonnes) – location-based approach	4,505	n/a
Total Scope 1 CO <sub>2</sub> equivalent emissions (thousand tonnes) – location-based approach	1,940	n/a
Total Scope 2 CO <sub>2</sub> equivalent emissions (thousand tonnes) – location-based approach	2,420	n/a
Total Scope 3 CO <sub>2</sub> equivalent emissions (thousand tonnes) – location-based approach	144	n/a
Offset CO <sub>2</sub> equivalent emissions (thousand tonnes)	241	n/a
Avoided grid electricity CO <sub>2</sub> emissions (thousand tonnes)	31	n/a

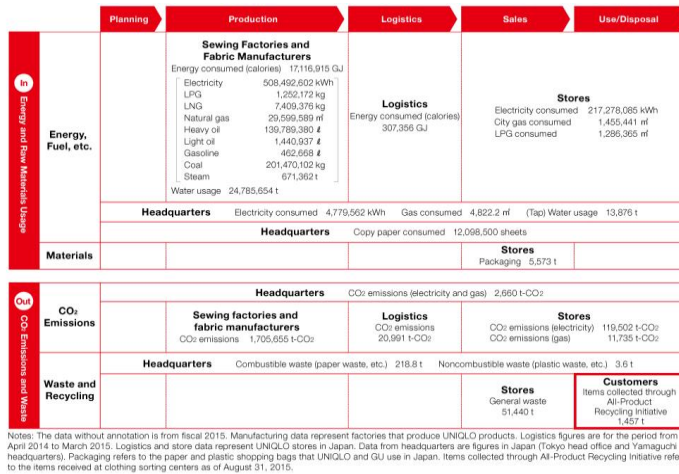
Source: Ahold Delhaize Supplementary report on Sustainable Retailing performance 2016,

<https://www.aholddelhaize.com/media/3984/supplementary-report-on-sustainable-retailing-performance-2016.pdf>

Significant reduction in carbon dioxide emissions by 2020 (30%) is expected at Ahold Delhaize. This will be achieved by using so-called “green energy” in business operations.

Sources of carbon dioxide emissions were: electricity 60%, cooling devices 31% and transport 9% (Ahold Delhaize Supplementary Report on Sustainable Retailing performance 2016, <https://www.aholddelhaize.com/media/3984/supplementary-report-on-sustainable-retailing-performance-2016.pdf>). Delhaize Serbia is also part of Ahold Delhaize which employs the same sustainable development strategy and environment reporting as well as company at its higher organizational level.

In the **Fast Retailing** (Japan, Dominant Operating Format: Apparel/Footwear Specialty), exceptional attention is devoted to the issue of carbon dioxide emission reduction. Figure 5 shows carbon dioxide emissions through the entire value chain in Fast Retailing.



**Fig. 5.** Sustainable reporting – Carbon dioxide emission through value chain in Fast Retailing

Source. *Fast Retailing – Sustainability Report*,

[http://www.fastretailing.com/eng/sustainability/environment/co2\\_popup.html](http://www.fastretailing.com/eng/sustainability/environment/co2_popup.html)

In 2016, at Fast Retailing, carbon dioxide emissions amounted to 2,917,069 (tCO<sub>2e</sub>). In logistics it was 17,707 (tCO<sub>2e</sub>). Table 15 presents carbon dioxide emission (tCO<sub>2e</sub>) in stores and management offices by sources (generators) at Fast Retailing for 2016.

**Table 15.** Carbon dioxide emission in stores and management according to sources (generators) at Fast Retailing for 2016 (tCO<sub>2e</sub>)

Store gas	11,436
HQ gas	38
Total	11,474
Scope 1	
Store electricity	123,932
HQ electricity	2,466
Total	126,398
Scope 2	

Source: *Fast Retailing – Sustainability Report 2017*,

[http://www.fastretailing.com/eng/sustainability/report/pdf/sustainability2017\\_en.pdf#page=1&pagemode=thumbs&zoom=80](http://www.fastretailing.com/eng/sustainability/report/pdf/sustainability2017_en.pdf#page=1&pagemode=thumbs&zoom=80)

Fast Retailing plans to reduce carbon dioxide emissions in stores by 10% by 2020 (Fast Retailing – Sustainability Report 2017, [http://www.fastretailing.com/eng/sustainability/report/pdf/sustainability2017\\_en.pdf#page=1&pagemode=thumbs&zoom=80](http://www.fastretailing.com/eng/sustainability/report/pdf/sustainability2017_en.pdf#page=1&pagemode=thumbs&zoom=80)).

For the purpose of more complex analyzes of greenhouse gas emissions by selected retailers, Table 16 shows the trend of greenhouse gas emissions for retailers in the United States and Great Britain.

**Table 16.** Trend of greenhouse gases in US and UK

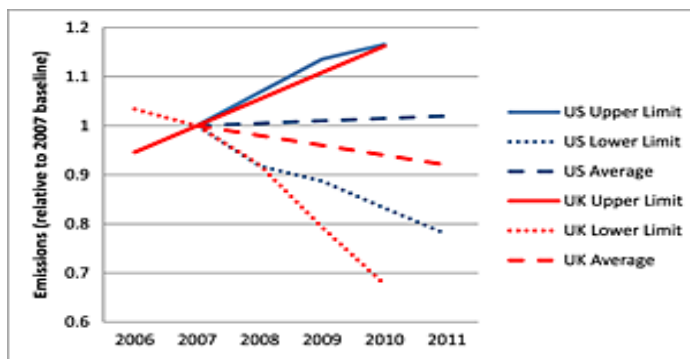
Company	Annual Change in GHG Emissions (%/year)
<i>UK Retailers</i>	
Asda	-3.67 (over 3 years)
Co-operative	-7.69 (4 years)
Marks and Spencer	-3.21 (4 years)
Morrisons	-2.22 (5 years)
Sainsbury's	-0.88 (5 years)
Tesco	+5.28 (4 years)
<i>US Retailers</i>	
Costco	5.23 (over 3 years)
Kroger	2.71 (5 years)
Lowe's	-2.11 (4 years)
Sears	-6.05 (4 years)
Target	0.98 (4 years)
Wal-Mart	2.19 (6 years)

Notes: a UK company based on Sullivan and Gouldson (2013).

b US company data based on company responses to the 2012 CDP survey

Source: Sullivan, (2016)

In order to have more comprehensive understanding on differences Figure 12 presents comparative analysis of the greenhouse gas emission of US and UK retailers for the period 2006-2011.



Notes:

1. See Table 2 for sources.
2. All data have been normalised against a 2007 baseline.
3. The UK and US Averages are arithmetic averages across the six UK and six US companies presented in Table 1. It has been assumed that these emissions have changed in a linear manner over the period 2007 to 2011.

**Fig. 6.** Comparative trend of greenhouse gas emissions of US and UK retailers

Source: Sullivan, (2016)

As well as in Fig. 6, the data in the given table show various annual changes in the greenhouse gas emissions between retailers UK and US. Thus, for example, in the UK, the highest annual positive percentage changes in greenhouse gas emissions are in Tesco (+5.28), and in US in the retailer Costco (5.23). Concerning the negative annual changes in the greenhouse gas emissions, the largest are in the UK in Cooperative (-7.69) and in the US in Sears (-6.05). The conclusion is that there is, to some extent, higher reduction in greenhouse gas emissions from retailers in the UK than in the US.

## Carbon dioxide emissions in retail companies of Serbia

In Serbia there is a significantly smaller number of (domestic) retailers who disclose sustainable development reports compared to other countries, with the expectation that this number will increase significantly in the future. In this regard, the company of the Naftna Industrija Srbije (NIS) is leading and for or a long period of time, it has regularly published a sustainable development reports, compiled in accordance with the G4 Global Reporting Initiative (GRI) Guidelines. Table 17 shows the amount of air pollutants emitted in the Naftna Industrija Srbije for 2014, 2015 and 2016.

**Table 17.** Amount of emitted air pollutants in Naftna Industrija Srbije

	2014	2015	2016
Emission CO <sub>2</sub> (t)	1457	3464	3649
Emission NO <sub>2</sub> (t)	601	1064	905
Emission of powdery materials (t)	30	74	51

*Source: NIS Sustainable Development Report 2015 a 2016*

In Naftna Industrija Srbije, appropriate measures are continuously being undertaken in order to reduce the emissions of greenhouse gases in the future.

## Conclusion

A growing number of retailers in the world are increasingly publishing reports on sustainable development. By their reputation, and because of its importance, other retailers will certainly tend to publish this report in the future. It provides the basis for a comparative analysis of environmental performance in retail from various aspects. In this report, special significance is given to trend of greenhouse gas emissions, in particular, carbon dioxide.

Carbon dioxide emissions in trade, in total and by sectors, vary by country. It is significantly higher in China than in Europe or the European Union. Likewise, carbon dioxide emissions are significantly higher in trade of France, Germany and Great Britain than in Greece, Croatia, Turkey and Serbia. Carbon dioxide emissions are higher in Croatia's trade than in Serbian.

These differences are due to the application of various ecological measures in business.

Carbon dioxide emissions differ in individual stages of the product life cycle, retail companies and product categories. Carbon dioxide emission generators in retail companies are: electricity, transport, ventilation, heating and cooking, refrigeration, and waste. The goal of all retailers is to take appropriate measures, primarily ecological in nature, to reach a planned reduction of carbon dioxide emissions in the future. Among other things, this is achieved with the increasing use of electricity from renewable sources (so-called "green energy"), by using modern ventilation, heating and cooking systems, refrigeration units, green logistics (ecological vehicles) and more efficient waste treatment. The effect of this is to improve the overall performance of retail companies, especially environmental.

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