

THE VOLKSWAGEN EMISSIONS SCANDAL – FACTS, FIGURES AND EFFECTS

CODRUȚA DURA¹

Abstract: The paper analyzes the unethical behavior of a big corporation in relation to the business environment and the relevant stakeholders, being focused on the famous corruption scandal caused by the car manufacturer Volkswagen, at the end of the year 2015. This case has been in the attention of management specialists, practitioners and public opinion, following the discovery of practices used by Volkswagen representatives for fraudulent scheduling of laboratory tests aimed at measuring nitrogen oxide (NOx) emissions for Diesel TDI engines produced between 2009-2015. By deluding government's regulation, Volkswagen has triggered a huge scandal which caused destructive effects upon the company and its stakeholders: significant drop in sales' volume; a historical fall in shares prices; a real threat upon the public health; charges of deceptive manipulation and reputation damages etc.

Keywords: sustainable development, unethical behavior, Dieselgate, corruption scandal, company's reputation

JEL CLASSIFICATION: M21, Q01, K40

1. INTRODUCTION

The ethical behavior in business and the social responsibility of corporations are notions closely linked to the concept of sustainable development. This is a relatively new concept in economic theory, its first use being recorded by the literature in 1987, in the Brundtland Report (name of the Norwegian Prime Minister at the time) released by the World Commission for Environment and Development, a report which was suggestively entitled "Our common future". According to this document, the notion of sustainable development designates that type of development "*which ensures the satisfaction of present needs, without compromising the possibility of future generations to meet their own requirements*"[www.iisd.org]. In this context, the term "development" is synonymous not only with growth, but also with the transition of an

¹ *Assoc. Prof., Ph. D., University of Petroșani, Romania, codrutadura@yahoo.com*

economic system from an old qualitative state to a new one, or from a lower level of development to a higher one.

By its very definition, this concept has three distinct dimensions: i) *economic*, which takes into account the optimization of the processes of use and capitalization of the non-renewable resources; ii) *ecological*, which focuses on protecting the environment and reducing pollution; iii) *socio-cultural*, which aims to ensure a decent standard of living for all members of the society.

At the level of the business organizations, the sustainable development considers the drawing up and observance of a set of ethical principles that govern the way of running the business, at the same time with the adequate management of the economic, social and ecological risks that the carried out operations can exert in the medium and long term on social development, ensuring the protection, support and improvement of human, financial and natural capital resources that any corporation inherits in the economic activity. Therefore, an economic entity that adopts the principles of sustainable development devises a long-term business strategy and envisages full compliance with a set of ethical and moral values shared by all partners operating in the same business environment.

2. VOLKSWAGEN'S ACTIVITIES ON THE INTERNATIONAL ARENA

Volkswagen AG, the parent company of the Volkswagen Group, is a multinational company headquartered in Wolfsburg, Germany. It designs, manufactures and distributes passenger and commercial vehicles, motorcycles, engines and provides related services, including financing, leasing and fleet management. Today, Volkswagen AG is a company with a key position in the international market of car manufacturers, being recognized as the 6th largest company in the world, according to a ranking that was released by Fortune Global 500 at the end of 2017.

The Volkswagen Group sells cars under the Audi, Bentley, Bugatti, Lamborghini, Porsche, SEAT, Škoda and Volkswagen brands; motorcycles under the Ducati brand; and commercial vehicles under other brands such as MAN, Scania and Volkswagen Commercial Vehicles. The group is organized into two main divisions, namely *the car division* and *the financial services division*, and owns two large joint venture companies in China: FAW-Volkswagen and SAIC Volkswagen. The company operates in approximately 150 countries and has approximately 100 production units in 27 countries.

According to a statistics published by the *International Automobile Manufacturers Organization* (OICA=Organisation Internationale des Constructeurs d'Automobiles), Volkswagen was the first car manufacturer in the world at the end of 2017, according to the number of units sold (10,226,657), being followed in this top by the Japanese manufacturer Toyota with 10,078,778 units and Renault Nissan Alliance with 9,637,070 units (see table 1).

Table 1 The largest car manufacturers in the world by sales volume

Rank 2017	Rank 2016		Sales 2016	Sales 2017	2017 +/- %	Share 2017
1	1	Volkswagen Group	10,226,657	10,603,433	3.7%	11.2%
2	2	Toyota Group	10,078,778	10,316,632	2.4%	10.9%
3	3	Renault Nissan Alliance	9,637,070	10,256,350	6.4%	10.9%
4	4	General Motors	8,905,809	8,999,852	1.1%	9.5%
5	5	Hyundai-Kia	7,957,443	7,302,810	-8.2%	7.7%
6	6	Ford Group	6,389,252	6,283,780	-1.7%	6.7%
7	7	Honda Motor	4,934,199	5,264,860	6.7%	5.6%
8	8	F.C.A.	4,834,981	4,837,246	0.0%	5.1%
9	9	P.S.A.	4,416,009	4,245,218	-3.9%	4.5%
10	10	Suzuki	2,838,683	3,174,057	11.8%	3.4%

(Source: <https://focus2move.com/world-car-brands-ranking/>)

Through its brands, the Volkswagen Group covers all relevant markets on the Globe, with significant sales volumes in areas such as Western Europe, China, USA, Brazil and Czech Republic (see table 2).

Table 2 Motor vehicle production by region in Volkswagen Group between 2016 and 2017 (no. of units)

CONTINENT	COUNTRY	MAKE	YEAR 2016	YEAR 2017
			SUM	SUM
AFRICA	South Africa	Volkswagen	123,854	110,299
AMERICA	Argentina	Volkswagen	19,557	21,093
		Audi	7,846	5,159
	Brazil	Volkswagen	316,282	408,376
		Total	324,128	413,535
		Audi	10,746	158,543
	Mexico	Volkswagen	414,685	461,248
		Total	425,431	619,791
		USA	Volkswagen	93,539
	TOTAL		862,655	1,166,844

ASIA	China	Audi	555,788	552,659
		Volkswagen	3,340,522	3,488,520
		Total	3,896,310	4,041,179
	India	Audi	5,667	6,513
		Volkswagen	148,455	156,090
		Total	154,122	162,603
	TOTAL		4,050,432	4,203,782
EU	Belgium	Audi	105,252	95,288
	Czech Republic	Volkswagen	761,187	858,103
	Germany	Audi	852,940	731,119
		Porsche	235,509	255,016
		Volkswagen	1,605,924	1,459,380
		Total	2,694,919	2,445,515
	Hungary	Audi	122,975	105,491
	Italy	Audi	3,579	4,056
	Poland	Volkswagen	95,811	102,415
	Portugal	Volkswagen	85,131	110,256
	Slovakia	Audi	102,614	105,640
		Volkswagen	215,543	196,991
		Total	318,157	303,631
	Spain	Audi	135,852	114,372
		Volkswagen	610,016	585,337
Total		745,868	699,709	
UK	Volkswagen	11,762	10,552	
TOTAL		4,944,095	4,735,016	
EUROPE	Russia	Volkswagen	145,245	166,393
TOTAL			10,126,281	10,382,334

(Source: <http://www.oica.net/>)

In Romania, Volkswagen is one of the most demanded car brands by consumers, the purchase decision being based on elements such as: the high quality of the models offered by the German brand, their reliability, the advantageous price, the existence, at national level, of a good network of car dealers and services that offer cheap spare parts and quality maintenance services etc.

3. THE VOLKSWAGEN EMISSIONS SCANDAL – A CHRONOLOGICAL VIEW

In 2013, an NGO called *The International Council on Clean Transportation* (ICCT) discovered, during a research conducted in collaboration with the *University of West Virginia* in the United States, that some Diesel models produced by Volkswagen were running on nitrogen oxides (NOx) up to 35 times higher under real conditions of use, compared to the limits set by the US *Environmental Protection Agency* (EPA).

In Europe, the Euro 5 standard is applied for Diesel engines and, according to it, the maximum limit for NOx is 0.18 g / km. CO₂ emissions are the best known to the general public, and in order to keep them under control, some local governments in the European Union set certain taxes that car owners pay in proportion to the values that their car records in tests that measure CO₂ emissions. According to a number of documents released by EPA specialists, scientific studies conducted in recent years have established a strong correlation between inhalation of nitrogen oxides and worsening health status of patients with asthma or other respiratory diseases. There is also a positive association between the amount of NOx present in the atmosphere and the number of premature deaths of people suffering from cardiovascular disease. ICCT specialists tested three car models: a Volkswagen Jetta model that used an LNT (lean-NOx trap) system to capture nitrogen oxides (without urea); a Volkswagen Passat model with a catalytic system for selective reduction of urea (SCR); a model of BMW X5 with SCR. At the time, an essential ingredient of the promotion mix implemented by the Volkswagen Group was Diesel engine - shown to be the most efficient in terms of low fuel consumption and the least significant impact on environmental pollution. As a result of this aggressive marketing strategy, the volume of sales achieved in the global car market was impressive. The testing was done under real traffic conditions and, to the surprise of all those involved, the Volkswagen Passat model generated NOx emissions up to 20 times higher than the legal standard on which it was approved for sale, while the model by Volkswagen Jetta had NOx emissions up to 38 times higher than the standard level allowed.

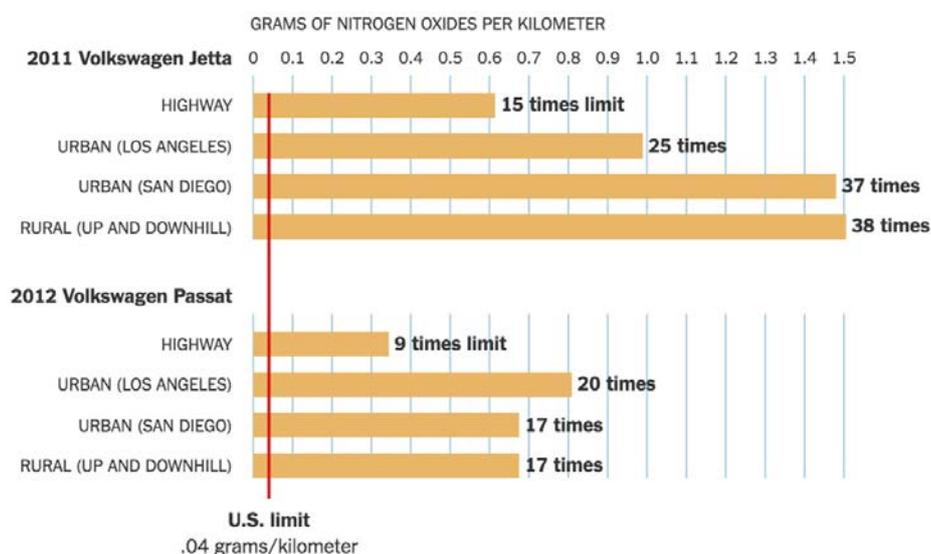


Fig. 1. Average emissions of nitrogen oxides in on-road testing according to the study carried out by ICTT&West Virginia University between 2011 and 2012
(Source: Arvind Thiruvengadam, Center for Alternative Fuels, Engines and Emissions at West Virginia University)

On the other hand, the BMW X5 model which was tested, fell within the legal limits allowed for emissions of pollutants, except in the case where a ramp in extra-urban mode climbed. The two Volkswagen models under test were approved in the standard called US-EPA Tier2-Bin5, which requires nitrogen oxide (NOx) emissions lower than the 0.05 g / mile level, i.e. 0.03 g / km. Thus, if the Volkswagen Jetta model subjected to ICCT checks had NOx emissions up to 35 times higher than the legal limit, it is possible that under actual conditions of use, the amount of nitrogen oxides could reach 1 g / km. Given that the differences between test results and the statements of Volkswagen representatives were huge, researcher Arvind Thiruvengadam called for repeated tests to elucidate the results.

ICTT suspected that Volkswagen specialists had deliberately installed a programming code that allowed the computer to detect that the car is under official testing conditions and to start the exhaust aftertreatment system (NOx catalyst) only in these conditions. ICTT summarized the data obtained for 15 vehicles purchased from three different sources and transmitted these research results to EPA and CARB - *California Air Resources Commission*.

EPA initiated the Volkswagen case investigation in May 2014, based on data from ICCT. The two parties involved in the investigations - EPA and Volkswagen - have been holding a series of discussions on the topic of emissions for several months. Volkswagen Group representatives stated different reasons why, in their opinion, the test results differed significantly from the maximum values allowed - from the weather conditions, to the insufficient experience of the ICCT, CARB and EPA specialists. At the same time, however, the researchers investigated the source code of the software used in cars sold by the Germans and found that it sent parallel signals to the measuring instruments in the laboratories, confusing them with false values. In the face of irrefutable evidence from EPA and ICCT, the CEO of the German concern was forced to acknowledge, on September 25, 2015, that Volkswagen deliberately cheated in EPA emissions tests and publicly apologized to clients and stakeholders, trying to recover what was left of the customers' trust with the company. In table 4, the chronology of the events that led to the Volkswagen corruption scandal was synthesized.

Table 4: Timeline of events that led to the Volkswagen scandal

2004–2009	Gradual introduction of new regulations on Diesel emissions.
2007	VW suspends sales of TDI engines in America and invests in new technologies in view of reducing the emissions.
2008	VW announces new "Clean Diesel" technology.
2009	Tier 2 environmental legislation becomes valid. Cars with TDI engines are sold in America. In Europe, some models are included in the Euro 5 pollution class.
2009–2015	Sales of VW diesel engines in the United States increase. The technology wins several prizes and becomes subsidized by the state.

2014	ICCT calls on WVU and CAFEE to demonstrate the benefits of Diesel technology used in the United States, hoping to implement similar policies in Europe.
May 2014	CAFEE identifies major discrepancies between the pollution data recorded in the laboratory and those emitted by automobiles during normal operation. The results are published and attract the attention of the <i>United States Environmental Protection Agency (EPA)</i> .
2014–2015	EPA repeats the tests and asks for explanations from VW about exceeding the legal thresholds for nitrogen oxides (NOx).
December 2014	VW is recalling cars equipped with TDI engines in service, but the action does not meet CARB and EPA requirements.
3 September 2015	EPA threatens VW not to approve 2016 Diesel engines. VW admits that it has used fraudulent practices in the electronic management mode of TDI engines.
18 September 2015	EPA publicly announces the recall application for TDI vehicles produced between 2009–2015.
20 September 2015	VW admits the deception and apologizes publicly.
21 September 2015	On the first business day after the announcement, VW shares fall by 20%.
22 September 2015	VW reserves \$ 7.3 billion to cover scandal costs; the company's shares fall by another 17%.
23 September 2015	The CEO of the company, Mr. Martin Winterkorn resigns from his position.
29 September 2015	Volkswagen announces plans to recall about 11 million vehicles affected by the scandal. The campaign is scheduled to start in January 2016, with all vehicles expected to be repaired by the end of the year.
2 October 2015	Volkswagen offers an online based service where customers can check if their model is affected by the emissions scandal.
8 October 2015	Michael Horn, CEO of Volkswagen US testifies before US Congress, acknowledging the use of unethical practices in the emissions scandal
3 November 2015	Internal investigation finds that fuel consumption and CO ₂ emissions data are also affected by "irregularities"
9 December 2015	VW returns to initial estimates, saying only 36,000 cars are affected by CO ₂ emissions
21 April 2016	VW announces that it will offer US customers "substantial compensation" and buyback offers for nearly 500,000 units of 2.0-liter vehicles.
6 November 2016	California regulators find that Audi engines have been equipped to produce lower CO ₂ emissions.
11 January 2017	VW agrees to plead guilty to the emissions scandal and pay penalties of \$ 4.3 billion. Six executives inside VW are indicted.
3 May 2018	Martin Winterkorn is being sued for fraud and conspiracy in the US.

(Sursa: Ionescu M., *Ethics in international affairs' management*, Graduation Dissertation, University of Petroșani, 2018)

4. SOME RELEVANT EFFECTS OF VOLKSWAGEN FRAUD UPON THE COMPANY AND ITS STAKEHOLDERS

Volkswagen corruption case brought about a series of overwhelming repercussions upon its internal and external stakeholders. In 2016, Volkswagen has hired three public relations firms from United States, Great Britain and Germany to strengthen the company's ability to deal with the consequences of the catastrophe. Furthermore, Volkswagen has brought the former communication expert of BMW to function as an advisor, being paid with a huge amount of \$22,000 per month [Hakim, 2016]. The main detrimental effects of this unethical business practice are investigated below.

4.1. Health Impacts

As I have mentioned earlier, researchers have established a strong direct correlation between NO_x emissions and premature deaths among those suffering from respiratory illness and/or cardiovascular disease. It is estimated that by end of 2016, Volkswagen automobiles equipped with false devices will have provoked increased levels of pollution to directly cause early decease of approximately 60 persons solely in the United States's geographic area [Mansouri, 2016]. Figure 2 shows detailed evaluations for the number of early deaths taking place in the ten European countries that were the most exposed to the emissions's surplus dispersed in the atmosphere between 2008 and 2015.

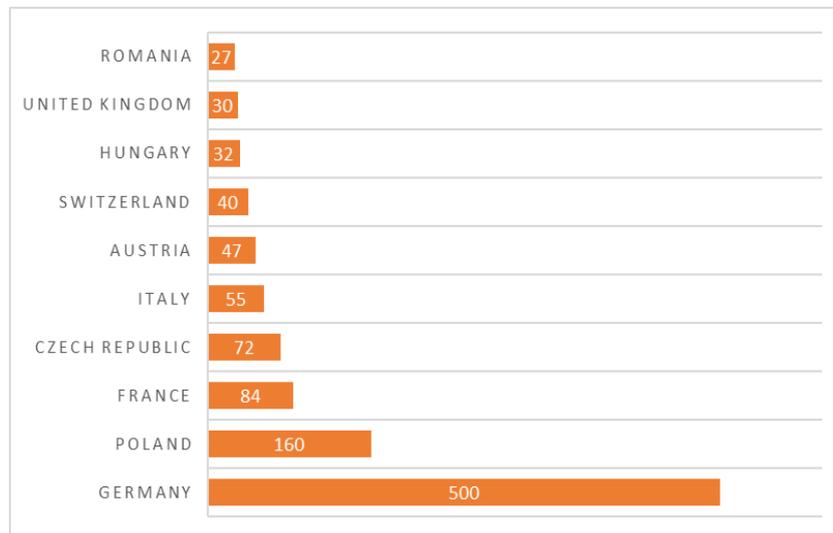


Fig. 2. Number of premature deaths caused by the excess of NO_x emissions released between 2008 and 2015 in the most affected countries

(Source: Chossière, G. P. Et al., *Public Health Impacts of Excess NO_x emissions from Volkswagen Diesel Passenger Vehicles in Germany*, *Environmental Research Letters*, 12)

It should also be underlined that that excess of toxic emissions from Volkswagen cars can be directly linked with the following numbers: 31 and 34 chronic bronchitis and hearth diseases respectively, registered only in the United States. In terms of monetization of health impacts, figures presented in the literature emphasize that the worsening of the individuals' health condition from 2008 to 2015 will burden United States's buget whith \$450 million [Kalaugher, 2015]. Moreover, the amount of nitrogen oxide in excess released by Volkswagen Diesel cars will exert a profound impact on the environment, by triggering the occurrence of the acid rain phenomenon. The acid rains are known to harm not only human health condition, bot also to cause crucial damage on macrocosm and natural resources.

4.2. Significant Decrease in Volkswagen Sales

Unfortunately, Volkswagen emissions scandal generated a great amount of distrust regarding the reliability of company's operations worldwide. Therefore, the costumers' loyalty was deeply affected by the unforeseen turn of events and a large amount of clients drop out the VW brand and turn to other notorious automotive manufacturers. This tendency resulted in a prominent slump in sales, as shown in figure 3.

The sales plunge wasn't restricted to a short period which followed the public exposure of the corporate unethical baheviour. Statistics showed that sales figures pursued the same diminishing trend for 12 months after the crisis. The long and the short of the matter, 2015 cand be judged as one of the most problematic years for Volkswagen and the beginning of 2016 followed the same course.



Fig. 3. Volkswagen Sales Drop 2016 vs. 2015
(Source: Volkswagen's Untapped Reserves of Boomer Goodwil,
<https://boomer-next-blog.com/>)

4.3. Noticeable Drop in Volkswagen Shares

Following the EPA's declaration according to which VW tricked emissions tests (2015 September 18th), VW's stock value registered a 19% drop (from €162.4 to €132.20) – see figure 4. It is estimated in the literature that the Volkswagen scam scandal took away billion dollars from the company's total value [Gomez, 2016].

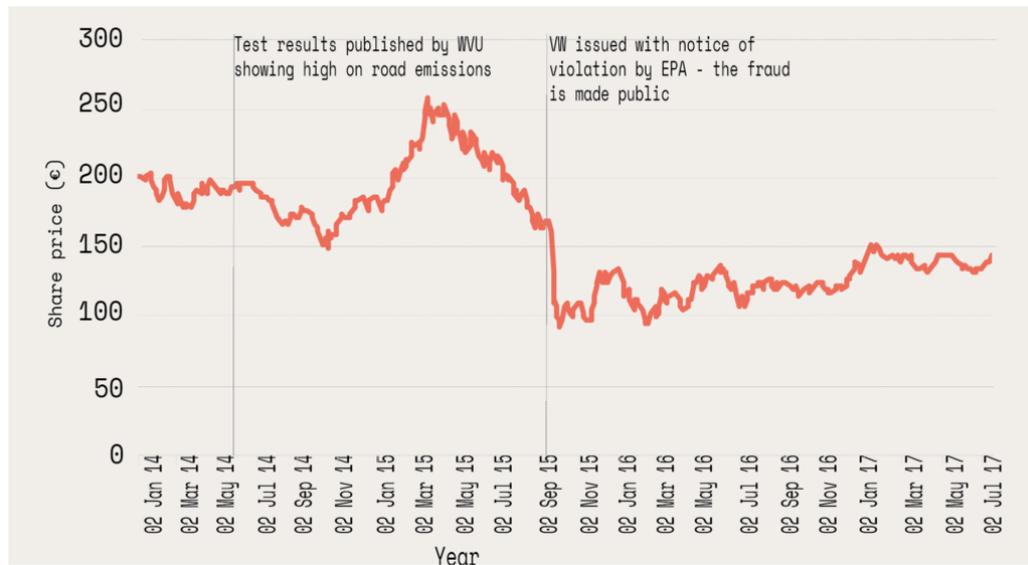


Fig. 4. Evolution of VW share prices between 2014-2017
(Source: <https://unherd.com/2017/07/vw-interview-jack-ewing/>)

During 2016 and 2017, stock prices continued to follow an unstable trend, as investors were tracking any information released by the company and the authorities involved in the scandal. To be clear, the VW crisis refuted the legend that corporate earnings and dividends occupies the forefront of shareholders' focus, while social evolutions were driven into the background.

4.4. Negative impact upon the level of financial performances registered by the company

Paradoxically, VW representatives deluded the pollution emission test thinking that they would gain more money from this unethical, yet secret business practice. After the fraud disclosure, Volkswagen managers became conscious of the fact that, on the contrary, their behavior was extremely expensive for the company: it is estimated that the scandal cost so far the corporation about \$33 billion which were spent as fines, automobiles reset, and other legal costs. Besides, the scandal brought about a global rejection of Diesel engine equipped cars.

As depicted in figure 5, in the end of 2015 Volkswagen's profit turned into loss due to all charges that have to be paid to the government and to the reparations owed to costumers. On the other hand, the sales volume did not fall as much as forecasted. In fact, it is noteworthy that only one year after the news about the scandal went round the world, VW managed to regain the position of Globe's number one car manufacturer. Nevertheless, the overall cost generated by the corruption scandal is huge and the appraisal of expenses associated with the "Dieselgate" is not yet completed.

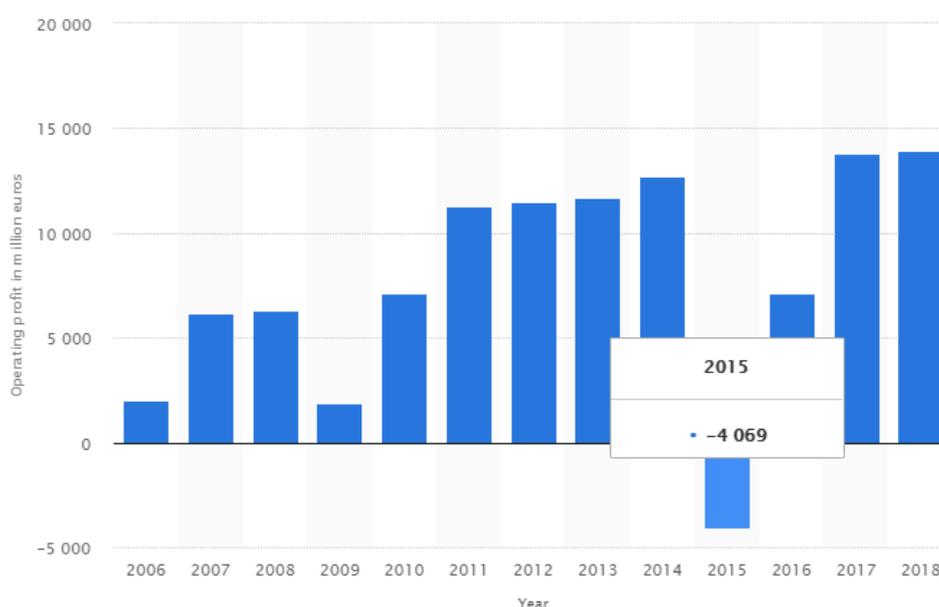


Fig. 5. Volkswagen's operating profit from FY 2006 to FY 2018 (in million euros)
(Source: Statista, 2018)

4.5. Effects upon company's reputation

The "Dieselgate" fraud seem to be one of the costliest corporate corruption case in contemporary automotive industry while the impact on the company brand was at least of equal magnitude. In this line of thought, VW has been excluded from *London Stock Exchange's FTSE4Good index series* for 2 years after the scam was made public. In other words, meeting the requirements of *FTSE4Good index* indicate that the corporation manages were able to address various types of risks – environmental, social, ethical and so on – in an appropriate manner. The fact that VW was removed from this index, illustrated the dregree of skepticism that accompanied investors' image on Volkswagen's corporate social responsibility after the emergence of the scandal [Mačaitytė, 2018]. Figure 6 shows some interesting figures exported from the Statista database regarding the global reputation of Volksvagen Group

between 2011 and 2017. The effects of the corruption scandal are still visible in 2016 and 2017 when the company has reached 61.3 and 75 points respectively, out of a 100 total. These are the lowest levels recorded by VW in terms of company's trustworthiness since 2011.

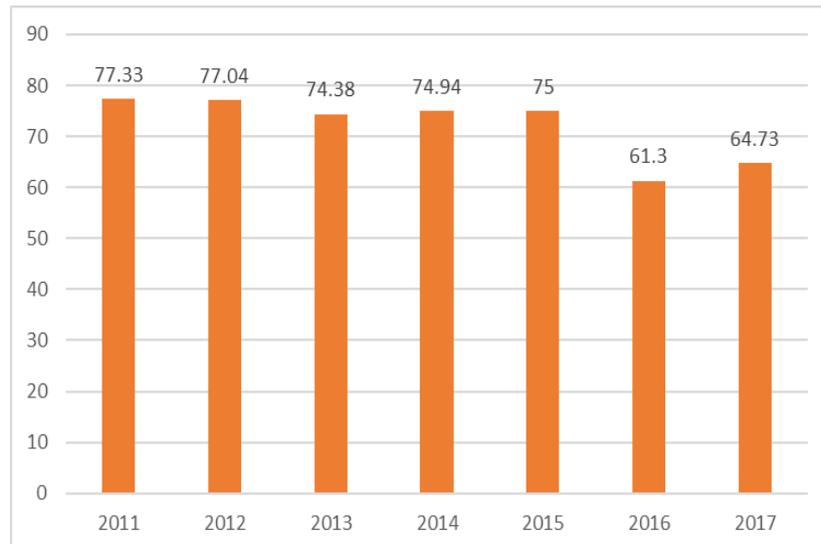


Fig. 6. Reputation of the Volkswagen Group from 2011 to 2017 (index score)
(Source: Statista, 2018)

Moreover, Volkswagen had to face accusations of deceptive communication or greenwashing in their corporate social responsibility reports, approach which was aimed at obscuring the truth regarding company's commitment to sustainability. For instance, *Siano et al.* performed a content analysis combined with interviews of former VW managers in order to demonstrate the huge gap between CSR communication and illegal practices, the root cause of stakeholders' manipulation.

5. CONCLUSIONS

Volkswagen's immoral behavior caused the business climate to be corrupted by misleading practices, determined severe pollution of the environment and contributed to the inefficient management of the company, against the demands imposed by the goals of healthy sustainable development.

On the other hand, the Volkswagen case study can emphasize some line of actions regarding the best approaches to follow in order to cope with corporate crisis. Thus, despite the unpredictability of the financial burdens and other legal consequences of the Dieselgate that overshadowed VW's operations over the last few years, the company has already made amazing efforts in reclaiming its excellent reputation.

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