Sustainable Value in Automobile Manufacturing

An analysis of the sustainability performance of automobile manufacturers worldwide

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Foreword

Purpose and scope of this study

The first edition of this study has been the first of its kind to assess the sustainability performance of automobile manufacturers worldwide using the Sustainable Value approach. Following a first update in 2009 this third edition of the study considers the newest available performance data for the 17 automobile manufacturers analysed. The Sustainable Value approach extends the concept of opportunity costs that is well established on financial markets to include environmental and social aspects. This allows for the fact that companies not only require economic capital for their business activities, but also environmental and social resources. To create positive Sustainable Value, the company must use its economic, environmental and social resources more efficiently than its market peers. This study therefore combines the concept of sustainability with the valuation methodology applied to investment and financial market decisions.

The purpose of this study is to demonstrate how efficiently the various vehicle manufacturers use their economic, environmental and social resources compared with their industry peers. Here it is important to stress that the focus is on the economic activities of the companies studied, i.e. the manufacture of cars, rather than the use of the vehicles themselves. To this extent the study follows the example of company valuations on financial markets. Although the Sustainable Value approach could in theory be extended to vehicle use, such analysis is not yet feasible due to the lack of suitable environmental and social data. This study therefore concentrates on the analysis of the monetary value created by companies engaged in automobile manufacture using their set of economic, environmental and social resources.

Funding from the BMW Group

The BMW Group is committed to promoting innovative approaches and methods for sustainability management and sustainability assessment, and has therefore kindly provided financial support for both the original study and this update. At the same time it must be stressed that the researchers at Euromed Management Marseille, University of Leeds and IZT – Institute for Futures Studies and Technology Assessment take full and sole responsibility for this study and its conclusions. At no time has the BMW Group had any influence on the content or findings of this study.

Executive Summary

The study reports the findings of a research project which attempts to analyse the sustainability performance of automobile manufacturers worldwide using the Sustainable Value approach. This research project was undertaken by researchers working at Euromed Management School Marseille, University of Leeds and IZT – Institute for Futures Studies and Technology Assessment in Berlin.

The Sustainable Value approach is the first value-based method for assessing corporate sustainability performance. It extends the traditional valuation methods used in financial analysis to include not just the use of economic capital, but also environmental and social resources. A carmaker creates positive (or negative) Sustainable Value if it earns a higher (or lower) return than its peers with its available economic, environmental and social resources. An analysis based on the Sustainable Value approach therefore establishes whether a company is successfully using these resources to create value. The Sustainable Value approach measures corporate sustainability performance in monetary terms. At the same time it establishes a link between corporate sustainability and the value-based approach that is traditionally used in management practice and company financial analysis.

This study examines the sustainability performance of the companies BMW Group, Chrysler, Daihatsu, Daimler AG[1], Fiat Group Automobiles (FGA)[2], Ford, GM, Honda, Hyundai, Isuzu, Mitsubishi, Nissan, PSA, Renault, Suzuki, Toyota and Volkswagen Group over the period 1999 to 2010. Applying the Sustainable Value approach, this study assesses the use of nine different economic, environmental and social resources. The analysis is based on the financial, environmental and social data reported and published by the companies themselves.

The results reveal a mixed pattern when it comes to the sustainability performance of the production processes employed by each vehicle maker. Toyota and the BMW Group are industry leaders by a long chalk in most of the years. Toyota creates by far the highest Sustainable Value among the industries assessed, although its performance deteriorates significantly towards the end of the review period. BMW is the only company that consistently creates positive Sustainable Value over the entire review period, and uses its economic, environmental and social resources in a value-creating way. In other words, BMW uses its bundle of resources more efficiently than its industry peers in each of the years studied. Daimler, Honda, Hyundai, Isuzu, Nissan, Suzuki, Toyota, and Volkswagen create positive Sustainable Value in most of the years assessed. Some of these manufactures improved their sustainability performance significantly over the review period and managed to keep up with the two sustainability leaders BMW and Toyota. In 2008 the highest Sustainable Value was generated by Volkswagen, followed by Hyundai. Daimler (replacing DaimlerChrysler in the analysis as of 2007) showed the third best performance in 2007 and

[1] As a result of the demerger of Daimler and Chrysler in 2007, Daimler AG replaces DaimlerChrysler in the last year of the review period.

[2] Until and including 2006 FIAT Auto.

2008. Still best in class in 2006 Toyota's performance subsequently dropped significantly. The highest Sustainable Value in 2009 is shown by Hyundai, followed by Honda.

GM has consistently produced only a negative Sustainable Value, and reveals a downside trend over almost the entire review period, showing slight improvements just in 2010. Volkswagen only managed to create significantly positive Sustainable Value in 2001, 2002 and 2007 to 2010. Ford has also languished in negative territory from 2001 onwards, temporarily showed signs of recovery in 2004 and 2005 (although still not managing to create positive Sustainable Value) and finally managed to show a positive result in 2010. Among European carmakers in the group of medium-sized manufacturers, PSA and Renault are mainly positioned in the bottom half of midfield, with Renault showing a negative trend towards the end of the review period. FGA and Mitsubishi posted almost consistently negative Sustainable Value. In the group of smaller producers, Isuzu showed a noticeable improvement until 2006, subsequently experienced a performance drop but recovered again in 2010. Daihatsu, on the other hand, generally fell just within the negative zone and could not be assessed after 2005 due to data concerns. Compared with European and North American manufacturers, it is interesting to see that a relatively high number of Asian carmakers achieve positive Sustainable Value. Compared with them, all three the North American automobile groups Chrysler, Ford and General Motors show a very disappointing performance. The pattern is mixed among European manufacturers.

This study provides a detailed description of the Sustainable Value approach, the methodology used to analyse the sustainability performance of the 17 carmakers examined, and the subsequent findings, including a ranking of these automobile companies. This ranking, based on the Sustainable Value Margin, can be found on page 40 of this study. The Sustainable Value Margin expresses the Sustainable Value created in relation to total sales, thereby allowing companies of different sizes to be compared. The study also includes a detailed report and discussion of the findings for each of the companies investigated. Taken as a whole, the results of this project provide a transparent and meaningful overview of sustainability performance trends within the automobile industry. The study also shows that the Sustainable Value approach is a practical tool for producing an in-depth and integrative assessment of corporate sustainability ratings.

1 Introduction

Companies face the challenge of demonstrating their actual contribution to sustainable development. Common management theory and practice concentrates on economic performance. Environmental and social performance has traditionally been excluded from the equation. This is because it is measured and represented differently from economic performance. For the first time, the Sustainable Value approach allows companies' environmental and social performance to be measured and reported in the same way as their economic performance: value-oriented and in tune with modern management practice.

Measuring corporate sustainability performance is complex, partly because economic, environmental and social information need to be considered simultaneously, but also because the presentation and availability of these data can vary enormously. For example, it is very difficult to compare a company's profit or sales figures with the amount of greenhouse gas it emits or the volume of water it consumes. Nevertheless, measuring corporate sustainability performance is extremely important: unless it can be measured, it cannot be controlled. Traditional instruments are not capable of combining the environmental, social and economic parameters of sustainability and reporting them in a standardised form.

The Sustainable Value approach was developed specifically to solve this problem [1-6]. Sustainable Value measures the efficient use of economic, environmental and social resources and expresses the result in a single integrated monetary measure. Established methods for valuing companies are used for this purpose. Sustainable Value measures the use of environmental and social resources exactly in the same way as companies currently assess the return on capital employed. In the value-oriented approach to management, it is assumed that the use of capital always creates value when it earns a higher return than if the capital had been employed elsewhere. The Sustainable Value approach therefore moves away from the traditional logic based on impacts and instead treats environmental and social assets as scarce resources that have to be used in a value-creating way.

This Sustainable Value approach was developed by researchers at Euromed Management School Marseille. It was subsequently tested through a series of case studies. The first edition of this report on the automobile industry was the first comprehensive sector study to be published and is now available in a third, updated version.

The aim of this study is to examine the Sustainable Value of companies in the automobile industry. Many studies compare carmakers exclusively on the basis of the consumption figures or the models they sell. This is regrettable, because there are also considerable differences in the amount of resources consumed in the production processes, as this study shows. In the next chapter we present the Sustainable Value approach and explain how this was practically applied for the purpose of this study. We explain the Sustainable Value logic using BMW as an example. The third chapter describes the scope of the Sustainable Value calculations for the automobile industry. We then take a more detailed look at the industry statistics and individual company performance in chapter 4. In chapter 5 we present our conclusions.

2 Method for calculating Sustainable Value in the Automobile Industry

2.1 *The Sustainable Value approach in brief*

Companies not only use economic capital but also environmental and social resources to create value. To determine the company's sustainability performance, the entire bundle of different resources used must be taken into consideration. The Sustainable Value approach measures corporate sustainability performance in monetary terms. In this sense the approach is based on a fundamental principle of financial economics: companies create value whenever they use a resource more efficiently than their peers. In the financial market, this valuation methodology has long been practised under the banner of opportunity costs.

The example illustrated below explains the underlying methodology. Let's assume an investment, such as a share, produces an annual return of 8%. To assess whether this was a good performance, we need to compare it with a benchmark – generally the market average. Assuming that the market (represented by a stock index like e.g. the DAX index) has only produced an annual return of 5%, the investment has achieved an additional return of 3%, also known as the value spread. To determine how much value has subsequently been generated, this value spread simply needs to be multiplied by the capital employed. Assuming an investment of €100, the value spread comes to €3 (see Fig. 1).

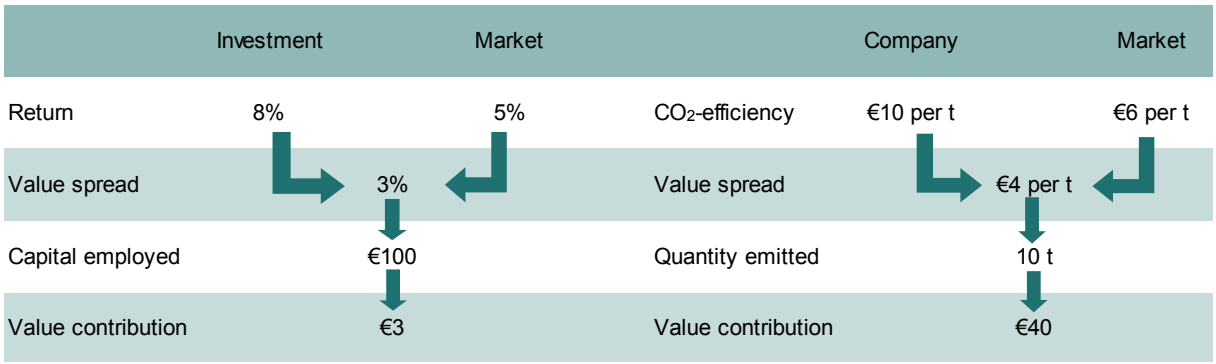

Figure 1: Value-oriented analysis of resource use

The Sustainable Value approach extends this methodology, which is firmly established in financial market and company valuation practices, to the use of environmental and social resources by companies. Sustainable Value is created whenever a company uses its economic, environmental and social resources more efficiently than the benchmark. To calculate Sustainable Value, a company's resource efficiency is subsequently compared with that of the benchmark. A company which emits 10 t of CO_2 in order to generate a return of €100, has a CO_2 efficiency of €10 per ton of CO_2. If the sector average for other companies is only €6 return per ton of CO_2, for example, the company earns €4 more return per ton of CO_2 than the benchmark (i.e. its industry peers). With total emissions of 10 tons of CO_2, a company therefore generates value of €40.

Sustainable Value is the first approach to use the opportunity costs method to value the use of economic, environmental and social resources by a company. It is therefore an extension of the system generally used in financial markets, where analysis is limited to economic capi-

tal. At the same time the Sustainable Value approach is compatible with the decision-making and valuation tools used by investors and managers.

2.2 *The valuation logic of Sustainable Value*

From a sustainability perspective, the valuation of the company's performance must not only take into consideration the use of economic resources, but also environmental and social resources. In this context the following rule of thumb usually applies when assessing resource use: a resource should only be used if the return generated is higher than the costs incurred. The costs of resource use therefore need to be determined.

Unfortunately this is not such a straightforward task, whether it be for economic capital or for environmental/social resources. In traditional financial economics, this problem is resolved for economic capital by using the opportunity costs approach [7-9]. Since their capital is limited, investors are unable to exploit all the investment opportunities available to them at the same time. The earnings foregone from these investment alternatives are costs as far as the investor is concerned, and are referred to as opportunity costs. For successful investors, the return on the investments made must be higher than the opportunity costs. Opportunity costs therefore represent the cost of using economic assets, such as capital.

As already mentioned, the financial market generally assumes that an investment creates value whenever it is at least as profitable as the average rate of interest available on the market. The benchmark commonly used for this interest rate is the performance of a stock index. In other words, an investment creates value whenever its return is higher than the stock index used as a benchmark. This method is typically used to value investment funds, for example. A fund that fails to beat the typical market interest rate does not cover its capital costs and therefore does not create value, but rather destroys it.

As we already emphasised, companies do not use economic capital alone, but also consume environmental and social resources. The Sustainable Value approach therefore extends beyond the financial market's one-dimensional focus on purely economic capital and also takes into account other resources when assessing company performance. At the same time it applies the tried and tested concept of opportunity costs. It is interesting to note that prior to the Sustainable Value approach, no other method had attempted to assess the use of environmental and social resources by applying the opportunity costs approach [4-6], even though this had first been suggested in principle more than 100 years ago [8].

To determine the sustainability performance of companies, the costs of the economic, environmental and social resources used have to be deducted from the return earned by the company. This approach has been followed some time [10, 11]. Even so, the costs have traditionally been determined using methods that focus primarily on burdens [3]. The key assumption here is that the costs of a resource depend on the burdens that arise through the use of the resource. Despite a plethora of different approaches, putting a monetary value on these burdens is still extremely difficult [12-16] and tends to produce not just inconsistent, but even conflicting results [17].

The Sustainable Value approach is the first value-based method for assessing corporate sustainability performance. This means that the cost of the use of resources is not determined

on the basis of the potential damage inflicted by these resources, but on the degree to which they are used in a value-creating way. The costs of resources are determined using the opportunity costs method: i.e. the return that could otherwise have been generated from an alternative use of these environmental and social resources. The Sustainable Value approach therefore applies the opportunity costs methodology used in financial management to environmental and social resources. This value-oriented approach makes it far simpler to determine the costs of resource use.

2.3 *Calculating Sustainable Value*

Sustainable Value represents the value that a company creates through the use of a bundle of economic, environmental and social resources. The Sustainable Value is calculated in five steps, described in detail in this section. It becomes clear that the assessment of corporate sustainability performance using the opportunity costs method is relatively straightforward and does not involve complex mathematics. The following five steps are necessary to calculate the Sustainable Value. Each step provides the answer to a specific question that is relevant for the assessment of a company's sustainable performance.

(1) How efficiently does a company use its resources?
In this step, the efficiency of the use of various resources in the company is evaluated.

(2) How efficiently does the benchmark use the resources?
In this step the benchmark is established, and then the efficiency of its resource use is assessed.

(3) Does the company use its resources more efficiently than the benchmark?
In this step the resource efficiency of the company is compared with that of the benchmark.

(4) Which resources are used by the company in a value-creating way (and which are used in a value-destroying way)?
In this step the value contribution of the various resources is determined.

(5) How much Sustainable Value does a company create?
In the final step, the task is to assess whether the company has by and large used the given set of economic, environmental and social resources to create value.

These five steps are now explained using the example of the sustainability performance of the BMW Group in 2010.

Step 1: How efficiently does a company use its resources?

The purpose of the first step is to establish how efficiently the company uses its various economic, environmental and social resources. To this end, the quantity of resources used is compared with the return generated by the company. First we need to establish what parameter to use for measuring the company's profitability. To determine the sustainability performance of global automobile companies, this study therefore uses the earnings before interest and tax (EBIT) from ordinary business activities. The calculation of resource efficiency is based on the EBIT generated by the company per unit of resource. To this end, the EBIT

is divided by the quantity of resources used in each case.[3] In 2010 the BMW Group, for example, generated an EBIT of €4,017 per ton of CO_2-emissions emitted. The CO_2-efficiency of the BMW Group in 2010 therefore came to €4,017 / t CO_2. When calculating the company's resource efficiency, special care must be taken to ensure that the data on resource use is based on the same scope of consolidation as the earnings figures.

Step 2: How efficiently does the benchmark use the resources?

The second step of the analysis calculates how efficiently the benchmark uses the relevant economic, environmental and social resources. First of all the benchmark has to be defined. This report uses the global automobile industry as the benchmark when assessing the sustainability performance of carmakers.[4] In other words, we need to establish the average EBIT produced per unit of resource by the automobile manufacturers examined in this study. Since average industry figures on efficiency are not generally published or reported, they have to be generated based on the reports and data issued by the individual companies within the sector. There are basically two ways to calculate industry efficiency: on the one hand it can be determined as an unweighted average. To this end, the mean value for the relevant resource efficiencies is determined for all the carmakers studied. But this approach fails to take into consideration the difference between large companies, which consume far greater quantities of resources, and small companies. Alternatively, a weighted average can be calculated for industry efficiency. To do this, the total EBIT produced by all companies studied is divided by the total amount of resources they have used. This approach takes into account the size differential between the companies, and is intended to replicate the industry performance as accurately as possible. Bigger companies which also consume more resources therefore have a heavier weighting in the benchmark. This study on the Sustainable Value of automobile companies uses the second approach, i.e. a weighted industry average. Another question is whether the valuation of the average industry efficiency should exclude the company actually being assessed. When attempting to determine the Sustainable Value of the BMW Group, for example, it might be more appropriate to use the average efficiency of the industry *excluding* BMW as a benchmark. The logic here this is that if BMW's resources are used elsewhere, these resources should not be counted again at BMW. In this study, this would have resulted in 17 different benchmarks for each of the companies assessed for every indicator and year. Therefore, in order to keep things simple we have not excluded the companies assessed from the benchmark.

The benchmark is therefore the weighted average efficiency of the use of resources by all automobile manufacturers studied. The average EBIT from ordinary business activities that the carmakers earn per unit of resource used is then calculated for all resources considered. The CO_2-efficiency of the automobile industry came to €1,052 EBIT/ t of CO_2 in 2010.

Step 3: Does the company use its resources more efficiently than the benchmark?

This step compares the efficiency of the company with the efficiency of the industry as a whole. To this end the industry efficiency is deducted from the company efficiency. The re-

[3] See 3.2 for details of the economic, environmental and social resources examined in this study.
[4] See 3.1 for a list of car manufacturers examined in this report.

sult is known as the value spread and describes how much more (or less) EBIT per unit of resource the company produces compared with the industry as a whole. The value spread is calculated for each resource examined. This establishes whether the company or the industry uses the various resources more efficiently. The concept of opportunity costs therefore plays a central role here.

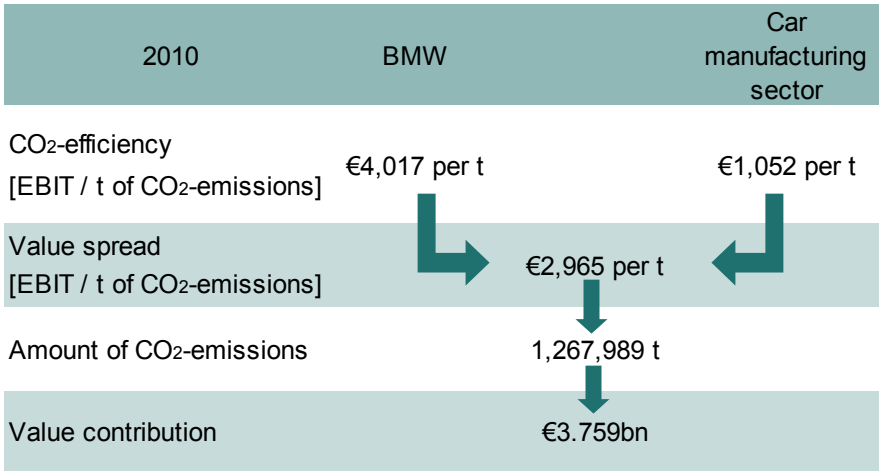

Figure 2: Calculation of the value contribution from BMW Group CO_2-emissions in 2010

The comparison of the CO_2-efficiency of the BMW Group with the rest of the industry shows that the BMW Group uses this resource more efficiently. It has a positive value spread of roughly €2,965 / t CO_2. In other words, the BMW Group generates €2,965 more EBIT per ton of CO_2 than the industry average (see Fig.2).

Step 4: Which resources are used by the company in a value-creating way (and which are used in a value-destroying way)?

In this step the value contribution of the various resources consumed is determined. The value spread calculated in the previous step identifies how much more (or less) return per unit of resource consumed the company makes compared to the benchmark. In this fourth step, the value contribution generated by the entire resource use within the company is calculated. To this end the relevant quantity of resources used is multiplied by the appropriate value spread. The result shows how much more or less return the company creates for the quantity of resource used compared with the benchmark. In 2010, for example, the BMW Group emitted 1,267,989 tons of CO_2. Having calculated the value spreads in step three, we know that the BMW Group creates roughly €2,965 more EBIT per ton than the industry average. If we multiply the value spread with the total quantity of CO_2 emitted, the resulting value contribution comes to approximately €3.8bn. This represents the value contribution resulting from BMW Group using this quantity of CO_2-emissions, as opposed to other car manufacturers (see Figure 2).

Step 5: How much Sustainable Value does a company create?

Companies do not use just one resource, but a bundle of different economic, environmental and social resources. In the previous step the value contribution of each resource was established. In this last step, we now determine how much value is being created in using the entire bundle of economic, environmental and social resources. In previous steps, the compa-

ny's entire EBIT was attributed to the use of a single resource. Obviously this does not reflect the real situation, since the return is only produced once, through the use of the entire resource bundle. If we were to simply add up the value contributions from the different resources, it would mean incorrectly counting a resource more than once. To be specific, if there were *n* resources the profit would be counted *n* times. When calculating the Sustainable Value, the sum of the value contributions is thus divided by the number of resources considered. Figure 3 illustrates the five calculation steps. It also shows that the BMW Group generated a Sustainable Value of roughly €3.6bn in 2010. The Sustainable Value expresses how much value has been created as a result of the BMW Group using the resources in question in 2010, as opposed to other industry peers.

	Amount of resources used		Efficiency of BMW Group		Efficiency of car sector		Value contribution
Total assets	€108,867,000,000	* (	4.68%	-	4.08%	) =	€651,555,392
CO_2-emissions	1,267,989 t	* (	€4,017 per t	-	€1,052 per t	) =	€3,759,450,938
NO_x-emissions	457 t	* (	€11,146,608 per t	-	€2,037,052 per t	) =	€4,163,067,423
SO_x-emissions	8 t	* (	€636,750,000 per t	-	€4,492,355 per t	) =	€5,058,061,163
VOC-emissions	2,047 t	* (	€2,488,520 per t	-	€285,611 per t	) =	€4,509,354,993
Waste generated	131,742 t	* (	€38,666 per t	-	€5,646 per t	) =	€4,350,153,318
Water use	3,205,191 m³	* (	€1,589 per m³	-	€186 per m³	) =	€4,497,254,400
Work accidents	1,045	* (	€4,874,641 per nb	-	€2,728,297 per nb	) =	€2,242,929,349
Employees	95,453	* (	€53,367 per nb	-	€23,327 per nb	) =	€2,867,382,018
Sustainable Value of BMW Group in 2010							**€3,566,578,777**

Figure 3: Sustainable Value of the BMW Group in 2010

2.4 *Making allowances for company size*

In financial analysis, larger companies are generally expected to generate higher profits, sales and cash flows. This size effect complicates matters when attempting to compare the performance of different companies. Financial analysis compares performance parameters, such as profit or cash flow, with other indicators that reflect the size of the company. Profit, for example, is frequently assessed in relation to capital employed or sales. Meaningful analysis of companies is possible using key ratios such as return on capital or net profit margin.

The Sustainable Value shows, in absolute terms, how much excess return is created by a company using its resources more efficiently than the benchmark. The same problem arises when attempting to compare different companies: Bigger companies generally use greater quantities of resources and therefore tend to create a bigger (positive or negative) Sustainable Value. As with the financial analysis method, allowances for the company's size therefore need to be made when comparing the Sustainable Value of different companies. To this end, this study looks at the Sustainable Value of a company in relation to its sales. This relative ratio expresses how much Sustainable Value a company generates for every Euro of sales, and is defined as the Sustainable Value Margin. This ratio allows meaningful comparisons to be made of the sustainability performance of those companies studied. In 2010 the

BMW Group created €5.90 Sustainable Value per €100 of sales, i.e. the Sustainable Value Margin came to 5.90 %.

2.5 *The explanatory power of Sustainable Value*

The Sustainable Value shows how effectively a company balances its drive for commercial success with its environmental and social responsibilities in production. It measures how much excess return is created by a company using a set of resources more efficiently than the industry benchmark. The significance of the Sustainable Value depends on the choice of benchmark. In this study, the global automobile industry is taken as a benchmark. The Sustainable Value therefore shows which of the vehicle manufacturers create the most value using the respective economic, environmental and social resources. It provides a monetary measure of how efficiently an individual company does business compared with the industry as a whole. The study therefore provides an analysis of companies within the automobile industry (best in class). It does not provide any conclusions about the sustainability of resource use in car production compared with other industries. The results do not therefore allow any comment to be made on whether the industry as a whole makes a contribution to sustainable use of resources and promotes sustainable development.

Sustainable Value provides an indication of which economic, environmental and social resources are used by a company in a value-creating way, and which are not. This study does not deal with aspects outside the company. The calculation of Sustainable Value therefore does not take into consideration factors such as the performance of suppliers or product features. It also has limitations when it comes to sustainability aspects that cannot be reasonably quantified. This applies, for example, to the company's involvement in social and cultural projects. As a result, Sustainable Value calculations can only take into consideration those sustainability aspects that can be effectively quantified. The Sustainable Value does not attempt to express a company’s entire commitment to sustainability in a single ratio. Qualitative sustainability aspects should also be managed with qualitative instruments. Rather, the Sustainable Value approach provides a link between sustainability and the value-oriented approach that is common in management practice. The biggest advantage of Sustainable Value is therefore that it allows (a) the use of environmental and social resources to be assessed in the same way as the use of economic resources and (b) an all-round appraisal of sustainability performance. Company valuation and financial analysis – as well as management thinking – have traditionally focused exclusively on optimising the use of economic capital. The Sustainable Value approach expands this one-dimensional focus and applies the value-oriented approach to the assessment of the use of environmental and social resources. Sustainable Value is therefore a practical tool for measuring – and ultimately managing – a company’s sustainability performance in the same way as its economic performance.

3 Scope of the Study

This chapter describes the scope of the study. In addition to the companies studied (3.1) and the indicators assessed (3.2) we also take a brief look at the review period (3.3) and the data sources used (3.4). Finally, 3.5 looks at data coverage and the treatment of missing data.

3.1 Companies studied

This study examines the Sustainable Value of 17 automobile manufacturers. They include the BMW Group, Chrysler, Daihatsu, Daimler AG (DaimlerChrysler until and including 2006), Fiat Group Automobiles (FIAT Auto until and including 2006), Ford, GM, Honda, Hyundai, Isuzu, Mitsubishi, Nissan, PSA, Renault, Suzuki, Toyota and the Volkswagen Group. KIA has been considered via inclusion in Hyundai. Other manufacturers such as Tata Motors or Porsche could not be included due to lack of available data.

3.2 Indicators assessed

One of the great strengths of the Sustainable Value approach is that it allows for an integrated assessment of the use of economic, environmental and social resources by a company. For this to be possible, meaningful and quantifiable indicators obviously need to be available on resource consumption. The use of a total of nine different resources was examined as part of this study. These can be subdivided into one economic, six environmental and two social resources (see Table 1).

Environmental indicators	Social indicators	Economic indicators
CO_2-emissions	No. of work accidents	Operating profit
NO_x-emissions	No. of employees	Total assets
SO_x-emissions		
VOC-emissions		
Waste generated		
Water use		

Table 1: Economic, environmental and social resources examined in the study

We were unable to incorporate additional environmental and social aspects due to lack of available data (e.g. information on particulate-emissions or spending on training and professional development), or due to the difficulty in quantifying them (e.g. social commitment).

As already mentioned, the parameter used for measuring profitability in this study is earnings before interest and tax (EBIT) from ordinary business activities. The sales figures of vehicle manufacturers were also collected in order to calculate the Sustainable Value Margin. We now take a brief look at the indicators analysed in this study.

Measure of return: Earnings before interest and tax

A number of different return figures can be used to calculate the Sustainable Value. This industry study uses the operating profit i.e. Earnings before Interest and Tax (EBIT). Compared with more narrow measures of profit, such as net profit, EBIT has the advantage that the

nature of the financing does not have any impact on the size of earnings. To calculate Sustainable Value, we look at EBIT from ordinary business activities. In other words, profit is adjusted to exclude the effects of exceptional items such as exceptional write-offs.

Another thing we considered doing was to strip out the earnings from financing activities, such as vehicle leasing, from the company's EBIT figure. The advantage of this would have been that only the profits from actual car manufacture – which is also the primary consumer of resources – would have been compared with the resulting economic, social and environmental burdens. On the other hand, it could be argued that financing is an integral part of a carmaker's offering. Ultimately we did not make this adjustment, partly because certain geographical limitations had to be applied in some cases (see also section 3.5 below), but also because the adjusted return figures for this reduced geographic region were not available for some manufacturers.

All monetary ratios were converted into Euros, where required, on the basis of the average annual exchange rate. In cases where the financial year does not match the calendar year, the average exchange rate over the financial year was used for conversion purposes.

Sales

Sales have no direct significance for Sustainable Value calculations. Sales figures were only collected in order to be able to compare them with the Sustainable Value created. This produces a ratio that is similar to a sales margin.

Use of capital

The use of capital must be matched to the measure of profitability applied. Profit is measured in terms of EBIT (see above) for the purposes of this study. Therefore, a corresponding broad capital figure can be chosen: it can be based both on loan capital and equity capital. The use of capital is thus approximated with total assets. No adjustment was made to strip out the assets of the financing business (e.g. lease vehicles carried as assets) (see also our comments on the return figure).

CO_2-emissions

When assessing CO_2-emissions, we looked at both the direct and indirect emissions[5] of the individual companies. Basically it is possible to argue that indirect emissions occur during the production of electricity and not directly during the carmaker's manufacturing operations. For the purposes of this study, however, we decided to include indirect emissions on the grounds of data availability. A number of manufacturers (including Toyota and Renault) only report their total CO_2-emissions, making it impossible to record the level of direct emissions. In addition to this, CO_2-emissions from traffic were not considered. In a similar vein, our analysis only focused on CO_2-emissions as an indicator, but not other greenhouse gases classed as CO_2 equivalents. Emission figures for CO_2 equivalents comprise all the different greenhouse gases. These figures are only reported by a small number of vehicle manufacturers.

[5] Direct emissions arise from the combustion of fossil fuels within the production process, while indirect emissions are those released when generating the mains electricity which is consumed during the production process.

NO_x-emissions

Nitrogen oxide is emitted during combustion processes. Nitrogen oxide-emissions are blamed for the excessive acidification of soils and the destruction of forests. Along with other pollutants, nitrogen oxide also encourages the formation of ozone at ground level. For reasons of data availability, direct nitrogen oxide-emissions from stationary sources were recorded for the purposes of this study. Indirect emissions from electricity generation and transport-related emissions were not considered due to incomplete data.

SO_x-emissions

Combustion processes not only produce nitrogen oxide but also sulphur dioxide, which also causes acidification of the soil and damages forests. The analysis of sulphur dioxide-emissions is also limited to direct emissions from stationary sources, for reasons of data availability. Indirect emissions from electricity generation and transport-related emissions were not recorded.

VOC-emissions

Volatile Organic Compounds (VOC) are produced during combustion processes and when solvents are used (e.g. spray-painting vehicles). VOC-emissions are responsible for causing not only smog but surface-level ozone, among other things. We analysed direct VOC-emissions from stationary sources, but did not include indirect and transport-related emissions. The biggest source of VOC-emissions in automobile production is from the release of solvents in paint shops.

Waste generation

In this study, waste generation covers any material output that does not concern products. It therefore neither includes by-products created during manufacturing nor outputs that can be sold on as reusable materials. The quantity of scrap metal produced during manufacturing is not included in the waste data, because of the extremely high recycling quotas. In addition, we only consider waste from the company's ordinary business activities. This means, for example, the building rubble created during (exceptional) remodelling of production facilities is not classed as waste.

Water consumption

The scope of our analysis extends to every type of water input. We have decided against imposing any limits on the recording of wastewater volumes, as not just a specific degree of pollution, but any quantity of water used, can be classed as resource consumption. Water usage within closed-loop circuits is not included, for example.

Number of work accidents

The absolute annual figure for work accidents in the company is examined here. The "one-day rule" applies, i.e. every accident is counted that causes an employee to be off work for at least one working day. The analysis covers both blue-collar and white-collar workers, but does not include accidents while commuting to or from work.

Number of employees

The head count for each manufacturer is based on all employees, including trainees and part-time employees. The analysis is based on annual full-time equivalents, in order to allow for seasonal fluctuations in employment. If these data are unavailable, an average annual head count is determined.

3.3 Review period

This study looks at the Sustainable Value of the 17 automobile manufacturers over a twelve-year period from 1999 to 2010.

3.4 Data sources and data collection

Data on the use of the different resources examined in the study, as well as the relevant profit and sales figures, were taken from the reports published by the individual companies. These included annual reports, financial statements, business reviews, as well as environmental, sustainability and CSR reports. We also referred to publications available on the companies' websites.

These data sources were used to assess the performance data for the 17 automobile manufacturers over the review period. We checked and where necessary adjusted the collated data to ensure its quality, integrity and comparability (see 3.5). The relevant companies were contacted directly if any ambiguities or questions arose. At this point the companies had the opportunity to comment on the data and also to provide corrected or missing data. After this feedback round, the data sets for each company were prepared. These data sets were then used to calculate the Sustainable Value of the automobile manufacturers. At the same time these data were used to calculate the average efficiency of resource use in the industry as a whole, which then served as a benchmark (see above under 2.3, Step 2).

3.5 Data coverage, treatment of missing data and data problems

Despite intense data collation efforts, we were unable to prepare a full data set for all automobile manufacturers for every year of the review period. This is mainly down to the different reporting standards that each company has for environmental and social data. In some areas, data coverage is also incomplete because of the poor comparability of the data reported due to differences in the definitions used in individual countries (e.g. for work accidents). One general point that comes to light here is that the area of environmental and social reporting, unlike traditional accounting, is still a long way from being standardised when it comes to the scope and quality of data. This section now looks at the degree of data coverage for the different resource indicators (3.5.1). We then examine how data gaps and data problems were dealt with for the purposes of this study. Specifically this refers to the problem of missing data (3.5.2), dealing with different scopes of consolidation (3.5.3), calculating and extrapolating data (3.5.4) and dealing with corrected data (3.5.5).

3.5.1 Data coverage

This section examines data coverage for the nine resources examined. Here it is evident that data coverage of the various indicators and companies varies considerably, although over the years we can see a steady improvement in reporting and subsequently in data coverage as well. We start by providing an overview of data coverage. We then explain how the various data gaps and data problems are worked around individually.

Use of capital

Figure 4 shows the data coverage for the use of capital in the companies analysed over the review period. Data coverage for this resource is generally very high. In the case of FIAT, data on the use of capital was available for the whole FIAT Group before 2005, but not for Fiat Group Automobiles, the business examined in this study. No complete time series is available for some manufacturers, because sufficient corporate data are only available at some point after 1999 (GM 2000 and 2008-2009, Hyundai 2001, Nissan 2002). Chrysler Group as individual company was included in the assessment only as of 2010, with their first reporting of environmental and social data after demerger of DaimlerChrysler in 2007. Daihatsu could only be considered until and including 2005 as the company did not publish environmental and social data for the years after. No consolidated financial figures are available for Hyundai for the period before 2001. As a result, all the indicators for Hyundai can only be assessed over the period 2001-2010. In the case of the Japanese companies Daihatsu, Isuzu, Mitsubishi and Suzuki, the use of capital only relates to business activities in their country of origin. GM could not be considered in 2008 and 2009 as the company did not publish environmental and social data for this period.

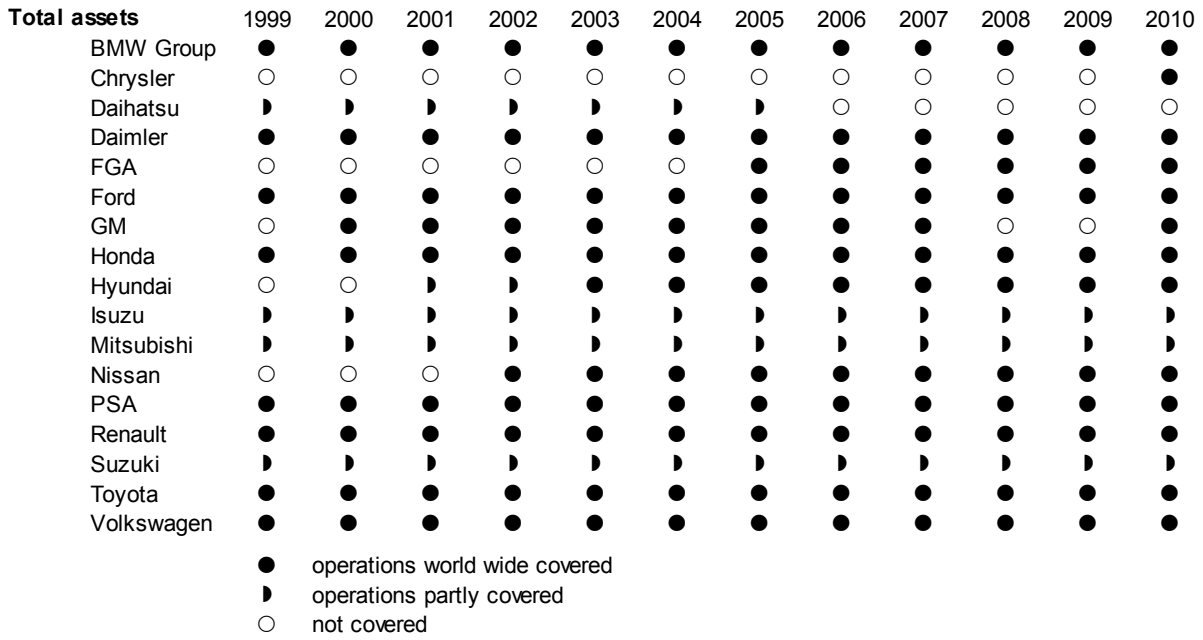

Figure 4: Data coverage for the use of capital

CO_2-emissions

Data coverage is also very good for the CO_2-emissions produced by the companies, as can be seen in Figure 5. The only companies where the data series is incomplete are Chrysler, Daihatsu, GM, Hyundai, Mitsubishi, Nissan and Volkswagen. Suitable emissions data are available for all the other automobile producers over the entire review period. The Asian manufacturers Daihatsu, Mitsubishi and Suzuki only provide data on CO_2-emissions in their home country. The scope is therefore limited to the home country for all of these manufacturers. Isuzu, Honda and Hyundai report on their global operations for some years within the review period. For other years, however, they only provide some limited international data, which is insufficient to establish an international data set. In these case, the scope has also been limited to the domestic activities of these manufacturers. Toyota provides data on group wide CO_2-emissions from 2000 onwards. Reliable environmental and social data for Nissan are only available from 2002 onwards. Our analysis of Nissan is therefore limited to the period 2002-2010. Daihatsu and Mitsubishi have not been included for the years 2006 to 2010 and 2008 to 2010 respectively due to the lack of data availability. Chrysler Group could be included in the assessment only as of 2010, when their first sustainability report after demerger of DaimlerChrysler in 2007 was published.

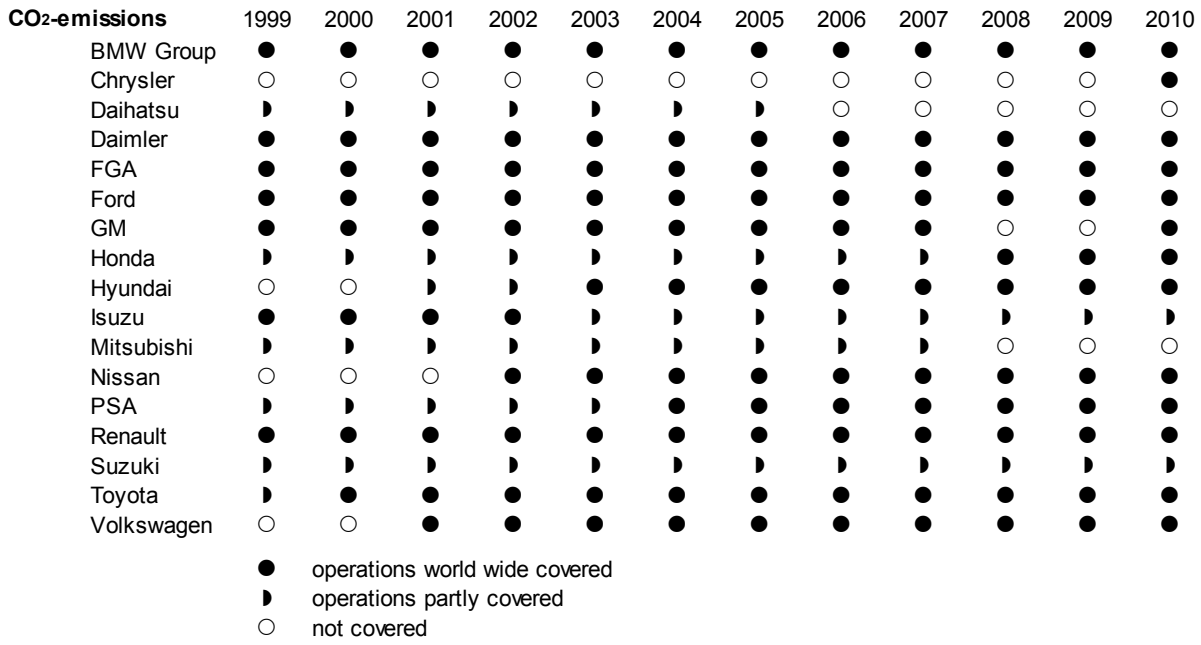

Figure 5: Data coverage for CO_2-emissions

NO_x-emissions

Figure 6 shows the data coverage for the indicator NO_x-emissions. We can see that only three out of the 17 companies examined provide data on their nitrogen oxide-emissions over the entire review period. While a full data series exists for NO_x-emissions from global activities in the case of the BMW Group and Daimler, the data for PSA apply for just part of the corporation. In seven other cases (FGA, Hyundai, Isuzu, Renault, Suzuki, Toyota and Volkswagen) annual emissions data are only published after 1999 either for global operations or limited to activities in the home market. Chrysler's NO_x-emissions data were published the first time in 2010 (until and including 2006 covered by DaimlerChrysler). Three

of the companies have yet to publish acceptable data on nitrous oxide-emissions (Ford, Honda and Nissan). No data has been available for Daihatsu and Mitsubishi for the years 2006 to 2010 and 2008 to 2010 respectively. GM does not report any environmental data for the years 2008 and 2009.

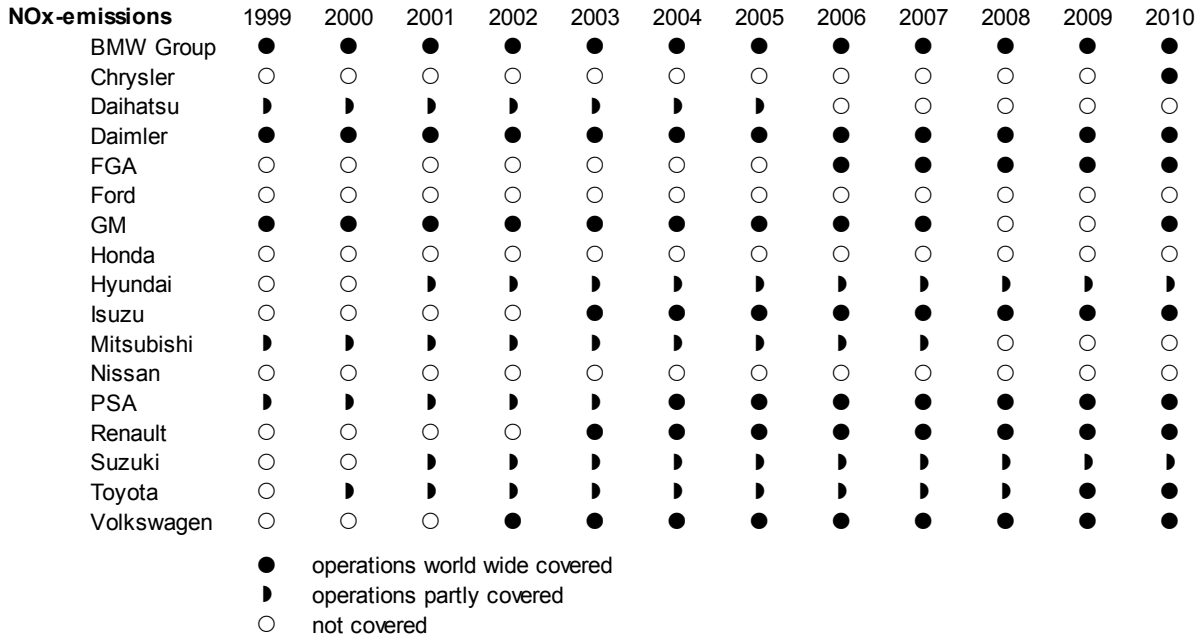

Figure 6: Data coverage for NO_x-emissions

SO_x-emissions

The picture is almost virtually identical in the case of data coverage for sulphur oxide-emissions (Figure 7). Once again there are limitations regarding the data availability or the scope of consolidation for 15 out of the 17 companies examined, so that data coverage is relatively poor compared with the other environmental indicators. No data are available for the entire review period in the case of Ford and Honda. Nissan who has not reported data on NO_x for the entire review period, however, provides data on SO_x-emissions for the years 2002 to 2005. Chrysler Group could be included in the assessment as individual manufacturer only as of 2010, when their first sustainability report after demerger of DaimlerChrysler in 2007 was published.

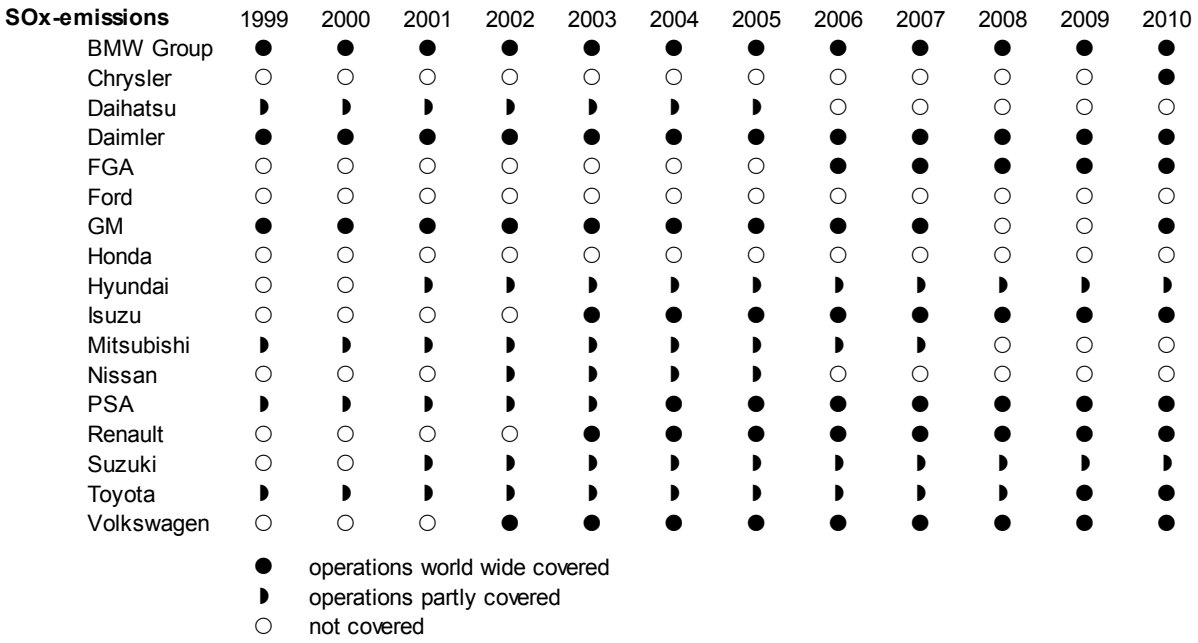

Figure 7: Data coverage for SO_x-emissions

VOC-emissions

Data coverage is relatively good for VOC-emissions (see Figure 8). A complete data series is available for the entire review period for nine of the 17 manufacturers. Since 2001 Ford, Hyundai and Volkswagen have consistently reported their VOC-emissions data. Nissan reported data for the period 2002-2004 as well as 2006, and estimates were made for 2005 and 2007-2010. An estimate was also made for Mitsubishi's emissions in 1999 (see chapter 3.5.4). In the case of all the Asian carmakers, the scope of consolidation is limited to their domestic production facilities. Due to the lack of data availability, Daihatsu and Mitsubishi have not been included in the years 2006 to 2010 and 2008 to 2010 respectively. In the case of PSA, emissions data for the review period are available only for its PCA division. Chrysler Group could be included in the assessment as individual manufacturer only as of 2010.

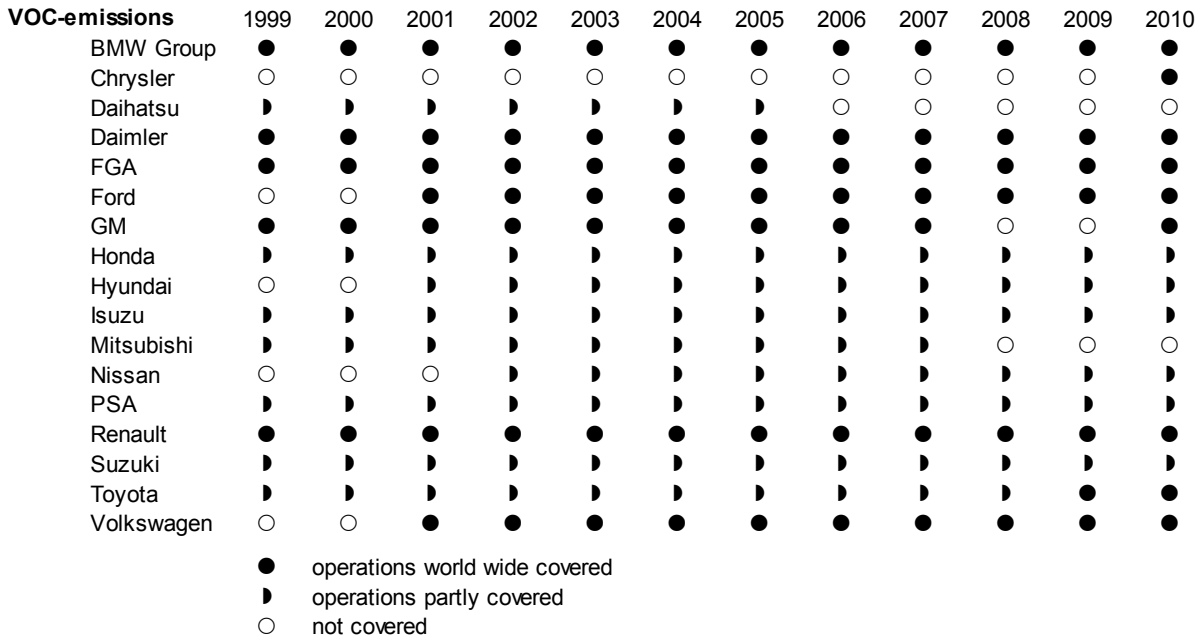

Figure 8: Data coverage for VOC-emissions

Waste generation

Data coverage was equally good for the waste volumes generated (Figure 9). In the years 2002 to 2005, data are available for 15 of the 17 manufacturers. Group wide data over the entire review period are available for six companies (BMW Group, Daimler, FGA, Ford, Isuzu and Renault). Honda, Hyundai, Nissan, PSA, Toyota and Volkswagen have only started to systematically collect and publish group wide data on waste during the course of the review period. In the case of Daihatsu, Mitsubishi and Suzuki waste data are only available for domestic production facilities. Moreover, no data are available for Daihatsu and Mitsubishi for the years 2006 to 2010 and 2008 to 2010 respectively. Chrysler and GM did not report on waste in 2008 and 2009 (until and including 2006 Chrysler was covered by DaimlerChrysler).

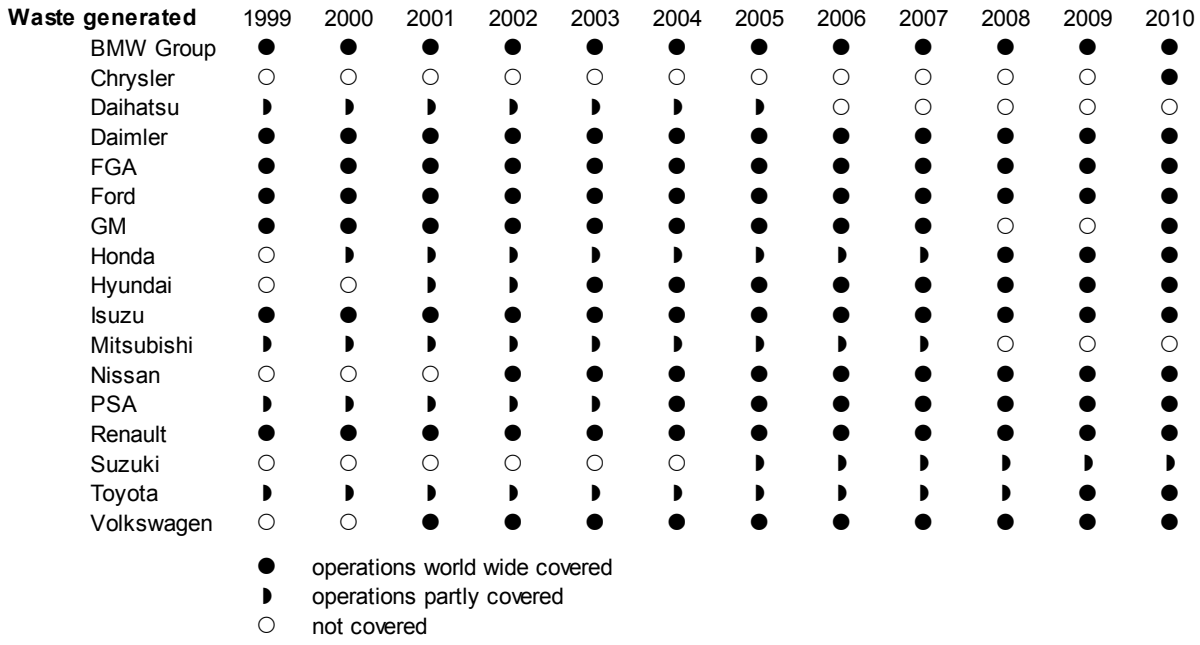

Figure 9: Data coverage for waste generation

Water consumption

A similar picture emerges for data coverage for water consumption. Here data are available for all manufacturers. Honda, Hyundai, Nissan, PSA, Toyota and Volkswagen have only started to systematically collect and publish data on group wide water consumption during the course of the review period. Chrysler has been included as of 2010. In the case of Daihatsu, Mitsubishi and Suzuki water consumption data are only available for domestic production facilities. No data is available for GM, Daihatsu and Mitsubishi for the years 2008 and 2009, 2006 to 2010 and 2008 to 2010 respectively. In the case of PSA, the data for the period 1999-2003 relate either to the PCA division, or to the entire group excluding the Faurecia division.

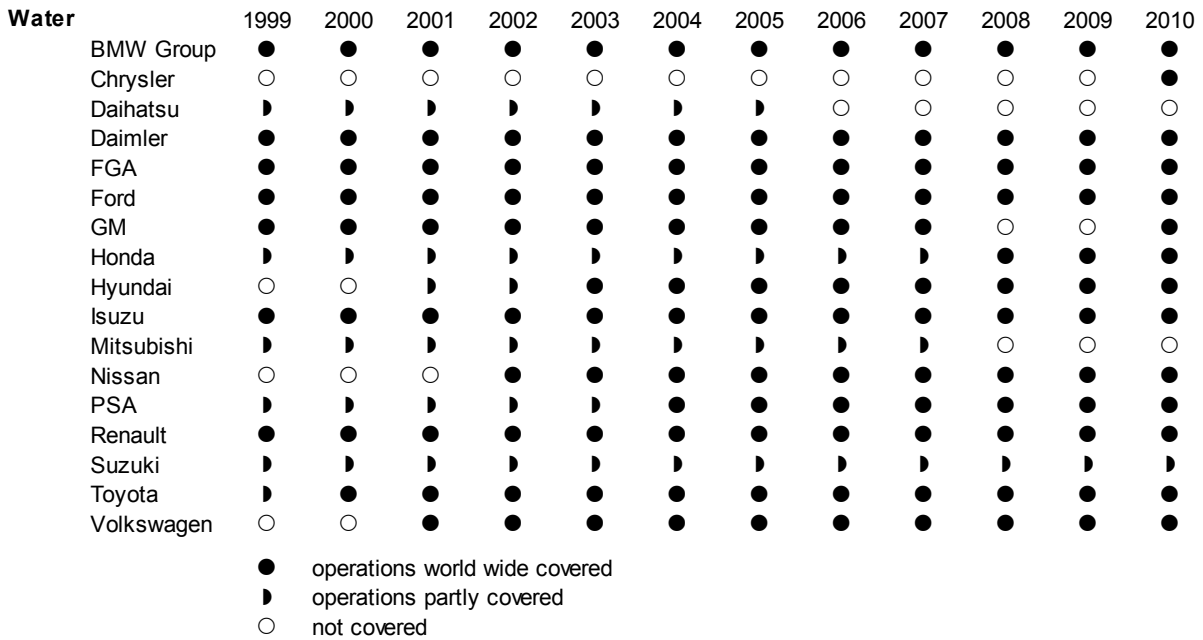

Figure 10: Data coverage for water consumption

Work accidents

This indicator has the poorest level of data coverage in our study. This is mainly because of the fact that due to the difficulty of comparing Japanese accident data with European and North American company data, we decided to exclude the data available from Japanese manufacturers on this particular indicator. We do not dispute the fact that intensive efforts are currently being undertaken in Japanese production plants to ensure a high level of work safety. The problem is that it seems to be impossible to compare the figures, because the accident data reported by the companies are obviously influenced by specific cultural factors and/or different definitions. In their analysis of Japanese car manufacturers and their North American subsidiaries, *Wokutch & Vansandt* found that the accident rates in the parent company plants in Japan and their North American counterparts differ by a factor of 200 in some cases [18]. The Heinrich rule [19] is sometimes referred to when analysing work accidents in Japanese production facilities. This is based on a statistical relationship first observed in the 1930s which describes the distribution of accidents on the basis of their seriousness. This states that the ratio of harmless to serious accidents is 29:1. Although the

number of work accidents at Japanese manufacturers calculated on this basis may well have been plausible, we decided to exclude an assessment of work accident rates in Japanese carmakers from this study because of the high level of statistical uncertainty.

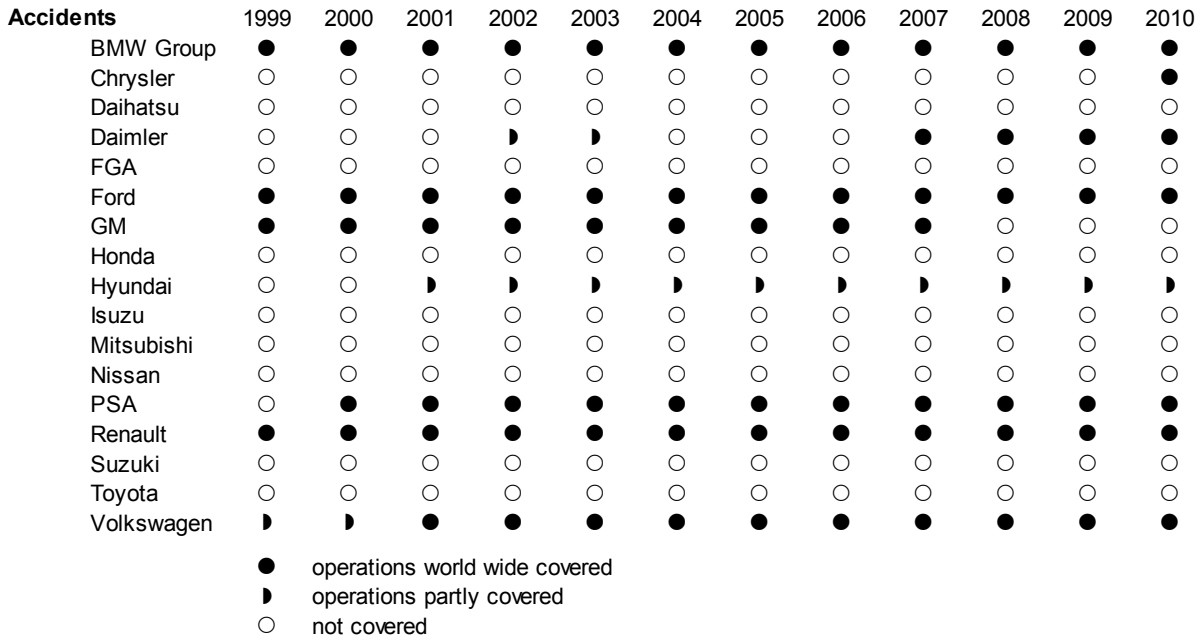

Figure 11: Data coverage for work accidents (* excluding the Japanese manufacturers)

In the case of DaimlerChrysler, no work accident data are available 1999 to 2001 and 2004 to 2006. For some years the company and also Volkswagen report only specific accident rates for blue collar workers in the vehicle production plants (Mercedes Car Group in the period 2002-2003) or in certain parts of the corporation (Volkswagen AG in the period 1999-2000). For 2007 to 2010, work accident data is available for Daimler AG. No accident data are available for GM after 2007 and for Chrysler and PSA before 2010 and 2000 respectively. Hyundai started reporting accident data in 2001 but for domestic activities only.

Number of employees

Data coverage for the number of employees was the highest of all the indicators (see Figure 12). In the case of Daihatsu, Mitsubishi and Suzuki, and Hyundai to some extent, only the number of domestic employees was recorded. As already mentioned, data are only available for Hyundai beginning from 2001, for Isuzu beginning from 2000, for Nissan beginning from 2002, for Daihatsu for the period from 1999 to 2005 and in the case of Chrysler as of 2010. No data were available for GM in 2008 and 2009.

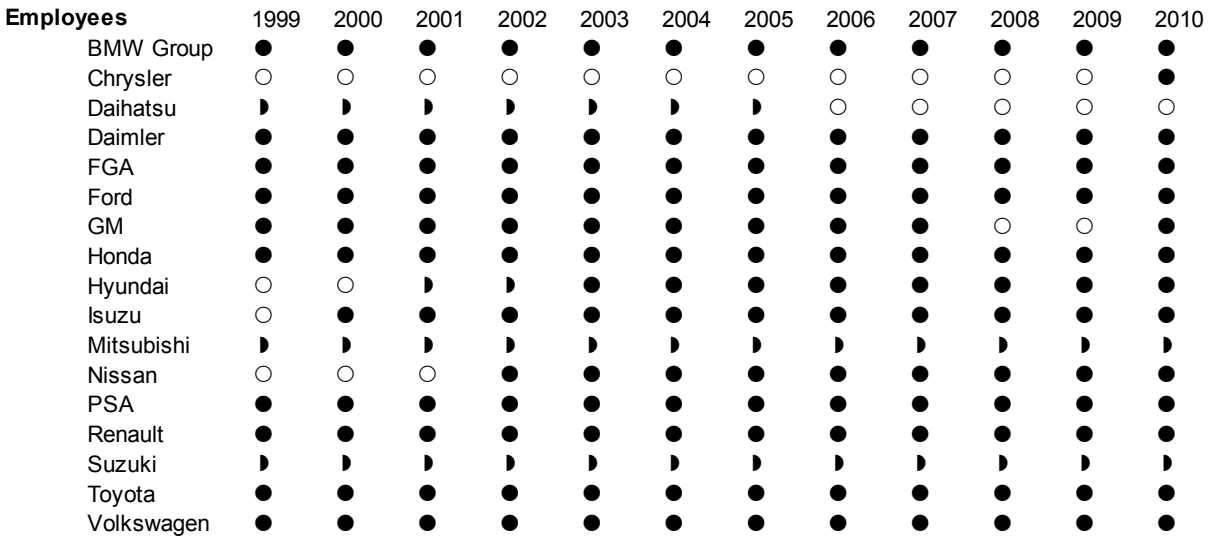

Figure 12: Data coverage for number of employees

3.5.2 Treatment of missing data

As we already mentioned in our comments on data coverage, there were no data available for some resources – either for the entire review period or for specific years – for some of the automobile manufacturers. In these cases, assessment is based on the assumption that the company uses these resources as efficiently as its industry peers do on average. Hence, in these cases a value contribution of €0 is entered for the calculation of the company's Sustainable Value.

Let's take the example of the calculation of work accident data for Daimler AG: While company data is available for 2002 and 2003 and for 2007 to 2010, allowing appropriate efficiency ratios to be calculated, no data exist for the years 1999 to 2001 and 2004 to 2006. We therefore made the assumption that Daimler's work accident indicator during these years was in line with the industry average. The relevant value contribution used to calculate the Sustainable Value of Daimler for the years 1999 to 2001 and 2004 to 2006 is thus €0.

Another example of this approach is the work accident rates for all Japanese car manufacturers. As already mentioned (see page 25), an adequate data set does not exist here. Since any estimate would therefore be speculative in nature, we have once again taken the industry average as the basis for calculation. This means that the work accident indicators for all the Japanese manufacturers have a value contribution of €0 for the purposes of our Sustainable Value calculations.

3.5.3 Handling different scopes of data

One important step in determining Sustainable Value is the comparison of the company's efficiency of resource use compared with the benchmark (see 2.3, step 3). The calculation of these efficiencies therefore plays a central role. They are worked out by dividing the company's operating profit by the quantity of the various resources used. In order to produce meaningful results, it is vitally important that the same system boundaries (scope) apply to the profit figures and the data on resource use [20]. No meaningful comparison can

be made, for example, between a profit figure that applies to the entire group and a figure for water consumption that only covers part of the company (e.g. a specific division or region). Unfortunately the environmental and social data reported by companies often tend to have different system boundaries from the published financial figures.

In such cases there are two possible ways of matching up the scope for the figures available on corporate profit and resource use:

- One way is to reduce the scope of the financial data to match the scope of the environmental or social indicator. We can illustrate this using the example of the five Japanese manufacturers Daihatsu, Honda, Isuzu, Mitsubishi and Suzuki. Since the available environmental data for some indicators is limited in each case to just the domestic production facilities, the financial data collated to calculate the efficiency of these companies also had to be restricted to their business activities in the home market.

  In cases where the scope of the company's environmental and social data differs, corresponding financial figures are used to calculate the efficiency indicators. We can illustrate this by looking at PSA, where the scope of data varies not only in terms of time, but also between the different indicators: while environmental data for the entire group are (more or less) available for the period 2004-2010, the data that exist for the previous years only relate to PCA, a business segment of the PSA Group. One exception illustrating the way that the scope of data can vary from one indicator to the next is PSA's VOC-emissions, which in fact only relate to PCA for the entire review period. In the period 2004-2010, the analysis of resource efficiency therefore compares the VOC-emissions of the PCA division with the financial data reported for this business segment, whereas all the other indicators in this period relate to the PSA Group as a whole and are therefore compared with PSA's consolidated financial figures.

- Another way is to extrapolate the reported environmental and social data to match the scope of the entire group. To do so, however, we have to assume that those divisions for which no data are available use resources with more or less the same efficiency as those divisions for which data are reported. When compiling the study, these extrapolations were undertaken on the basis of different allocation keys. One possibility is to extrapolate with the help of the company's production or sales figures. The nitrogen and sulphur oxides-emissions reported by General Motors, for example, refer only to GM North America (GMNA) for the entire review period. Taking GMNA's contribution to General Motors' total production output as a starting point, it was therefore possible to extrapolate the group's entire emissions. The same rationale applies to the extrapolation of total waste generated by Ford. In this case the waste figures for the North American production sites were extrapolated to the entire group. All extrapolated data were presented to the respective companies for checking and comment.

3.5.4 Calculating and estimating performance data

In many cases the figures reported by companies on the use of various resources tend to be relative rather than absolute figures. In such cases the absolute performance figures have to be worked out – occasionally using estimates and assumptions. Eight of the 17 companies mostly do not report VOC-emissions for the entire group, but rather VOC-emissions per bodywork surface area painted (FGA, Ford, Isuzu, Mitsubishi, Nissan, Renault, Suzuki, Toyota). To make an extrapolation based on production volume, assumptions therefore first need to be made on the average bodywork surface area painted during vehicle production. Allowances need to be made for the different vehicle models manufactured and their respective production volumes. For example, the extrapolation for Ford assumed a figure of 110 m². Table 2 shows the estimates used for each of the eight manufacturers.

Company	Average bodywork surface area painted (estimate)
FGA	80 m²
Ford	110 m²
Isuzu	90 m²
Mitsubishi	90 m²
Nissan	100 m²
Renault	88 m²
Suzuki	65 m²
Toyota	100 m²

Table 2: Estimates used for extrapolation of total VOC-emissions of seven manufacturers

A similar approach was used to determine the annual work accidents of different companies. Some of the manufacturers (e.g. GM, Ford, Chrysler Group) report the annual accident rate as a relative figure per employee. These relative ratios were converted into absolute accident statistics with the help of the figures collected on the number of employees. Another popular form of reporting is the number of work accidents per one million hours worked (e.g. Daimler, Hyundai, PSA, Renault). To come up with absolute accident statistics in such cases, estimates also need to be made of the average annual working hours in these companies. For the purposes of this study, we referred to the official labour market statistics published by the OECD [21]. The projections made based in each case on the average number of hours worked in the home country.

In many instances any gaps in the data could be filled with a reasonable estimate. This applies chiefly to CO_2-emissions resulting mainly from the company's energy consumption. When calculating the CO_2-emissions, it is possible in such cases to refer back to the specific emission coefficients of the various energy resources [20]. When choosing the coefficients, it is important to note the quota of external energy consumed by the company and the energy source that provided the power used in the company. The energy mix ultimately determines the level of CO_2 emitted by each company. Using these assumptions, it was possible to calculate the total CO_2-emissions of PSA, for example.

Another example is the estimate for waste fractions of individual manufacturers in the event that comprehensive data are not available for a particular financial year. A typical example

would be the calculation of the amount of waste generated by Daihatsu in 1999. Although the company does not actually publish any figures for total waste generation, it does provide data on individual waste fractions. Based on the assumption that Daihatsu uses identical waste reduction and recycling technologies in 1999 and 2000, the total waste generated for the 1999 financial year can be determined on the basis of the relationship between the individual waste fractions in the year 2000.

A third indicator where data gaps can to some extent be filled by estimates is the number of work accidents. In some cases companies only report the work accidents of blue-collar workers (e.g. Volkswagen). To ensure a uniform data base, the number of accidents suffered by white-collar workers was estimated on the basis of the employment structure and to some extent with reference to the frequency of accidents in different parts of the workforce in other car manufacturers, as well as based on details from the literature [22].

3.5.5 Dealing with data corrections

In many cases manufacturers have corrected or updated figures in their subsequent environmental or social reports. Where new data have been provided to correct erroneous data in previous reports, they were taken over. Examples include the data Ford published on its water consumption for the years 2000 and 2001. These were corrected in the Ford Citizenship Report 2002, as one of the divisions that only started environmental reporting from 2002 onwards was included retrospectively in the global water consumption data of this manufacturer [23].

In other cases environmental or social data were adjusted in subsequent years in response to a change in the scope of consolidation, to ensure that the data could still be compared despite the restructuring of the company. Since this change in the scope of consolidation is also reflected in the financial figures published by the group, and for methodological reasons must match the scope of the corresponding environmental and social data (see chapter 3.5.3), here the originally reported data is used. The best example to illustrate this approach is to look at the waste figures for Mitsubishi Motors [24]. After the business segment Mitsubishi Fuso was split off in 2002, the waste data disclosed in the current environmental report were adjusted to exclude the quantities of waste generated by Fuso. But since the scope of the financial data in the period 1999 - 2002 includes Mitsubishi Fuso, this study used the previous corporate data that included Mitsubishi Fuso.

4 Results: Overview of the Industry

In this chapter we present the results of our Sustainable Value analysis of global automobile manufacturers. Chapter 4.1 starts with an overview of the Sustainable Value created by automobile manufacturers over the period 1999-2010. This is followed by the ranking of these manufacturers (4.2). In 4.3 we present and discuss the results of the individual companies examined in this study.

4.1 Sustainable Value of global automobile manufacturers in the period 1999-2010

Figure 13 provides an initial overview of the absolute Sustainable Value created by 17 automobile manufacturers studied during the period 1999-2010. The Sustainable Value produced by these companies ranges from -€13.23bn (GM, 2005) to +€10.62 bn (Toyota, 2006). One salient feature is that only one manufacturer managed to consistently produce a positive Sustainable Value over the entire review period (BMW Group). GM was identified as the only company continuously generating negative Sustainable Value for the years data are available. Also Chrysler shows only a negative Sustainable Value but was only included as individual company with one year (2010)[6]. The 14 remaining companies show both positive and negative Sustainable Value figures.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
BMW Group	€1,486m	€1,940m	€2,697m	€2,432m	€2,287m	€2,643m	€2,981m	€3,223m	€2,811m	€502m	€101m	€3,567m
Chrysler	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-€683m
Daihatsu	-€222m	-€59m	€49m	-€167m	-€91m	-€75m	€13m	n/a	n/a	n/a	n/a	n/a
Daimler	€4,386m	€421m	-€1,780m	€1,464m	€1,215m	€1,855m	€1,539m	€2,212m	€3,989m	€2,384m	-€1,986m	€3,044m
Fiat Group Automobile	-€1,579m	-€1,314m	-€1,127m	-€1,644m	-€1,285m	-€1,220m	-€843m	-€444m	-€522m	€257m	€224m	-€751m
Ford	€303m	€1,052m	-€3,643m	-€3,021m	-€1,942m	-€667m	-€1,197m	-€5,318m	-€3,406m	-€3,029m	-€2,369m	€2,061m
GM	-€3,354m	-€3,165m	-€5,346m	-€8,536m	-€6,157m	-€7,320m	-€13,235m	-€8,525m	-€9,519m	n/a	n/a	-€6,718m
Honda	€369m	€923m	€2,332m	€1,613m	€1,273m	€1,154m	€3,075m	€1,784m	€950m	-€139m	€1,040m	-€115m
Hyundai	n/a	n/a	€1,401m	€900m	€359m	-€207m	€311m	€187m	-€172m	€1,337m	€2,993m	€2,241m
Isuzu	-€514m	-€282m	-€70m	-€64m	€366m	€330m	€294m	€340m	€150m	-€158m	€29m	€276m
Mitsubishi	-€602m	-€1,098m	-€190m	-€89m	-€215m	-€791m	-€298m	-€247m	€112m	n/a	n/a	n/a
Nissan	n/a	n/a	n/a	€2,192m	€2,099m	€1,874m	€2,469m	€1,453m	€313m	-€1,554m	€864m	-€921m
PSA	-€993m	-€521m	€352m	€302m	-€336m	-€378m	€124m	-€492m	-€666m	-€253m	-€1,076m	-€401m
Renault	-€232m	-€248m	-€879m	-€565m	-€566m	€501m	-€133m	-€312m	-€704m	-€584m	-€746m	-€1,188m
Suzuki	-€67m	-€4m	€160m	€85m	€122m	€92m	€106m	€106m	-€21m	-€70m	€162m	-€32m
Toyota	€2,181m	€3,679m	€6,814m	€6,632m	€7,371m	€6,455m	€8,682m	€10,618m	€8,135m	-€4,325m	€181m	-€1,153m
Volkswagen	-€596m	-€355m	€1,624m	€1,018m	-€1,961m	-€2,069m	€21m	-€696m	€1,599m	€4,002m	€869m	€853m

Figure 13: Absolute Sustainable Value of car manufacturers

During the review period, clearly positive trends in absolute Sustainable Value were reported for BMW (1999: €1.49bn; 2010: €3.57bn), FGA (1999: -€1.58bn; 2010: -€751m) and Isuzu (1999: -€514m; 2010: €276m). Toyota initially followed a strong positive trend too, showing the highest Sustainable Value generated in this study in 2006, but then changed direction and fell into negative terrain in 2008 and 2010. Hyundai, in contrast, follows a negative trend until 2004 (-€207m) but improves significantly until 2010 (€2.24bn). Also Ford shows a considerable improvement when comparing 1999 (€303m) and 2010 (€2.06bn) results, the

[6] Until 2007 Chrysler was included via DaimlerChrysler (Daimler's results from 1999 to 2006 refer to DaimlerChrysler)

development, however, is strongly erratic with high negative results throughout the period from 2001 to 2009. The company showing the strongest negative trend in its Sustainable Value is GM (1999: -€3.35bn; 2010: -€6.7bn). The negative performance of the two sector heavyweights Ford and GM has a significant influence on the results: While most manufacturers showed a negative performance relative to the industry average in the years 1999 and 2000 (9 out of 14), the relationship changes in subsequent years. In the period 2001-2007 at least half of the 16 companies report a positive Sustainable Value (2001: 8/15; 2002: 9/16; 2003: 8/16; 2004: 8/16; 2005 11/16; 2006 8/15; 2007 8/15). In 2005, the significant deterioration in the performance of General Motors meant that merely five other manufacturers in the group of 16 posted a negative Sustainable Value. The considerable increase in manufacturers with a negative Sustainable Value in 2008 (8/13) can partly be ascribed to the exclusion of GM, but is also a result of Volkswagen's strong performance increase and of the global economic crisis.

The graphic representation of the Sustainable Value (Figure 14) clearly illustrates the impact of the two large manufacturers on the overall development. The downward trend for General Motors and the strong erratic development for Ford's performance can be clearly seen. Daimler (DaimlerChrysler) shows a very negative trend from 1999 to 2001, but subsequently recovers continuously. In 2007, after demerger of Daimler and Chrysler, the company creates the second largest Sustainable Value in 2007, deteriorates in 2008 and 2009 and improves its performance again in 2010. Toyota shows the strongest positive trend until 2006 (starting from an already high initial level). Afterwards, however, the performance dropped significantly. The trend is also positive for the BMW Group, which also has a high starting point, but is interrupted by a performance drop in 2008 and 2009 before achieving its best performance in 2010. Particularly striking is the isolated position of General Motors, whose performance in the area of absolute Sustainable Value is by far the worst in the industry. The remaining manufacturers show comparatively modest, fluctuating performance changes without following a clear trend.

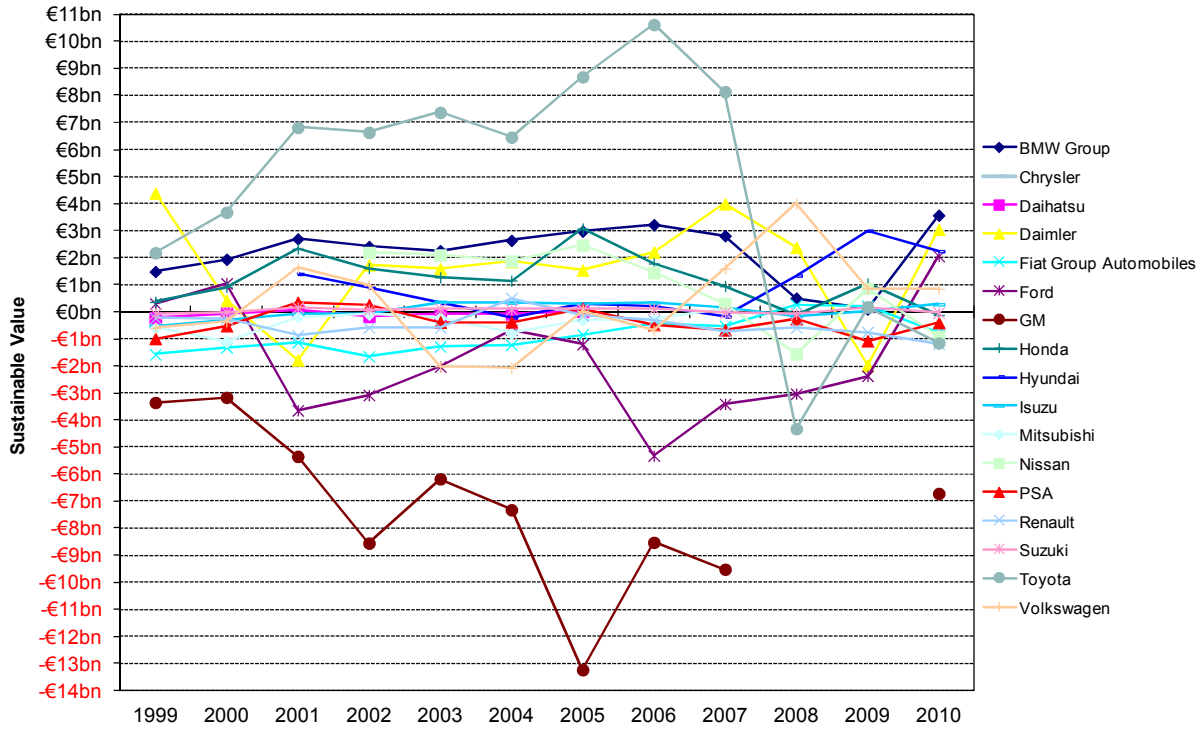

Figure 14: Absolute Sustainable Value of car manufacturers (graphic representation)

The next figure shows the graphic representation of Sustainable Value trends in regional terms. Figure 15 shows that no uniform trend initially emerges for European and North American manufacturers. But if we look at the two manufacturers with the biggest proportion of US production facilities (Ford, General Motors), they show the worst negative performance in terms of absolute Sustainable Value. With European manufacturers, by contrast, the Sustainable Value is relatively consistent over time (BMW Group, Fiat Group Automobiles, PSA, and Renault). The exceptions to these two groups are Daimler and Volkswagen, whose curves fluctuate significantly over time.

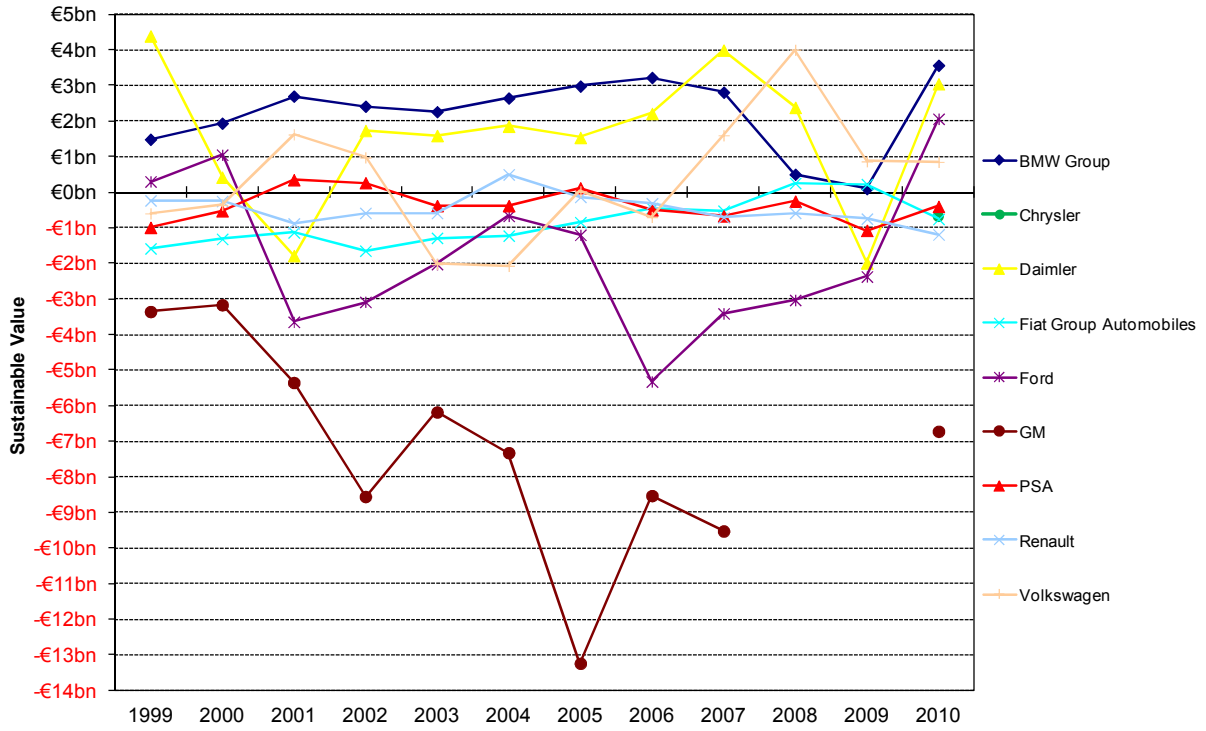

Figure 15: Sustainable Value trends: European and North American manufacturers

A different picture emerges when we look at the Asian manufacturers (Figure 16): with the exception of Toyota, all of the other seven Asian manufacturers move within a comparatively narrow bandwidth of between -€1.6bn and +€3.1bn Sustainable Value. In terms of amounts, the deviations in Sustainable Value from the industry average are therefore less pronounced for Asian manufacturers than they are in the case of the European and North American automobile producers. This is mainly attributable to the fact that many of the Asian manufacturers are comparatively small companies, such as Suzuki, Daihatsu or Isuzu. It is also interesting to note that during the period 2001-2007 the majority and in 2009 all of the Asian manufacturers show a positive Sustainable Value (2001 2/7; 2002 3/8; 2003 2/8; 2004 3/8; 2005 1/8; 2006 1/7; 2007 2/7).

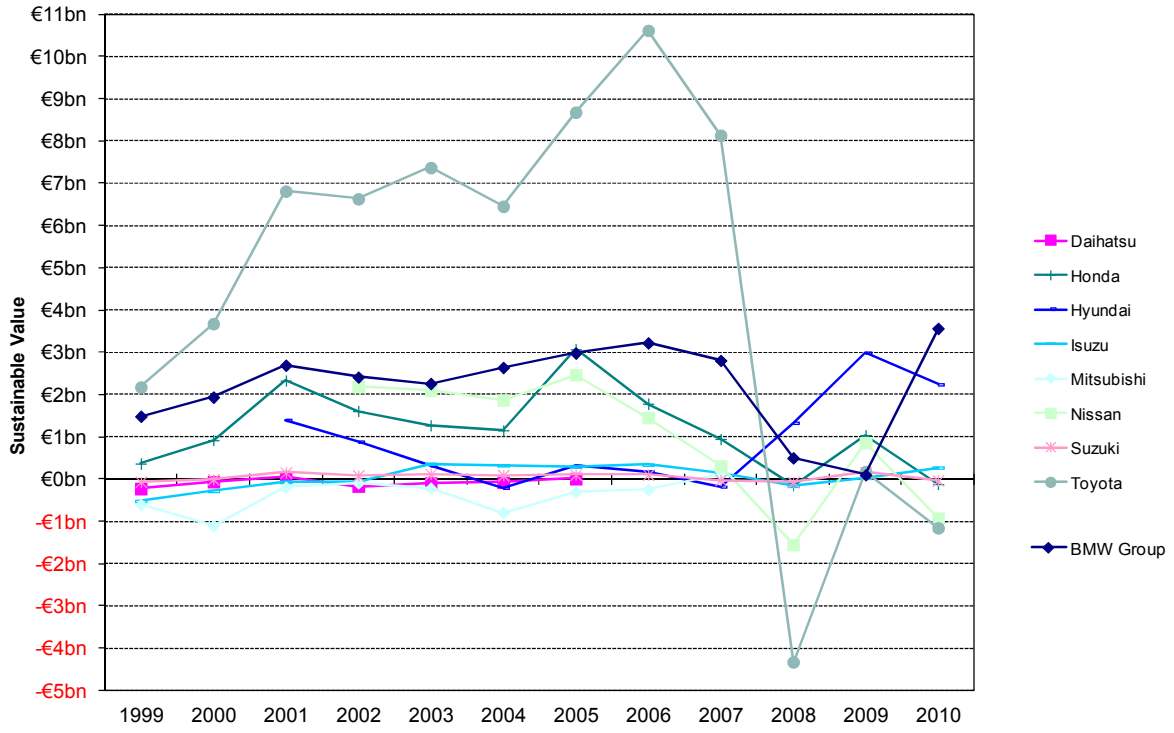

Figure 16: Sustainable Value trends: Asian manufacturers

4.2 *Sustainable Value Margin – manufacturers' rankings*

So far our analysis of the Sustainable Value data has focused on the absolute Sustainable Value of the individual automobile manufacturers. As already explained in chapter 2.4, the actual amount of Sustainable Value created is directly linked to the size of the company in question. The Sustainable Value Margin is a relative ratio that takes into consideration the size of the company. Figure 17 shows the Sustainable Value Margin, i.e. the ratio of Sustainable Value to sales, for each manufacturer.

	1999	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
BMW Group	4.32%	5.21%	7.01%	5.70%	5.45%	5.96%	6.39%	6.58%	5.02%	0.94%	0.20%	5.90%
Chrysler	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-2.16%
Daihatsu	-2.25%	-0.67%	0.65%	-2.29%	-1.32%	-0.95%	0.15%	n/a	n/a	n/a	n/a	n/a
Daimler	2.92%	0.26%	-1.16%	1.16%	1.17%	1.34%	1.03%	1.46%	4.01%	2.49%	-2.52%	3.11%
FGA	-3.28%	-5.25%	-4.61%	-7.42%	-6.42%	-5.94%	-4.32%	-1.87%	-1.95%	0.95%	0.76%	-2.70%
Ford	0.20%	0.57%	-2.01%	-1.78%	-1.39%	-0.48%	-0.84%	-4.17%	-2.71%	-3.05%	-2.79%	2.12%
GM	-2.03%	-1.58%	-2.70%	-4.56%	-3.77%	-4.70%	-8.56%	-5.16%	-7.20%	n/a	n/a	-6.59%
Honda	0.70%	1.44%	3.50%	2.45%	2.07%	1.80%	4.28%	2.41%	1.28%	-0.20%	1.59%	-0.15%
Hyundai	n/a	n/a	4.12%	2.32%	0.94%	-0.56%	0.68%	0.36%	-0.32%	2.70%	5.82%	3.06%
Isuzu	-5.20%	-2.61%	-0.78%	-0.82%	4.56%	4.10%	3.63%	4.24%	1.93%	-2.15%	0.47%	2.98%
Mitsubishi	-2.85%	-5.02%	-0.89%	-0.69%	-2.27%	-8.49%	-3.04%	-2.66%	0.87%	n/a	n/a	n/a
Nissan	n/a	n/a	n/a	3.88%	3.75%	3.11%	3.78%	2.08%	0.47%	-2.65%	1.51%	-1.19%
PSA	-2.63%	-1.18%	0.68%	0.49%	-0.70%	-0.67%	0.22%	-0.87%	-1.10%	-0.46%	-2.22%	-0.71%
Renault	-0.62%	-0.62%	-2.42%	-1.60%	-1.56%	1.23%	-0.32%	-0.75%	-1.73%	-1.54%	-2.21%	-3.05%
Suzuki	-0.55%	-0.03%	1.23%	0.67%	1.06%	0.77%	0.80%	0.76%	-0.15%	-0.55%	1.43%	-0.23%
Toyota	1.99%	2.82%	5.31%	5.18%	5.66%	4.70%	5.69%	6.65%	5.00%	-3.03%	0.13%	-0.69%
Volkswagen	-0.79%	-0.41%	1.83%	1.12%	-2.32%	-2.33%	0.02%	-0.66%	1.47%	3.52%	0.83%	0.67%

Figure 17: Sustainable Value Margin of car manufacturers

Making provisions for the size of the company allows a meaningful comparison of the performance of the individual manufacturers. A comparison with the absolute Sustainable Value

data of carmakers (Figure 13) shows that the negative/positive signs are identical in each case: a manufacturer that uses its bundle of resources more efficiently than the industry average over the review period and subsequently creates positive absolute Sustainable Value inevitably achieves a positive Sustainable Value Margin as well. As with our analysis of Sustainable Value, only the BMW Group has a consistently positive Sustainable Value Margin; GM always falls below the industry average in every year studied.

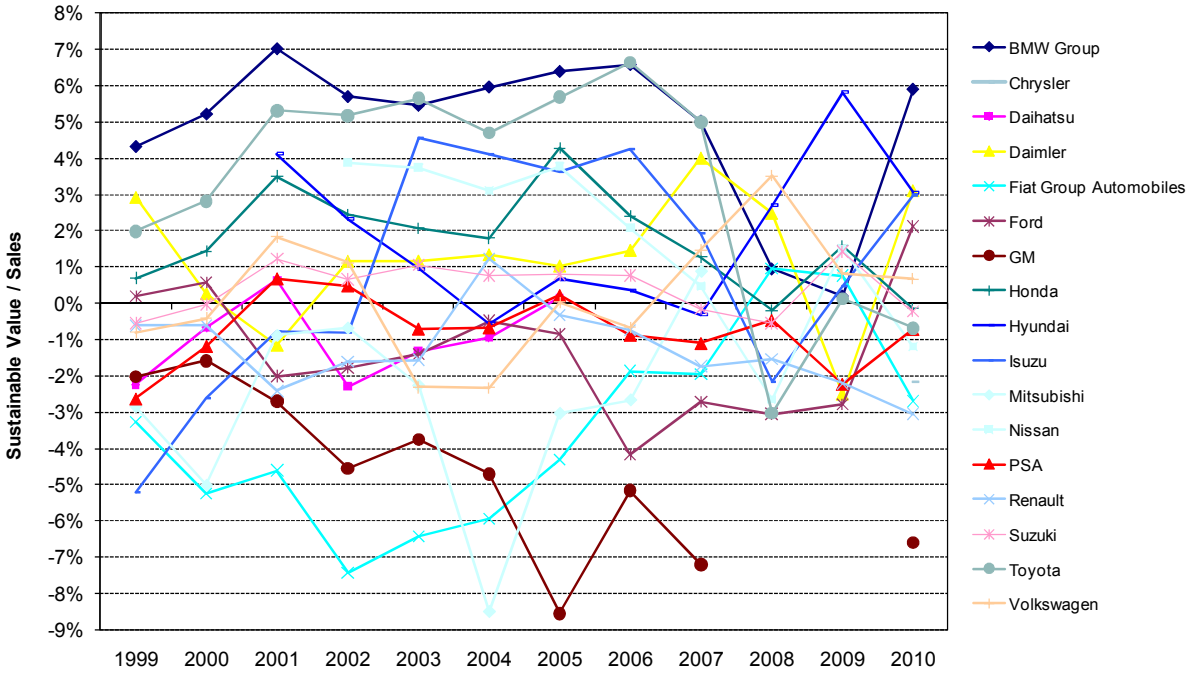

Figure 18: Sustainable Value Margin of car manufacturers (graphic representation)

It seems that the anomalous positions of Toyota and General Motors seen in the analysis of the absolute Sustainable Value can partly be attributed to the size of both corporations. Although Toyota is one of the leaders, while General Motors is one of laggards when it comes to Sustainable Value performance, the difference to the other companies studied is not as pronounced as in the analysis of absolute Sustainable Value. By contrast, the BMW Group and Fiat Group Automobiles have extreme positions when it comes to the analysis of Sustainable Value Margins, although their (positive or negative) Sustainable Value is relatively modest as far as amounts are concerned. Relative to company sales, the BMW Group beats the previous leader Toyota in ten of the twelve years studied, while the performance of Fiat Group Automobiles puts it well below the previous laggard General Motors between 1999 and 2004. A similar effect can also be seen with Isuzu: while the absolute Sustainable Value analysis only showed modest changes due to the company's small size, its Sustainable Value Margin followed a far more erratic trend. Starting off in last place with a Sustainable Value Margin of -5.20% in 1999, its performance significantly improved in the second half of the review period, reaching its best positive value of 4.56% in 2003.

A regional comparison of the Sustainable Value Margin is also worthwhile. Figure 19 provides a graphic representation of the performance of the Sustainable Value Margin of Euro-

pean and North American automobile manufacturers. We can see that the BMW Group occupies a unique position in these regions. BMW is the only carmaker to consistently report a positive Sustainable Value Margin. Not just the consistency of this performance, but also the significant gap between the BMW Group and other European and North American manufacturers is very noticeable (except for 2008 and 2009). This is especially so in 2001, when the BMW Group shows a Sustainable Value Margin of around 7%. GM lies well into negative territory over the entire review period. Similarly does Fiat Group Automobiles, bringing up the rear until and including 2004 but recovers from 2005 onwards, even being in positive territory in 2008 and 2009. Daimler stages a marked recovery and in 2007 finally manages to top the relatively high level of a Sustainable Value Margin it achieved in 1999. Despite a drop in 2008 and 2009 it came out with its second best result in 2010. The Sustainable Value Margin of Renault follows a similar path until 2004, when the company moves into positive territory for the first time and ranks third among European and North American manufacturers. In the six following years, however, Renault drops back below the industry average, reaching its worst performance in 2010. The Volkswagen Group manages to achieve a positive Sustainable Value Margin in 7 of the 12 years assessed (2001, 2002, 2005, 2007 - 2010). Ford and PSA achieve very modest results over the entire review period, reaching a positive Sustainable Value Margin only in 3 of the 12 years assessed (1999, 2000, 2010 and 2001, 2002 and 2005 respectively). Also Chrysler (2010) achieves a modest Sustainable Value Margin only and performs in the lower midfield of the European and North American manufacturers.

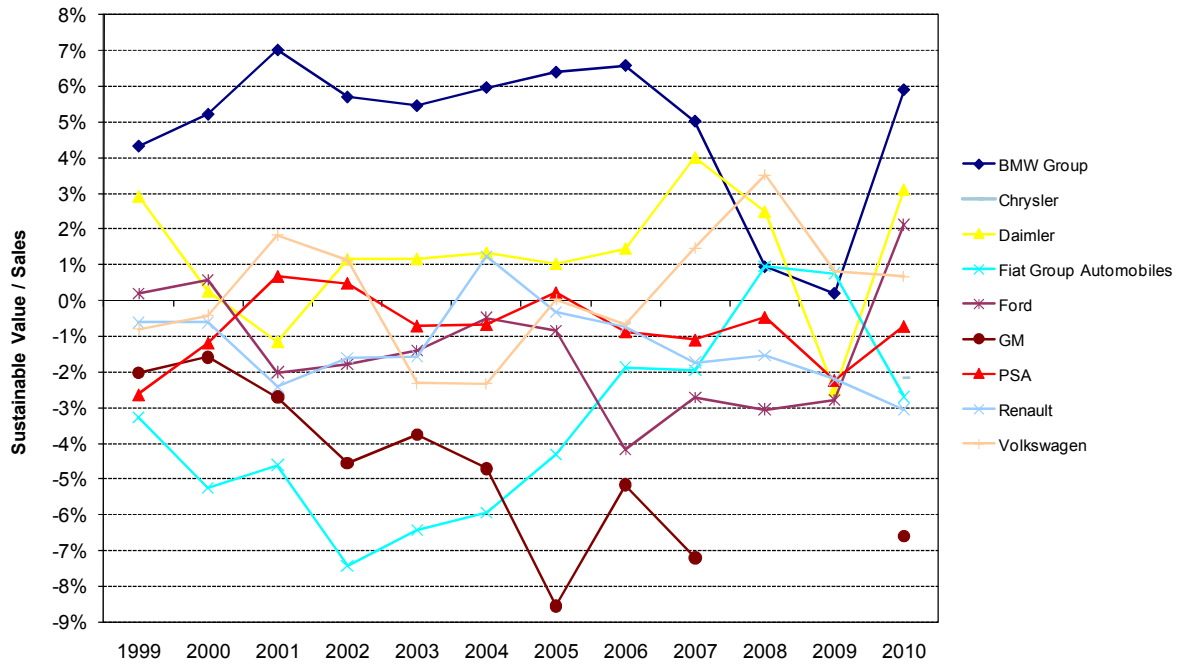

Figure 19: Sustainable Value Margin trends for European and North American automobile manufacturers

If we compare the performance of the Sustainable Value Margin of the Asian manufacturers (Figure 20), the first thing we notice is that every company with the exception of Mitsubishi managed to steadily improve their Sustainable Value Margin in the period 1999 to 2001. This means that all the Asian companies (apart from Mitsubishi) succeeded in generating a higher Sustainable Value per unit of sales than in the previous year. In 2002, however, the Sustain-

able Value Margin of most Asian manufacturers declined slightly and in some cases did not start to improve again until 2003. With the only exception being Daihatsu, in 2004 seven of the eight Asian manufacturers were not able to at least hold the 2003 level. Particularly Mitsubishi fell sharply. In 2005, seven of the eight Asian companies experienced more or less marked improvements. Compared with the performance of absolute Sustainable Value, where many of the Asian manufacturers were bunched tightly together, the analysis of the Sustainable Value Margin provides a more meaningful comparison, as it takes into account the size of the company. Of all the Asian manufacturers, Toyota is the one with the highest Sustainable Value Margin from 1999 to 2007 but shows the worst performance of all Asian manufacturers in 2008 and 2009 and second worst in 2010. Suzuki shows a positive trend until 2001, then follows a more or less stable performance until it suffers a decline beginning from 2007 and remains in negative territory except for 2009. Isuzu's performance is strongly erratic, being the laggard among the Asian manufacturers in 1999 and second best performer in 2003, destroying Sustainable Value in 2008 and being second best Asian manufacturer again in 2010. Also Hyundai's performance changes strongly over the assessment period. Although the company had quite a high Sustainable Value Margin of over 4% in 2001, it suffered a sharp and continuous decline over the next three years and achieves a Sustainable Value Margin of just below 1% in 2005 and 2006. Performing slightly below industry average in 2007, Hyundai improves its performance significantly towards the end of the review period, being the best Asian manufacturer in 2008, 2009 and 2010. Honda and Nissan also show a consistently positive Sustainable Value Margin in most of the years assessed but drop into negative territory in 2008 and 2010. By contrast, Daihatsu and particularly Mitsubishi fall well behind other Asian manufacturers. The latter brings up the rear among the Asian manufacturers in six of the nine years the company has been assessed, but managed to generate a positive Sustainable Value Margin for the first time in 2007. Compared with the European and North American automobile manufacturers, the most obvious difference is that the gaps to the leader are not as great, and the performances of each company are more evenly spaced. The one exception is Mitsubishi's performance in 2004.

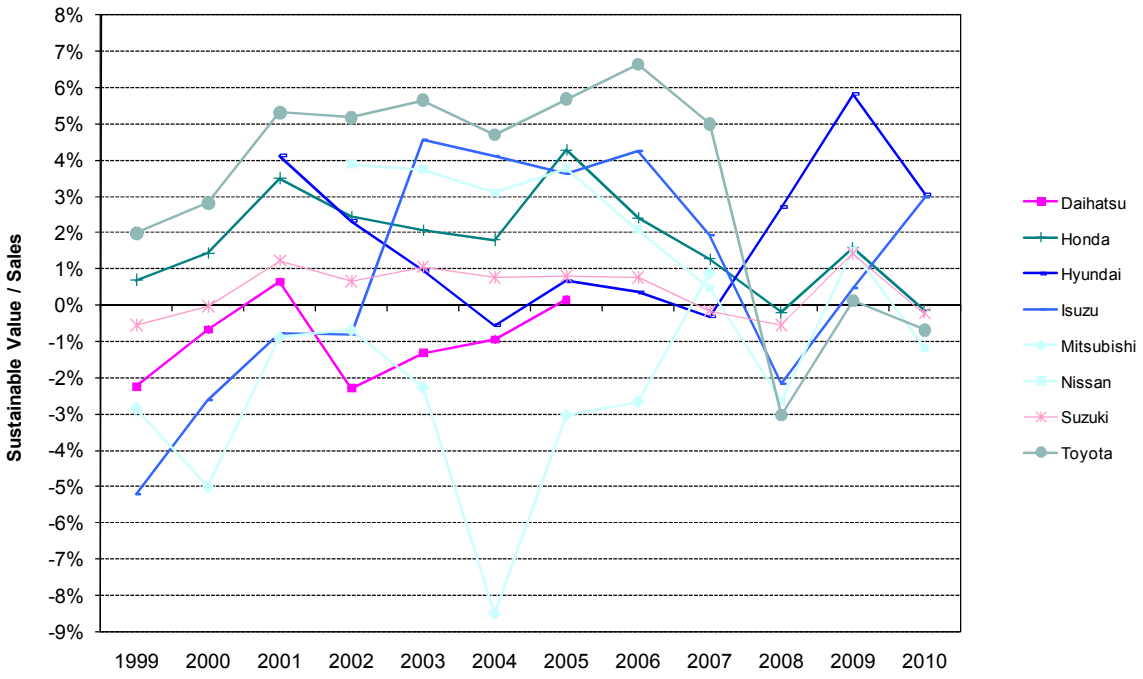

Figure 20: Sustainable Value Margin trends for Asian automobile manufacturers

As described in chapter 2.4, the Sustainable Value Margin provides a meaningful basis for comparing the performance of individual carmakers. Figure 21 shows the ranking of the 17 manufacturers based on the Sustainable Value Margin. The BMW Group and Toyota are the two companies that almost consistently top the rankings until and including 2007. The BMW Group is the manufacturer that generates the highest Sustainable Value per unit of sales using the bundle of resources at its disposal over the entire review period. The exceptions are 2003 and 2006, when Toyota leads the rankings and 2008 and 2009 when BMW drops on fifth and eighth position respectively. Aside from the BMW Group and Toyota, Honda consistently features in the top third from 1999 to 2006 and in 2009. Hyundai and Nissan also appear high up in the rankings in most of the years for which sufficient data are available for them. Furthermore it is noticeable that Hyundai came off particularly well from 2008 to 2010. Daimler ranks second in 1999 (at that time still DaimlerChrysler) before suffering a decline, ranking 11th in 2001. Despite a slight improvement in 2002 the company remains on sixth position for the next four years before improving again, now as Daimler AG, ranking among the top three in 2007, 2008 and 2010.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
BMW Group	1	1	1	1	2	1	1	2	1	5	8	1
Chrysler	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	12
Daihatsu	10	9	8	14	10	12	10	n/a	n/a	n/a	n/a	n/a
Daimler	2	5	11	6	6	6	6	6	3	3	12	2
FGA	13	14	15	16	16	15	15	12	13	4	6	13
Ford	5	4	12	13	11	9	13	14	14	13	13	5
GM	9	11	14	15	15	14	16	15	15	n/a	n/a	15
Honda	4	3	4	4	5	5	3	4	6	6	2	7
Hyundai	n/a	n/a	3	5	8	10	8	8	10	2	1	3
Isuzu	14	12	9	11	3	3	5	3	4	10	7	4
Mitsubishi	12	13	10	10	13	16	14	13	7	n/a	n/a	n/a
Nissan	n/a	n/a	n/a	3	4	4	4	5	8	11	3	11
PSA	11	10	7	9	9	11	9	11	11	7	11	10
Renault	7	8	13	12	12	7	12	10	12	9	10	14
Suzuki	6	6	6	8	7	8	7	7	9	8	4	8
Toyota	3	2	2	2	1	2	2	1	2	12	9	9
Volkswagen	8	7	5	7	14	13	11	9	5	1	5	6

Figure 21: Manufacturers' Sustainable Value Margin rankings

Over the review period it is generally Fiat Group Automobiles, General Motors and Mitsubishi that bring up the rear. While Isuzu only comes in last place in 1999 but improves almost continuously, Fiat Group Automobiles manages to do so every year in the period 2001-2003. During the reporting period Mitsubishi is positioned towards the bottom of the mid-field for most of the time, but comes second to last in 2000 and last in 2004. General Motors is also consistently low down in the rankings, coming last in the years 2005 to 2007 and in 2010. The performance trend is therefore negative over the observation period as a whole. While GM came ninth out of the 14 companies analysed in 1999, it ranked in the last three places during the period 2001-2010.

Other companies showing a negative performance trend compared with their industry peers over the review period include Renault (1999: 7th; 2010: 14th) and Suzuki (1999: 6th; 2010: 8th). Also Ford shows a negative trend (1999: 5th; 2006: 14th) but in 2010 eventually manages to get back on its 1999 position. By contrast, the performance trend was positive for Isuzu (1999: 14th; 2010: 4th). When analysing company-specific trends, it should be noted that in the period 2001-2010 three new companies joined the rankings: Hyundai (2001), Nissan (2002) and GM (2010), where at least the first two both occupy high positions. At the same time Mitsubishi and Daihatsu were assessed only until and including 2007 and 2005 respectively. FGA, for example, ranks 13th in 1999 and 13th in 2010; in the rankings for the initial group of manufacturers, however, the company would actually have finished in 10th, 11th or 12th place in 2010 (dependent on the 2010 performance of Daihatsu and Mitsubishi).

One group of companies features relatively consistently in the middle of the rankings (apart from the odd year): PSA, Suzuki and Volkswagen, although Volkswagen drops away in 2003 and 2004 when it ranks 14th and 13th respectively and first in 2008. Chrysler – which has been included as of 2010 – ranks 12th in this year, well below the industry average.

4.3 *Individual company results*

In this section we present the results for each of the 17 automobile manufacturers studied, listed in alphabetical order. This provides an in-depth analysis of the company's sustainability performance within the industry. The report on each automobile manufacturer begins with an overview of its ranking measured by the Sustainable Value Margin. The individual findings are then presented and briefly discussed.

4.3.1 BMW Group

BMW Group

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	1	1	1	1	2	1	1	2	1	5	8	1

The calculation of the Sustainable Value of the BMW Group is based on an analysis of the group's global activities over the period 1999-2010. Figure 22 illustrates the value contributions of the individual resources as well as the Sustainable Value and Sustainable Value Margin of the BMW Group.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets	1,000	1,536	2,094	1,685	1,364	1,547	1,906	1,887	539	86	-384	652
	CO_2-emissions	1,406	1,836	2,660	2,339	2,101	2,362	2,632	2,987	2,715	662	66	3,759
	NO_x-emissions	1,265	2,156	2,872	2,638	2,523	2,911	3,224	3,253	2,774	-16	52	4,163
	SO_x-emissions	2,421	2,787	3,369	2,854	2,726	3,316	3,600	3,811	3,906	745	237	5,058
	VOC-emissions	1,848	2,290	2,919	2,828	2,765	3,251	3,389	3,678	3,534	758	273	4,509
	Waste generated	2,097	2,494	3,123	3,122	3,039	3,485	3,545	3,828	3,865	795	218	4,350
	Water uses	2,001	2,380	3,070	3,066	2,885	3,259	3,406	3,673	3,614	796	187	4,497
	Work accidents	633	1,063	2,245	1,672	1,638	1,964	2,987	3,428	2,470	174	308	2,243
	Employees	704	922	1,922	1,540	1,334	1,692	2,141	2,459	1,883	517	-47	2,867
Sustainable Value [m€]		**1,486**	**1,940**	**2,697**	**2,416**	**2,264**	**2,643**	**2,981**	**3,223**	**2,811**	**502**	**101**	**3,567**
Sustainable Value Margin		**4.32%**	**5.21%**	**7.01%**	**5.70%**	**5.45%**	**5.96%**	**6.39%**	**6.58%**	**5.02%**	**0.94%**	**0.20%**	**5.90%**

Figure 22: Value contributions, Sustainable Value and Sustainable Value Margin of the BMW Group

We can see that the BMW Group managed to use nearly all the resources considered to create value in every single year of the review period, except for NO_x in 2008 and employees and its total assets in 2009. Over the period 1999-2010 the Sustainable Value more than doubled, from €1.5bn to €3.6bn. This means that in 2010 an additional €3.6bn EBIT was created because the resources in question were used by the BMW Group rather than by the average manufacturer in the automobile industry.

The BMW Group therefore almost consistently features in the top rankings when it comes to the Sustainable Value Margin (see Figure 21). No other automobile manufacturer studied uses its bundle of resources as efficiently as the BMW Group during the review period (with the exceptions of 2003, 2005, 2008 and 2009). The Sustainable Value Margin of 7.01% in 2001 is the highest achieved by any of the 17 companies throughout the review period.

4.3.2 Chrysler

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	12

The calculation of Chrysler's Sustainable Value is limited to the year 2010[7], includes all indicators considered in this study and covers its global activities. Figure 36 shows the value contributions of these resources as well as the Sustainable Value and Sustainable Value Margin of Chrysler for 2010.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-546
	CO_2-emissions	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-2,235
	NO_x-emissions	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-1,148
	SO_x-emissions	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	453
	VOC-emissions	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-559
	Waste generated	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	81
	Water uses	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-1,453
	Work accidents	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-109
	Employees	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-630
Sustainable Value [m€]		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-683
Sustainable Value Margin		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-2.16%

Figure 23: Value contributions, Sustainable Value and Sustainable Value Margin of Chrysler

In the only year considered, Chrysler uses its resources well below the sector average. Except for SO_x-emissions, showing the highest value contribution (€453m), and waste generated all resources generate negative value contributions. Most value is destroyed by the use of CO_2-emissions (-€2.24bn), followed by water use (-€1.45bn) and NO_x-emissions (-€1.15bn).

Consequently, Chrysler's Sustainable Value Margin ranges well below the industry average in 2010 with a value of 2.16%. This corresponds to 12th position in the ranking of Sustainable Value Margins in this year.

4.3.3 Daihatsu

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	10	9	8	14	10	12	10	n/a	n/a	n/a	n/a	n/a

The calculation of Daihatsu's Sustainable Value is limited to the company's Japanese production facilities. All indicators apart from the number of work accidents are covered throughout the review period.[8] Figure 23 shows the value contributions of the resources considered

[7] Until and including 2006 Chrysler's performance is considered within this study via DaimlerChrysler

[8] Although data were available on the number of work accidents at Daihatsu, they were not included in this study due to the lack of plausibility; see the relevant comments on page 24.

as well as the Sustainable Value and Sustainable Value Margin of Daihatsu for the period 1999 to 2005. The company was not analysed in the years 2006 to 2010 due to a lack of data availability.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets	-129	18	130	-63	11	56	117	n/a	n/a	n/a	n/a	n/a
	CO_2-emissions	-247	-67	80	-176	-104	-74	11	n/a	n/a	n/a	n/a	n/a
	NO_x-emissions	-136	12	93	-147	-59	-20	94	n/a	n/a	n/a	n/a	n/a
	SO_x-emissions	2	150	223	59	141	195	241	n/a	n/a	n/a	n/a	n/a
	VOC-emissions	-524	-213	-18	-314	-213	-283	-75	n/a	n/a	n/a	n/a	n/a
	Waste generated	-465	-214	-117	-398	-315	-331	-218	n/a	n/a	n/a	n/a	n/a
	Water uses	-410	-274	-84	-367	-270	-262	-168	n/a	n/a	n/a	n/a	n/a
	Work accidents								n/a	n/a	n/a	n/a	n/a
	Employees	-89	59	131	-99	-12	46	113	n/a	n/a	n/a	n/a	n/a
Sustainable Value [m€]		-222	-69	49	-167	-91	-75	13	n/a	n/a	n/a	n/a	n/a
Sustainable Value Margin		-2.25%	-0.67%	0.65%	-2.29%	-1.32%	-0.95%	0.15%	n/a	n/a	n/a	n/a	n/a

Figure 24: Value contributions, Sustainable Value and Sustainable Value Margin of Daihatsu

Daihatsu only achieved a positive Sustainable Value in the years 2001 and 2005. Its Sustainable Value moves within quite a narrow bandwidth of -€222m (1999) to €49m (2001). The low rating is primarily down to the consistently negative value contributions from VOC-emissions, waste and water use. By contrast, Daihatsu consistently creates value when it comes to SO_x-emissions.

As the Sustainable Value Margin rankings showed earlier (see Figure 21), Daihatsu generally finishes in the lower mid-field compared with its peer group. This is because it tends to use its resources inefficiently compared with the industry as a whole. An analysis of the Sustainable Value Margin shows that the relatively small Sustainable Value (in terms of absolute amount) is mainly attributable to the company's small size.

4.3.4 DaimlerChrysler/Daimler AG

DAIMLER

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	2	5	11	6	6	6	6	6	3	3	12	2

The analysis of DaimlerChrysler's Sustainable Value encompasses the group's entire global activities between 1999 and 2006, with the exception of the figures for work accidents in 2000 and 2001, which only refer to the Chrysler Group. Beginning from the year 2007, Daimler AG is analysed. Figure 24 shows the value contributions of the individual resources as well as the Sustainable Value and Sustainable Value Margin of DaimlerChrysler for the period 1999-2006 and Daimler AG for 2007 to 2010.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
							Value contributions in m€						
Resources	Total assets	2,330	-1,782	-3,851	-314	-82	369	82	318	2,289	2,636	-2,436	1,879
	CO_2-emissions	2,607	-1,422	-3,242	-280	-340	253	-216	682	3,887	2,875	-2,202	3,529
	NO_x-emissions	7,046	2,072	-1,487	1,996	1,563	3,163	3,016	3,308	5,997	1,939	-2,037	5,418
	SO_x-emissions	9,195	4,536	734	4,745	4,580	4,131	4,367	5,173	7,473	3,076	-1,763	7,242
	VOC-emissions	6,778	2,631	-486	3,598	3,556	4,072	3,194	3,818	5,996	3,323	-1,620	5,884
	Waste generated	6,799	1,528	-725	3,725	3,356	3,907	3,123	4,191	6,226	3,160	-1,854	4,943
	Water uses	3,860	-652	-2,733	950	383	1,742	1,075	2,279	5,058	3,143	-1,988	4,806
	Work accidents				*2,413*	*2,613*				-2,781	-1,325	-1,492	-7,657
	Employees	854	-3,120	-4,231	-1,256	-1,321	-943	-792	136	1,757	2,626	-2,481	1,355
Sustainable Value [m€]		**4,386**	**421**	**-1,780**	**1,731**	**1,590**	**1,855**	**1,539**	**2,212**	**3,989**	**2,384**	**-1,906**	**3,044**
Sustainable Value Margin		**2.92%**	**0.26%**	**-1.16%**	**1.16%**	**1.17%**	**1.34%**	**1.03%**	**1.46%**	**4.01%**	**2.49%**	**-2.52%**	**3.11%**

Figure 25: Value contributions, Sustainable Value and Sustainable Value Margin of DaimlerChrysler/ Daimler AG

The Sustainable Value of DaimlerChrysler drops from €4.39bn in 1999 to €2.21bn in 2006. In 2007, Daimler AG achieves a Sustainable Value of €3.99bn, in 2010 of €3.04bn. At times the Sustainable Value drops heavily into the red, down to -€1.78bn in 2001 and down to -€1.99bn in 2009. This steep fall can be explained by a sharp drop in profits in both years 2001 and 2009 and is therefore reflected in the value contributions from all the resources considered. The figures for the value contributions from each resource also show that CO_2, use of capital, number of work accidents and number of employees are particularly critical resources for DaimlerChrysler. The number of work accidents also is the most critical resource for Daimler. Only in 1999 and in 2006, all resources are used in a value creating way. The number of work accidents, however, has not been assessed in these years.

The Sustainable Value Margin drops from 2.92% (1999) to -1.52% (2001), before continuously recovering in the subsequent years. In 2007, the company achieves its highest Sustainable Value Margin of 4.01%, ranking third in this year. Apart from 1999 (ranked 2nd), 2007, 2008 (ranked 3rd) and 2010 (ranked 2nd), Daimler finishes up in the middle of the rankings. The manufacturer shows its worst result in 2009 with a SVM of -2.52% and ranking on 12th place.

4.3.5 Fiat Group Automobiles (FGA)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	13	14	15	16	16	15	15	12	13	4	6	13

The analysis of Fiat Group Automobiles' Sustainable Value encompasses this division's entire global activities. No adequate data set could be established for the number of work accidents. CO_2-emissions data are available for the period 2001-2010. The figure for the company's use of capital could only be recorded for the years 2005 to 2010. For the use of NO_x- and SO_x-emissions data were available only beginning from 2006. Figure 25 shows the Sustainable Value (and its composition) and the Sustainable Value Margin of FGA.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets							-820	-177	51	542	332	-469
	CO_2-emissions			-1,249	-2,169	-1,769	-1,631	-909	-403	-380	422	258	-460
	NO_x-emissions								156	181	44	289	-110
	SO_x-emissions								284	802	656	460	598
	VOC-emissions	-3,499	-3,098	-2,756	-4,077	-3,175	-3,055	-1,919	-1,286	-1,900	157	403	-1,512
	Waste generated	-2,290	-1,732	-1,780	-2,599	-2,077	-1,937	-1,205	-876	-1,333	-112	-14	-2,255
	Water uses	-5,254	-4,485	-2,982	-3,650	-2,706	-2,628	-1,734	-1,314	-1,824	126	3	-1,816
	Work accidents												
	Employees	-1,794	-1,442	-1,375	-2,303	-1,841	-1,727	-1,001	-376	-292	479	281	-737
Sustainable Value [m€]		-1,579	-1,314	-1,127	-1,644	-1,206	-1,220	-843	-444	-522	257	224	-751
Sustainable Value Margin		-3.28%	-5.25%	-4.61%	-7.42%	-6.42%	-5.94%	-4.22%	-1.87%	-1.95%	0.95%	0.76%	-2.70%

Figure 26: Value contributions, Sustainable Value and Sustainable Value Margin of Fiat Group Automobiles

Fiat Group Automobiles has created a positive Sustainable Value in 2008 and 2009. Over the review period the Sustainable Value ranges between -€1.64bn (2002) and €257m (2008). In each of the areas examined, FGA uses the bundle of resources in question less efficiently than the benchmark over the period from 1999 to 2005. In 2006 the company used two resources more efficiently than the benchmark (NO_x- and SO_x-emissions). The company is particularly inefficient when it comes to VOC-emissions and water use, where negative value contributions of up to -€5.25bn arose (1999). Another interesting point is that the expansion of the set of indicators to include CO_2 in the period 2001-2010 has virtually no perceptible impact on the Sustainable Value of FGA. With positive value contributions only in 2008 and 2009 and with negative results down to -€2.17bn (2002), the company uses the resource CO_2 just as inefficiently as any of the other indicators considered.

The negative Sustainable Value also means that FGA's Sustainable Value Margin is most of the years heavily in the red, with values between 0.95% (2008) and -7.42% (2002). As a result, FGA's Sustainable Value Margin puts it in one from last place (1999, 2004, 2005) and last place (2000 to 2003) in the rankings. Only in 2008 and 2009 FGA managed to perform among the top third.

4.3.6 Ford

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	5	4	12	13	11	9	13	14	14	13	13	5

The calculation of Ford's Sustainable Value is based on the company's global activities. The review of VOC-emissions is limited to the period 2001 to 2010; NO_x and SO_x are not assessed due to lack of available data. Total waste generated has not been included for the years 2007 to 2010 due to problems with data quality of the data published by Ford. Figure 26 provides an overview of the value contributions from the individual resources, as well as Ford's Sustainable Value and Sustainable Value Margin over the period 1999 to 2010.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets	-2,174	-448	-7,270	-7,623	-5,626	-3,168	-3,016	-9,277	-7,805	-4,098	-3,380	1,560
	CO_2-emissions	-321	1,190	-5,458	-4,703	-3,816	-2,490	-3,065	-7,678	-5,476	-4,059	-3,454	1,043
	NO_x-emissions												
	SO_x-emissions												
	VOC-emissions			-3,121	-1,862	-494	1,072	-53	-5,517	-2,946	-3,770	-2,561	3,173
	Waste generated	5,339	6,506	-2,270	-774	303	1,743	92	-5,315				
	Water uses	1,766	2,776	-4,827	-4,350	-3,203	-1,865	-2,794	-8,119	-5,463	-3,952	-3,289	2,078
	Work accidents	-3,911	-3,942	-4,990	-4,251	-2,432	436	285	-4,520	-1,556	-3,696	-2,458	5,082
	Employees	2,025	3,389	-4,848	-4,170	-2,930	-1,728	-2,225	-7,436	-4,724	-3,733	-3,057	2,761
Sustainable Value [m€]		**303**	**1,052**	**-3,643**	**-3,081**	**-2,022**	**-667**	**-1,197**	**-5,318**	**-3,406**	**-3,029**	**-2,369**	**2,061**
Sustainable Value Margin		**0.20%**	**0.57%**	**-2.01%**	**-1.78%**	**-1.38%**	**-0.48%**	**-0.84%**	**-4.17%**	**-2.71%**	**-3.05%**	**-2.79%**	**2.12%**

Figure 27: Value contributions, Sustainable Value and Sustainable Value Margin of Ford

Over the review period Ford's Sustainable Value ranges from -€5.32bn (2006) to €2.06bn (2010). Ford's Sustainable Value drops deeply into the negative zone from 2001 onwards, and only manages to recover slightly in 2004 and 2005 before again dropping heavily towards end of the review period. In 2010 Ford manages to get back into positive territory, achieving its best result in terms of Sustainable Value creation. Moreover, in 2010 all resources where used value creating. While the company managed to produce positive Sustainable Value in 1999 and 2000, Ford lagged the industry average over the next nine years – quite significantly in some cases. The use of capital produced consistently negative value contributions, except for 2010. The significant deterioration in value contributions from 2000 to 2001 relates to all resources considered and is mainly the result of a sharp drop in profits in 2001. The slight recovery in the entire bundle of indicators examined during the years 2003 and 2004 and the strong positive result in 2010 are also down to the performance of corporate profits. In six of the twelve years (2001, 2002, 2006 to 2009) under review, Ford uses each single resource less efficiently than the industry on average.

Ford's Sustainable Value Margin ranges between -4.17% (2006) and 2.12% (2010). In the ranking of Sustainable Value Margins, the company starts off in fifth place in 1999 and moves up to fourth in 2000, before dropping to around the bottom of the table in subsequent years until 2009. This reflects in Ford's comparatively inefficient use of resources. In 2010, however, Ford managed to gain back its initial position in the ranking table (fifth).

4.3.7 General Motors

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	9	11	14	15	15	14	16	15	15	n/a	n/a	15

The calculation of General Motors' Sustainable Value is based on the company's global activities. Figure 27 shows the value contributions of the individual resources as well as the Sustainable Value and Sustainable Value Margin of GM for the period 1999-2010. The company was not analysed in the years 2008 and 2009 due to a lack of data availability.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets		-2,878	-5,679	-9,824	-8,619	-9,755	-15,181	-5,056	-3,069	n/a	n/a	-440
	CO_2-emissions	-5,666	-4,702	-5,519	-8,357	-6,824	-7,554	-13,574	-7,823	-8,095	n/a	n/a	-4,448
	NO_x-emissions	-7,793	-7,667	-10,009	-13,877	-10,103	-11,097	-15,085	-13,942	-17,598	n/a	n/a	-14,631
	SO_x-emissions	-12,929	-10,658	-12,735	-21,555	-15,881	-16,779	-20,789	-20,867	-28,430	n/a	n/a	-29,928
	VOC-emissions	870	1,413	-1,721	-3,306	-1,777	-3,756	-10,703	-5,939	-6,914	n/a	n/a	-5,153
	Waste generated	-10,450	-9,365	-9,058	-12,779	-9,950	-10,433	-15,071	-9,774	-11,087	n/a	n/a	-1,434
	Water uses	-143	-670	-2,731	-4,792	-3,160	-4,653	-11,775	-6,776	-7,334	n/a	n/a	-3,541
	Work accidents	4,588	5,199	1,422	1,335	2,834	1,561	-6,194	-1,364	739	n/a	n/a	0
	Employees	1,336	847	-2,089	-3,803	-2,101	-3,415	-10,738	-5,181	-3,882	n/a	n/a	-883
Sustainable Value [m€]		-3,354	-3,166	-6,346	-8,551	-6,176	-7,320	-13,235	-8,526	-8,519	n/a	n/a	-6,718
Sustainable Value Margin		-2.03%	-1.58%	-2.70%	-4.56%	-3.77%	-4.70%	-8.56%	-5.16%	-7.20%	n/a	n/a	-6.59%

Figure 28: Value contributions, Sustainable Value and Sustainable Value Margin of General Motors

General Motors reports a deeply negative Sustainable Value figure for every single year of the review period. Despite the mostly positive value contributions from the relatively small number of work accidents and the initially positive value contributions from the number of employees and VOC-emissions, the company's Sustainable Value deteriorates from -€3.35bn (1999) to -€6.72bn (2010). In 2005 GM has by far the worst negative Sustainable Value within the industry in absolute terms with -€13.24bn. This is mainly the result of the dramatic profits slump in 2005.

The value contributions from CO_2, NO_x and SO_x-emissions, as well as waste generation, are very negative during the period 1999-2010. The SO_x value contributions of General Motors range between -€10.66bn (2000) and -€29.93bn (2010), which in absolute terms is the worst level of resource efficiency in the entire sample studied. Taking GM's size into consideration, however, this exceptionally low Sustainable Value can be put into perspective when calculating the company's Sustainable Value Margin for some years of the review period. Because of the high turnover the company generates during this period using the bundle of resources available, the Sustainable Value Margin ranges between -1.58% (2000) and -8.56% (2005). The latter value of -8.56% is easily the lowest Sustainable Value Margin during the entire review period, and brings up the rear in the SVM performance rankings for that year (Figure 21). In the years 1999 to 2004, GM generally features in the bottom third of the rankings. In the years 2005 to 2010, GM is ranked last of all manufacturers.

4.3.8 Honda

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	4	3	4	4	5	5	3	4	6	6	2	7

The calculation of Honda's Sustainable Value is limited to the company's Japanese production facilities. Figure 28 shows the value contributions of the resources considered as well as the Sustainable Value and Sustainable Value Margin of Honda for the period 1999-2010. The

indicators NO_x-emissions, SO_x-emissions and number of work accidents were not studied, due to the lack of available data.[9]

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets	1,755	2,051	4,179	3,578	2,479	2,385	4,354	3,483	2,676	640	2,186	862
	CO_2-emissions	892	1,774	3,819	2,576	2,226	2,028	5,284	2,814	1,753	221	1,969	430
	NO_x-emissions												
	SO_x-emissions												
	VOC-emissions	-1,363	11	2,170	1,015	1,189	894	4,361	1,903	261	-3,662	-684	-1,326
	Waste generated		1,273	3,242	1,866	1,719	1,568	4,801	2,283	766	495	1,846	-1,454
	Water uses	617	1,437	3,604	2,239	1,870	1,551	4,831	2,392	1,071	469	1,885	-397
	Work accidents												
	Employees	1,421	1,761	3,973	3,239	1,976	1,960	4,046	3,182	2,021	586	2,154	852
Sustainable Value [m€]		**369**	**923**	**2,332**	**1,613**	**1,273**	**1,154**	**3,075**	**1,784**	**950**	**-139**	**1,040**	**-115**
Sustainable Value Margin		**0.70%**	**1.44%**	**3.50%**	**2.45%**	**2.07%**	**1.80%**	**4.28%**	**2.41%**	**1.28%**	**-0.20%**	**1.59%**	**-0.15%**

Figure 29: Value contributions, Sustainable Value and Sustainable Value Margin of Honda Motors

Honda created a positive Sustainable Value in every year of the review period except for 2008 and 2010. The company used most of the resources considered more efficiently than its industry peer group. In some years, however, a negative value contribution is shown by the use of VOC-emissions (2008-2010), waste generated (2010) and water used (2010). Honda's Sustainable Value increases from €369m (1999) to €3.08bn (2005), before dropping to -€115m in 2010. Honda's lowest Sustainable Value was achieved in 2008 (-€139m), which amongst others results from the lowest operating profit the company has generated over the entire review period. The Sustainable Value Margin rose accordingly, from 0.70% (1999) to 4.28% (2005), before dropping towards the end of the review period with -0.15% in 2010.

In the Sustainable Value Margin table Honda ranks between 2nd (2009) and 7th place (2010). With respect to the ranking position after the year 2000 it must be remembered that two of the companies ahead of Honda e.g. in 2003 (Hyundai, Nissan) were only considered in our study from 2001 and 2002 onwards. Compared with the industry as a whole, Honda's performance is therefore relatively steady.

4.3.9 Hyundai

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	n/a	n/a	3	5	8	10	8	8	10	2	1	3

For the resources NO_x-emissions, SO_x-emissions and work accidents the calculation of Hyundai's Sustainable Value is limited to the company's South Korean production facilities. For the remaining resources global activities are covered beginning from 2003. No consolidated financial data are available for the years 1999 and 2000, so the analysis provided in this study is limited to the period 2001-2010. All nine resource indicators are

[9] Although data were available on the number of work accidents at Honda Motors, they were not included in this study due to the lack of plausibility; see the relevant comments on page 25.

used in this period. Figure 29 shows the value contributions of the resources considered as well as the Sustainable Value and Sustainable Value Margin of Hyundai for the period 2001-2010.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
							Value contributions in m€						
Resources	Total assets	n/a	n/a	1,711	1,236	717	329	488	-113	-478	1,380	2,782	2,794
	CO_2-emissions	n/a	n/a	1,681	1,241	619	-235	7	-325	-501	1,282	2,612	2,437
	NO_x-emissions	n/a	n/a	1,862	1,579	1,311	860	1,146	1,098	1,315	1,645	3,383	4,564
	SO_x-emissions	n/a	n/a	2,373	2,207	1,621	1,186	1,366	1,574	2,128	1,837	3,446	5,616
	VOC-emissions	n/a	n/a	-307	-1,367	-1,501	-1,338	-956	-256	-1,438	1,424	3,483	-241
	Waste generated	n/a	n/a	1,380	967	582	146	582	267	-79	882	2,420	714
	Water uses	n/a	n/a	980	395	-276	-952	-484	-1,010	-1,173	1,069	2,374	606
	Work accidents	n/a	n/a	1,642	899	-403	-1,674	487	672	-1,041	1,084	3,695	652
	Employees	n/a	n/a	1,285	823	263	-186	161	-225	-276	1,431	2,741	3,027
Sustainable Value [m€]		**n/a**	**n/a**	**1,401**	**887**	**326**	**-207**	**311**	**187**	**-172**	**1,337**	**2,993**	**2,241**
Sustainable Value Margin		**n/a**	**n/a**	**4.12%**	**2.32%**	**0.94%**	**-5.06%**	**0.68%**	**0.36%**	**-0.32%**	**2.70%**	**5.82%**	**3.06%**

Figure 30: Value contributions, Sustainable Value and Sustainable Value Margin of Hyundai

Hyundai achieves a positive Sustainable Value in eight of the ten years considered. One interesting point, however, is that the manufacturer starts off well, but suffers a gradual deterioration in all nine indicators examined over the period 2001-2003. This trend continues in 2004, with only one value contribution improving temporarily in the case of VOC-emissions. This general decline in the years 2001 to 2004 is attributable to a profit slump during that period. In 2005 value contributions from all resources studied slightly improved again. The two resources NO_x-emissions and SO_x-emissions were used in a value creating way in all of the years considered. The least efficiently used resource is VOC-emissions. In this case Hyundai dips below the benchmark and thus produces negative value contributions in eight of the ten years assessed. The remaining resources show a mixed pattern over the research period. In 2008 and 2009 Hyundai for the first time uses all of the resources assessed more efficiently than the industry on average.

The company's absolute Sustainable Value drops from €1.4bn (2001) to -€207m (2004), and recovers again in 2005 to €311m. In 2006 the Sustainable Value drops again slightly and enters negative territory in 2007. The following year Hyundai shows a significant improvement in terms of Sustainable Value creation and achieves its best result in 2009 (€2.99bn). Although in 2010 the performance slightly drops again, the company in that year shows its second highest result achieved over the entire review period.

Hyundai's Sustainable Value Margin consequently drops from 4.12% (2001) to -5.06% (2004), and then rebounds to 3.06% (2010). Except for 2004 and 2007 Hyundai finishes consistently in the top half of the Sustainable Value Margin rankings. From 2008 to 2010 the company even positions among the top three performers (ranking 2nd, 1st and 3rd respectively).

4.3.10 Isuzu

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	14	12	9	11	3	3	5	3	4	10	7	4

For most of the resources the calculation of Isuzu's Sustainable Value is limited to the company's Japanese production facilities. Only total assets, VOC-emissions and to some extent CO_2-emissions (2003 to 2010) cover Isuzu's global activities. Due to a lack of available data, the resources number of work accidents, number of employees, NO_x-emissions and SO_x-emissions were either ignored or only studied beginning from 2001 and 2003 respectively.[10] Figure 30 shows the value contributions of the resources considered as well as the Sustainable Value and Sustainable Value Margin of Isuzu for the period 1999-2010.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets	-1,040	-625	-103	-85	348	305	283	343	148	-82	55	268
	CO_2-emissions	-883	-326	-59	-71	304	250	230	300	-16	-102	41	129
	NO_x-emissions					527	475	419	440	213	-235	29	368
	SO_x-emissions					572	516	439	457	289	-424	-31	431
	VOC-emissions	-765	-370	-39	-21	491	476	409	470	303	-58	94	402
	Waste generated	-973	-386	-141	-137	339	384	362	450	291	-140	50	478
	Water uses	-970	-454	-165	-210	279	189	175	235	-36	-222	-3	130
	Work accidents												
	Employees		-378	-124	-49	431	377	333	366	158	-160	24	282
Sustainable Value [m€]		-914	-202	-70	-64	366	330	294	340	150	-153	29	276
Sustainable Value Margin		-5.20%	-2.61%	-0.78%	-0.82%	4.56%	4.10%	3.63%	4.24%	1.93%	-2.15%	0.47%	2.98%

Figure 31: Value contributions, Sustainable Value and Sustainable Value Margin of Isuzu

Isuzu achieves a negative Sustainable Value in five of the twelve years studied; even so, the value follows a positive pattern until 2006. In 2003 Isuzu created a positive Sustainable Value for the first time (€366m). While all the resources considered provided a negative value contribution during the period 1999-2002, the exact opposite was true during the years 2003 to 2006. In 2007, the value contributions for CO_2 and water use drop back into the red. In 2008 a negative value contribution is shown for all resources. Isuzu's performance improves again in 2009, when only SO_x and waste are in negative territory. In 2010 all resources are used value creating. In Isuzu's case we can therefore see a big overall improvement in the efficiency with which the company uses its set of resources.

In contrast to the small Sustainable Value figures (in absolute terms) compared with its industry peers, there is a big improvement in Isuzu's Sustainable Value Margin over the course of the review period. This is because of the company's relatively small size. With a comparatively low turnover, even relatively small fluctuations in the absolute Sustainable Value result in a significant change in the Sustainable Value Margin. The company improved its Sustainable Value Margin from -5.20% (1999) to 4.56% (2003). However, it subsequently retreated slightly to 4.24% (2006) and then suffered a sharp decline to -2.15% in 2007 before recovering again towards the end of the review period (2010 2.98%). In terms of the

[10] Although data were available on the number of work accidents at Isuzu, they were not included in this study due to the lack of plausibility; see the relevant comments on page 25.

Sustainable Value Margin rankings this results in a rise from 14th place (1999) to 3rd place (2003, 2004 and 2006) – the best improvement by any manufacturer within this study. At the end of the review period Isuzu holds the 4th position in the SVM ranking.

4.3.11 Mitsubishi

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	12	13	10	10	13	16	14	13	7	n/a	n/a	n/a

The calculation of the Sustainable Value of Mitsubishi Motors is based on the data from all its Japanese production facilities. The indicators do not include the number of work accidents[11] or the VOC-emissions in 2000. Figure 31 illustrates the value contributions of the individual resources as well as the Sustainable Value and Sustainable Value Margin of Mitsubishi Motors.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets	-835	-1,409	-287	-4	-142	-834	-287	-266	205	n/a	n/a	n/a
	CO_2-emissions	-588	-1,149	-121	-38	-160	-825	-319	-257	131	n/a	n/a	n/a
	NO_x-emissions	-318	-950	-134	15	-135	-769	-216	-147	338	n/a	n/a	n/a
	SO_x-emissions	-45	-677	132	294	80	-615	-135	-91	423	n/a	n/a	n/a
	VOC-emissions	-1,591		-699	-800	-832	-1,319	-577	-489	-208	n/a	n/a	n/a
	Waste generated	-559	-1,076	-102	34	-168	-802	-311	-225	137	n/a	n/a	n/a
	Water uses	-979	-1,552	-425	-343	-461	-1,169	-569	-525	-253	n/a	n/a	n/a
	Work accidents										n/a	n/a	n/a
	Employees	-500	-1,097	-71	42	-115	-782	-268	-220	237	n/a	n/a	n/a
Sustainable Value [m€]		-602	-1,098	-190	-89	-215	-791	-298	-247	112	n/a	n/a	n/a
Sustainable Value Margin		-2.85%	-5.02%	-0.89%	-0.69%	-2.27%	-8.49%	-3.04%	-2.66%	0.87%	n/a	n/a	n/a

Figure 32: Value contributions, Sustainable Value and Sustainable Value Margin of Mitsubishi Motors

Mitsubishi's Sustainable Value is consistently negative. The minimum value is -€1.10bn (2000) and the maximum €112m (2007). The value contributions from the resources VOC and water consumption are negative throughout the review period. Mitsubishi therefore uses its bundle of resources less efficiently than the benchmark in eight of the nine years under review.

Mitsubishi's Sustainable Value Margin is consequently in the red for eight of the nine years. The Sustainable Value Margin initially falls from -2.85% (1999) to -5.02% (2000), but then recovers to -0.69% (2002). Towards the end of the review period the Sustainable Value Margin tumbles heavily to -8.56% (2004), and then recovers to 0.87% in 2007. 2007 is the first year in which Mitsubishi achieves a positive Sustainable Value Margin. Mitsubishi generally ranks between 7th (2010) and 16th (2004) place in the Sustainable Value Margin table. In 2004 it came last.

[11] Although data were available on the number of work accidents at Mitsubishi Motors, they were not included in this study due to the lack of plausibility; see the relevant comments on page 24.

4.3.12 Nissan

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	n/a	n/a	n/a	3	4	4	4	5	8	11	3	11

For most of the resources assessed the analysis of Nissan's Sustainable Value encompasses the company's entire global activities. Exceptions are VOC-emissions and SO_x-emissions. However, meaningful environmental data are only available for Nissan for the period 2002-2010. In addition, the indicators NO_x-emissions and number of work accidents were not considered over the entire review period due to poor data availability/plausibility.[12] SO_x-emissions could not be considered for the years 2006 to 2010 due to the lack of data availability.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
							Value contributions in m€						
Resources	Total assets	n/a	n/a	n/a	4,101	4,300	4,009	4,247	2,917	1,844	-1,548	1,860	877
	CO_2-emissions	n/a	n/a	n/a	3,539	3,406	3,279	3,833	2,731	1,436	-1,612	1,766	256
	NO_x-emissions	n/a	n/a	n/a									
	SO_x-emissions	n/a	n/a	n/a	3,223	2,398	1,950	3,288					
	VOC-emissions	n/a	n/a	n/a	3,164	2,528	2,430	3,686	2,485	1,097	-3,484	-149	-1,408
	Waste generated	n/a	n/a	n/a	103	903	-156	1,428	1,061	-1,971	-3,551	933	-6,697
	Water uses	n/a	n/a	n/a	1,975	1,532	1,212	2,273	1,488	-569	-2,125	1,582	-2,439
	Work accidents	n/a	n/a	n/a									
	Employees	n/a	n/a	n/a	3,620	3,821	4,139	3,465	2,397	983	-1,668	1,782	1,126
Sustainable Value [m€]		**n/a**	**n/a**	**n/a**	**2,192**	**2,099**	**1,874**	**2,469**	**1,453**	**313**	**-1,554**	**864**	**-921**
Sustainable Value Margin		**n/a**	**n/a**	**n/a**	**3.88%**	**3.75%**	**3.11%**	**3.78%**	**2.08%**	**0.47%**	**-2.65%**	**1.51%**	**-1.19%**

Figure 33: Value contributions, Sustainable Value and Sustainable Value Margin of Nissan Motors

Nissan creates positive Sustainable Value every year during the period 2002-2006, within a narrow bandwidth of €1.26bn (2006) and €2.08bn (2005). In 2007, Nissan's Sustainable Value drops significantly but remains in positive territory (€313m). In 2008 the Sustainable Value deteriorates further to -€1.56bn but recovers again in the subsequent year (€864m). In 2010, however, Nissan again uses its bundle of resources less efficiently than the benchmark (-€921m). In most of the years assessed all of the resources considered are used more efficiently than the industry average. Waste generated shows a negative value contribution in 2004, 2007, 2008 and 2010, VOC-emissions in 2008, 2009 and 2010 and water use in 2007, 2008 and 2010. In 2008 all resources were used less efficiently than by the benchmark. The biggest value contributions come from the use of capital, CO_2-emissions and the number of employees.

Between 2002 and 2005, Nissan's Sustainable Value Margin falls within a narrow range of between 3.78% (2005) and 3.88% (2002). In the following years Nissan's Sustainable Value Margin suffers a strong decline, finishing – despite a small recovery in 2009 - in the red with a value of -1.19%. In the Sustainable Value Margin rankings this equates to positions between 3rd place (2002 and 2009) and 11th place (2008 and 2010).

[12] Although data were available on the number of work accidents at Nissan, they were not included in this study due to the lack of plausibility; see the relevant comments on page 24.

4.3.13 PSA

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	11	10	7	9	9	11	9	11	11	7	11	10

The calculation of PSA's Sustainable Value is based on the company's global activities. In the years 1999-2003 all the environmental indicators refer to the PCA division. In the years 2004 to 2010 the figures for VOC-emissions refer to the PCA division. Work accidents could be included only beginning from 2000 due to data gaps. Figure 33 provides an overview of the value contributions of the individual resources, the Sustainable Value and the Sustainable Value Margin of PSA for the years 1999 to 2010.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets	-283	472	1,264	1,076	316	191	189	-770	-1,095	549	-689	1,793
	CO_2-emissions	314	947	1,767	1,868	1,432	773	825	100	181	201	-948	64
	NO_x-emissions	-74	568	1,086	1,731	904	807	1,043	122	281	-835	-1,052	237
	SO_x-emissions	-2,526	-536	-633	103	-495	586	975	382	1,283	-303	-1,120	1,574
	VOC-emissions	-1,872	-1,631	-390	-1,131	-1,915	-1,983	-1,186	-1,711	-2,078	-1,074	-1,671	-2,404
	Waste generated	-698	-427	542	1,096	447	303	415	-190	-399	-259	-1,125	-987
	Water uses	-2,110	-1,758	-359	-185	-1,365	-1,263	-634	-725	-846	79	-1,069	-402
	Work accidents		-994	121	-1,228	-1,076	-923	805	403	-570	-368	-669	-654
	Employees	-1,686	-1,328	-230	-936	-1,674	-1,890	-1,316	-2,042	-2,750	-264	-1,340	-2,828
Sustainable Value [m€]		-993	-521	352	266	-391	-378	124	-492	-666	-253	-1,076	-401
Sustainable Value Margin		-2.63%	-1.18%	0.68%	0.49%	-0.70%	-0.67%	0.22%	-0.87%	-1.10%	-0.46%	-2.22%	-0.71%

Figure 34: Value contributions, Sustainable Value and Sustainable Value Margin of PSA

During the reporting period, PSA's Sustainable Value lies between -€1.08bn (2009) and €352m (2001). In 2001, 2002 and 2005, PSA manages to use the bundle of resources available more efficiently than the industry benchmark. The CO_2-emissions offer almost consistently positive value contributions, while the resources VOC-emissions, water use and number of employees are used less efficiently than the benchmark over the review period and therefore result - except for water use in 2009 - in permanently negative value contributions.

With values ranging between -2.63% (1999) and 0.68% (2001), PSA commonly positioned in the bottom half in the Sustainable Value Margin rankings, starting 11th (out of 14 companies) in 1999 and finishing in 10th place (out of 15) in 2010.

4.3.14 Renault

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	7	8	13	12	12	7	12	10	12	9	10	14

The calculation of Renault's Sustainable Value is based on the company's global activities. Figure 34 shows the value contributions of the resources considered as well as the Sustainable

Value and Sustainable Value Margin of Renault for the period 1999-2010. NO_x and SO_x indicators were not collated from the years 1999-2002 due to data gaps; complete data series are available for all the other indicators.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets	83	197	-783	-263	-484	411	-408	-818	-1,461	-315	-818	-1,762
	CO_2-emissions	1,572	1,436	-361	246	108	1,141	275	139	6	-60	-627	-201
	NO_x-emissions					226	1,299	592	183	130	-826	-685	-116
	SO_x-emissions					-137	1,237	612	535	865	-1,660	-888	938
	VOC-emissions	-585	-471	-1,420	-1,111	-975	73	-450	-541	-1,277	-407	-465	-1,714
	Waste generated	-1,277	-1,182	-1,887	-1,652	-1,705	-464	-1,217	-1,535	-2,294	-1,068	-1,271	-4,321
	Water uses	-553	-533	-1,258	-1,047	-1,164	-106	-660	-504	-812	-218	-759	-891
	Work accidents	-302	-380	-571	-317	-8	1,065	712	597	-30	-391	-382	-862
	Employees	-1,029	-1,301	-1,629	-1,082	-1,128	-148	-654	-861	-1,466	-309	-820	-1,761
Sustainable Value [m€]		-232	-248	-879	-581	-585	501	-133	-312	-704	-584	-746	-1,188
Sustainable Value Margin		-0.62%	-0.62%	-2.42%	-1.60%	-1.58%	1.23%	-0.32%	-0.75%	-1.73%	-1.54%	-2.21%	-3.05%

Figure 35: Value contributions, Sustainable Value and Sustainable Value Margin of Renault

Renault only managed to generate positive Sustainable Value in 2004, with a figure of €501m. In the years 1999 to 2003 the company's Sustainable Value is consistently negative, ranging between -€879m (2001) and -€232m (1999). From 2005 onwards Renault's Sustainable Value is also just in the red and deteriorates continuously, showing its lowest level in 2010 (-€1.19bn). The value contributions from the indicators waste generation, water use and number of employees are consistently negative. Waste generated is the most critical resource in terms of Sustainable Value creation. Only CO_2-emissions, SO_x-emissions and NO_x-emissions provide positive value contributions over the majority of the years reviewed.

With a Sustainable Value Margin of between -3.05% (2010) and 1.23% (2004) Renault's ranking in the Sustainable Value Margin table is between 14th in the years 2001 and 2007, and 7th in 1999 and 2004.

4.3.15 Suzuki

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	6	6	6	8	7	8	7	7	9	8	4	8

The calculation of Suzuki's Sustainable Value is limited to the company's Japanese production facilities. Data series for the resources NO_x and SO_x-emissions and waste generation are either incomplete or missing entirely; the number of work accidents for Suzuki is not considered.[13]

[13] Although data were available on the number of work accidents at Suzuki, they were not included in this study due to the lack of plausibility; see the relevant comments on page 24.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets	83	170	275	261	306	275	267	276	245	139	210	134
	CO_2-emissions	19	129	249	176	207	175	170	199	109	118	200	125
	NO_x-emissions			313	262	305	315	322	355	360	9	226	359
	SO_x-emissions			363	323	357	355	308	328	315	-843	129	332
	VOC-emissions	-677	-395	-52	-372	-228	-338	-220	-368	-846	-179	229	-687
	Waste generated												
	Water uses	-136	-94	43	-94	-83	-168	-89	-85	-346	20	135	-337
	Work accidents												
	Employees	110	155	251	211	236	215	220	260	161	126	196	70
Sustainable Value [m€]		-67	-4	160	85	122	92	106	106	-21	-70	162	-32
Sustainable Value Margin		-0.55%	-0.03%	1.23%	0.67%	1.06%	0.77%	0.80%	0.76%	-0.15%	-0.55%	1.43%	-0.23%

Figure 36: Value contributions, Sustainable Value and Sustainable Value Margin of Suzuki

Over the review period Suzuki's Sustainable Value spreads from -€70m (2008) to €162m (2009). After rising to €160m (2001) in the first half of the review period, the Sustainable Value has been relatively steady in subsequent years before dropping into negative territory again in 2007 and 2008. Despite a recovery in 2009 with the highest Sustainable Value Suzuki has achieved over the entire review period, the company again performed below benchmark efficiency in 2010. One point worth noting is that the only negative value contributions came from VOC-emissions (except for 2009), from water use (except for 2001, 2008 and 2009) and in 2008 also from SO_x-emissions. Otherwise value contributions were generally positive for all the remaining indicators.

With a Sustainable Value Margin between -0.55% (1999 and 2008) and 1.43% (2009), Suzuki is ranked in the top of the mid-field between 1999 and 2010. In 2009, the company is ranked 4th which is the company's best position in the twelve years under review.

4.3.16 Toyota

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	3	2	2	2	1	2	2	1	2	12	9	9

The calculation of Toyota's Sustainable Value is partially limited to the company's Japanese production facilities (NO_x-, SO_x- and VOC-emissions as well as waste generation from 1999 to 2008, CO_2-emissions and water consumption in 1999). Moreover, VOC-emissions could be included just beginning from 2000. Where available, data was collated for the group's global activities (use of capital, number of employees for the entire review period as well as CO_2-emissions and water consumption for the period 2000-2010). The number of work accidents is not taken into consideration.[14] Figure 37 shows the value contributions of the resources considered as well as the Sustainable Value and Sustainable Value Margin of Toyota for the period 1999-2010.

[14] Although data were available on the number of work accidents at Toyota, they were not included in this study due to the lack of plausibility; see the relevant comments on page 24.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets	-461	1,922	5,514	5,048	7,187	6,443	8,356	8,982	5,759	-4,877	-403	-6,607
	CO_2-emissions	4,211	2,277	6,091	5,325	7,206	6,928	9,099	10,174	5,517	-4,825	-269	-3,466
	NO_x-emissions		6,477	9,620	9,699	9,464	7,837	10,536	13,669	11,394	-6,073	200	746
	SO_x-emissions	6,056	7,177	10,361	10,767	10,332	8,564	11,478	14,953	14,213	-5,679	511	3,644
	VOC-emissions	915	2,590	7,333	7,329	7,052	5,663	9,335	12,757	9,783	-4,533	985	-755
	Waste generated	3,633	4,972	8,921	9,215	8,768	6,840	9,734	12,967	10,601	-4,137	403	433
	Water use	3,482	4,142	7,298	6,911	8,889	8,669	10,430	11,611	8,752	-4,298	197	-1,098
	Work accidents												
	Employees	1,792	3,551	6,192	5,392	7,444	7,150	9,168	10,452	7,202	-4,501	4	-3,278
Sustainable Value [m€]		**2,181**	**3,679**	**6,814**	**6,632**	**7,371**	**6,455**	**8,682**	**10,618**	**8,135**	**-4,325**	**181**	**-1,153**
Sustainable Value Margin		**1.99%**	**2.82%**	**5.31%**	**5.18%**	**5.66%**	**4.70%**	**5.69%**	**6.65%**	**5.00%**	**-3.03%**	**0.13%**	**-0.69%**

Figure 37: Value contributions, Sustainable Value and Sustainable Value Margin of Toyota

Toyota is near the top of the rankings, with a Sustainable Value ranging between -€4.33bn (2008) and €10.62bn (2006). This latter value is the highest figure for absolute Sustainable Value in the entire study. With the exception of use of capital in 1999, Toyota produces positive value contributions from all the resources considered until and including 2007. In the subsequent years, negative value contributions are shown by all resources in 2008, by total assets and CO_2-emissions in 2009 and 2010 as well as by VOC-emissions, water used and number of employees in 2010. The highest absolute value contribution comes from the resource SO_x-emissions (up to €14.95bn, 2006). Compared to the industry benchmark, Toyota's use of resources is extremely efficient.

In the Sustainable Value Margin rankings, Toyota's size (and high turnover) plays a significant role. Although Toyota achieved the highest absolute Sustainable Value in 2000-2007, it only finishes top of the Sustainable Value Margin rankings in 2003 and 2006. Toyota's SVM of between -3.03% (2008) and 6.65% (2006) place it constantly among the top three from 1999 to 2007, and in the lower mid-field for the subsequent years, with its worst performance in 2008 ranking in 12th place.

4.3.17 Volkswagen

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Rank SVM	8	7	5	7	14	13	11	9	5	1	5	6

The calculation of Volkswagen's Sustainable Value is based on the company's global activities. Group wide data for NO_x- and SO_x-emissions were collected only for the period 2002-2010. Adequate data for considering CO_2-emissions, VOC-emissions, waste generation and water consumption are available for the years 2001 to 2010. Figure 38 shows the value contributions of the individual resources as well as the Sustainable Value and Sustainable Value Margin of Volkswagen for the period 1999-2010.

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Value contributions in m€											
Resources	Total assets	-329	775	2,808	1,190	-2,075	-2,562	-576	-1,728	152	4,946	685	-995
	CO_2-emissions			1,838	140	-3,175	-3,323	-1,366	-2,039	-228	4,876	586	-963
	NO_x-emissions				650	-1,684	-1,739	464	-1,274	923	1,219	423	1,317
	SO_x-emissions				2,881	-265	641	1,810	1,378	4,646	-325	-150	5,474
	VOC-emissions			2,607	1,084	-1,794	-1,868	401	-335	2,029	5,090	1,686	-385
	Waste generated			4,222	3,352	14	80	1,699	965	4,378	5,622	1,384	3,658
	Water uses			2,199	566	-2,390	-2,713	-583	-1,214	788	5,068	745	280
	Work accidents	-1,888	-1,863	132	111	-2,492	-2,448	937	829	2,681	4,683	1,895	1,463
	Employees	-3,145	-2,106	814	-1,178	-4,311	-4,689	-2,594	-2,841	-982	4,841	568	-2,175
Sustainable Value [m€]		**-596**	**-355**	**1,624**	**977**	**-2,019**	**-2,069**	**21**	**-696**	**1,599**	**4,002**	**869**	**853**
Sustainable Value Margin		**-0.79%**	**-0.41%**	**1.83%**	**1.12%**	**-2.32%**	**-2.33%**	**0.02%**	**-0.66%**	**1.47%**	**3.52%**	**0.83%**	**0.67%**

Figure 38: Value contributions, Sustainable Value and Sustainable Value Margin of Volkswagen

Volkswagen's Sustainable Value hit a temporary peak in 2001. Initially the Sustainable Value climbs from -€596m (1999) to €1.62bn (2001), but then falls back again to -€2.07bn by 2004. Subsequently, it recovers up to €4bn in 2008 before dropping again in 2009 (€869m) and 2010 (€853m). The individual indicators for which data are available over the full review period basically follow a similar pattern. The majority of positive value contributions come from the use of capital, waste generation, water consumption and SO_x-emissions, while clearly negative value contributions are provided by CO_2-emissions and the number of employees. In five of the twelve years studied, the company's Sustainable Value is negative and thus reflects that it uses its resources less efficiently than the industry benchmark.

Volkswagen's Sustainable Value Margin rises initially, in parallel with the absolute Sustainable Value, from -0.79% (1999) to 1.83% (2001). Then it sinks back to -2.33% (2004) and, despite a strong upward trend until 2008, finishes the review period just slightly above the industry average at 0.67% in 2010. In terms of Sustainable Value Margin, the company ranks between 14th (2003) and 1st position (2008).

5 Conclusions and Outlook

In the first edition of this study the Sustainable Value approach for assessing companies' sustainability performance was applied to an entire global industry for the first time. This third edition extends the first update by the years 2008 to 2010 and added one automobile manufacturer. The study has shown that the Sustainable Value approach is capable of providing a meaningful and comprehensive assessment of a company's sustainability credentials. One of the biggest advantages of this approach is that it establishes a link between corporate sustainability and the value-based approach that is traditionally used in management practice and company financial analysis. An analysis based on the Sustainable Value approach therefore demonstrates which economic, environmental and social resources a company is using in a value-creating way. To this end it extends the traditional valuation methods used in financial analysis to include not just the use of economic capital, but also environmental and social resources. The result is Sustainable Value: a monetary measure of the actual value created by the company's use of a bundle of economic, environmental and social resources. A carmaker creates positive (or negative) Sustainable Value if it earns a higher (or lower) return than its industry peers with its available economic, environmental and social resources. To compare companies of different size, the Sustainable Value can be compared with sales to produce the Sustainable Value Margin.

The analysis of carmakers' sustainability performance based on the Sustainable Value approach looks at the use of nine different economic, environmental and social resources. A total of 17 automobile manufacturers worldwide were rated over a twelve-year period, from 1999 to 2010.

The results reveal a mixed pattern when it comes to the sustainability performance of each car manufacturer. Toyota and the BMW Group are industry leaders by a long chalk from 1999 to 2007. Both companies create extremely positive Sustainable Value over that period, and use their set of economic, environmental and social resources considered in a value-creating way. In other words, they use these resources more efficiently than their industry peers. They achieve by far the best results, with a Sustainable Value Margin of over 6% on occasions – the BMW Group posted 7.01% in 2001 and Toyota 6.65% in 2006. It is noteworthy that in the update period of 2008 to 2010 both leaders, Toyota and BMW, suffered from a significant decline in performance with only BMW recovering in 2010 to a Sustainable Value Margin of 5.90% and Toyota remaining in negative territory with a Sustainable Value Margin of -0.69%. Until 2007, the other volume manufacturers apart from Toyota, with an annual production of at least around 4 million vehicles [25] in 2007 – DaimlerChrysler (1999-2006), Ford, General Motors and Volkswagen – show a far weaker performance in some cases. DaimlerChrysler only managed to just keep pace with the two industry leaders in 1999 and to some extent from 2002 to 2006. Ford's performance has deteriorated sharply within the review period, improved, however, significantly in 2010. General Motors is consistently in negative territory. It always has the worst negative Sustainable Value in absolute terms. In the Sustainable Value Margin rankings it finishes every year in the bottom third of all companies studied, except for 1999, ranking 9th of 14.

Volkswagen generates a positive Sustainable Value in 2001, 2002, 2005 and 2007 to 2010, and finishes in the top third in the latter half of the review period, even taking the lead in 2008. During the update period of 2008 to 2010 the size of some of the car manufacturers changed considerably. Following the demerger from Chrysler, Daimler AG fell below an annual production of 4 million vehicles and displays production figures of 1.94 million vehicles in 2010. At the same time, Hyundai grew considerably and achieved production figures above 4 million cars from 2009 on to produce 5.76 million vehicles in 2010 [26]. Interestingly, both the growth of Hyundai to a volume manufacturer as well as Daimler's shrinking to a medium-sized producer goes along with a positive Sustainable Value trend. Compared to the previous years, Hyundai showed a significant improvement from 2008 on and managed to figure among the top 3 during the period of 2008 to 2010 and leading the ranking in 2009 with a Sustainable Value Margin of 5.82%.

The group of medium-sized manufacturers (with an annual production of over one million vehicles) includes not just BMW Group, but PSA, Nissan, Honda, Hyundai, Renault, FGA, Suzuki, Mitsubishi, and Daimler AG as of the year 2007 as well as and Chrysler as of 2010 [26]. Apart from BMW Group, no other company managed to consistently achieve positive Sustainable Value. Honda and Nissan show negative results only in two of the years assessed. A comparison of the Sustainable Value Margin shows the Asian companies experienced a gradual downtrend in 2004, partly based on a comparatively high starting point, however (Nissan, Honda), with a slight recovery following in 2005. Except for Mitsubishi, all Asian manufacturers' performance deteriorated until 2007. The Asian manufacturers within this group continued their negative trend, before recovering again in 2009. In 2010 all these companies fell into negative territory again. Out of the European manufacturers in this group, only PSA showed a relatively consistent performance overall, generally ranking in mid-field but creating, however, a positive Sustainable Value only in three of the twelve years under review (2001, 2002, 2005). During the review period, Renault only achieves a positive Sustainable Value in the year 2004, and overall drops from 7th position in 1999 to 14th position in 2010. FGA consistently achieves a negative Sustainable Value except for 2008 and 2009 and comes last (by a long chalk in some cases) in the Sustainable Value Margin rankings during the period 2000-2003. After demerger of DaimlerChrysler, Daimler managed to get closer to BMW's performance in 2007, 2008 and, following a sharp drop in 2009, in 2010 (then ranking 2nd). Chrysler, assessed as individual manufacturer only in 2010, generates a negative Sustainable Value and ranks in the lower midfield (12th).

Daihatsu and Isuzu have an annual production below 1 million vehicles during the review period, making them the two smallest manufacturers examined in this study [25; 26]. Because of their small size, their Sustainable Value is also smaller in absolute terms. But an analysis of these carmakers' Sustainable Value Margins produces some interesting results. Isuzu, for example, sees a big improvement in its Sustainable Value Margin from -5.2% in 1999 to 2.98% in 2010. Daihatsu, by contrast, revolves around the industry average with a Sustainable Value Margin ranging between -2.29% in 2002 and 0.65% in 2001.

If we compare the creation of Sustainable Value between the regions North America and Asia, the prominence of Asian manufacturers is very noticeable, with far more of them re-

porting a positive Sustainable Value. Compared with them, the North American automobile groups Chrysler, Ford and General Motors show a very poor performance. There is a mixed pattern among European manufacturers: None of them managed to continuously create Sustainable Value, except for the BMW Group. However, PSA, Renault and Volkswagen manage to do so in at least some of the years during the period studied. Daimler (until 2007 DaimlerChrysler), however, gets comparatively close to BMW's performance, showing negative results only in two of the 12 years reviewed. Therefore the differences between Asian and European manufacturers on average are not as pronounced. In this context it should be noted that due to the lack of available data for many Asian manufacturers, only the companies' operations in their home country could be included in the analysis, not their global activities.

The analysis performed in this study is based on the data and information published and provided by the manufacturers themselves. The biggest difficulty in applying the Sustainable Value approach to an entire industry is the difference in data availability and quality between the various companies. This is particularly true when it comes to the environmental and social data provided. As described in more detail above, this meant that some areas could not be fully covered, or only with the help of estimates and approximations. Nevertheless, the Sustainable Value method proved to be a robust and meaningful analysis tool that allows informative results and comparisons to be produced on the sustainability performance of companies. Here too, the basic principle is: the better the data base, the more meaningful and robust the results of the analysis.

As the results of this study have shown, companies vary not just in respect of their sustainability performance, but also regarding the quality of their sustainability reporting. Most of the automobile manufacturers examined in this study have by now adopted GRI-based sustainability reporting (Global Reporting Initiative). Standardised reporting is obviously very important for a comparative study, and efforts in this area can make a valuable contribution. A detailed analysis of the sustainability reporting of car manufacturers produces rather disappointing results, however. Barely any improvements in terms of reporting can be observed comparing the first (2008) and the second update of this study. Only some companies publish figures that can be directly compared with other companies. Most of the corporate data published have to be subsequently corrected. It is common knowledge from financial reporting that adjustments occasionally need to be made to published data in order to ensure comparability. The problem is that the significance of the available environmental and social data is open to question. In this respect, sustainable reporting has some catching up to do with financial reporting. The environmental and social data from most sustainability reports still do not cover the company's entire operations. Some corporations choose to exclude parts of the business with a high environmental impact, for example. A number of particularly worrying examples emerged even in this second update, reinforcing the view that the quality of sustainability reporting has still been mixed at best in 2010.

In future, more standardisation and harmonisation of environmental and social reporting would therefore be very welcome in the automobile industry. Crucial aspects in this respect include the standardisation of data definitions (e.g. for waste and work accident statistics) on the one hand, and greater consistency and transparency in the scope of data on the

other, to ensure comprehensive coverage of the companies' global activities. The minimum objective here should be to ensure the same scope of coverage for financial, environmental and social data.

The Sustainable Value approach applies the logic of financial management to sustainability management. Financial management theory states that the use of capital must cover its opportunity costs. In many instances the need to maximise shareholder value is a common conclusion. This is justified by the fact that economic benefit is produced. Companies obviously not only need economic capital, but environmental and social resources as well. Because these resources are scarce, it makes sense to use them efficiently not just in order to protect the natural environment, but to optimise the economic benefit. The Sustainable Value approach expresses the benefit of efficient resource use as a monetary measure.

If we follow the logic of financial management, companies that do not create shareholder value could see their existence threatened. From a market economy viewpoint, this microeconomic threat helps to avoid macroeconomic harm, namely the inefficient use of a valuable resource, capital. From a sustainability viewpoint, a perspective that only focuses on economic capital has its shortcomings. The inefficient use of environmental and social resources also has the potential to produce macroeconomic damage. Applying market economy thinking, a low Sustainable Value, i.e. the inefficient use of economic, environmental and social services, would therefore pose a potential threat to a company's existence. Companies wishing to counter this threat need to create Sustainable Value. In doing so, they encourage an allocation of resources that is not only in their self-interest, but benefits the economy as a whole.

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