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. This second edition of the study considers the newest available performance data and increases the number of automobile manufacturers under analysis to 17. 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, Queen's University Belfast 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, Queen's University Belfast 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, Daihatsu, DaimlerChrysler/Daimler AG[1], FIAT Auto, Ford, GM, Honda, Hyundai, Isuzu, Mitsubishi, Nissan, PSA, Renault, Suzuki, Tata, Toyota and Volkswagen Group over the period 1999 – 2007. Tata has been included for the first time in this update. 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. Both companies consistently create positive Sustainable Value over the entire review period, and use their economic, environmental and social resources in a value-creating way. In other words, they use these resources more efficiently than their industry peers. Hyundai, Honda and – to a certain extent – Nissan and Suzuki, generally create positive Sustainable Value as well. Apart from Toyota, the only other major volume manufacturer managing to keep up with the two sustainability leaders is DaimlerChrysler, but only intermittently – in 1999, and then to some extent from 2004 to 2006. In 2007, however, Daimler AG (replacing DaimlerChrysler in the analysis as of 2007) manages to close the gap to BMW Group and Toyota considerably. GM has consistently produced only a negative Sustainable Value, and reveals a downside trend over the entire review period. Volkswagen only managed to create significantly positive Sustainable Value in 2001, 2002 and 2007. Ford has also languished in negative territory from 2001 onwards, and only temporarily showed signs of recovery in 2004 and 2005 (although still not managing to create positive Sustainable Value). In the group of medium-sized manufacturers, only the BMW Group and Asian

[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.

producers were able to consistently generate positive Sustainable Value. Among European carmakers in this group, PSA and Renault are mainly positioned in the bottom half of mid-field, with Renault showing a negative trend towards the end of the review period. FIAT Auto, and to a certain extent Mitsubishi, posted consistently negative Sustainable Value. In the group of smaller producers, Isuzu showed a noticeable improvement. Daihatsu, on the other hand, generally fell just within the negative zone. Compared with European and North American manufacturers, it is interesting to see that a relatively high number of Asian car-makers achieve positive Sustainable Value. Compared with them, both the North American automobile groups 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 37 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 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 and Queen's University Belfast. 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 an 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).

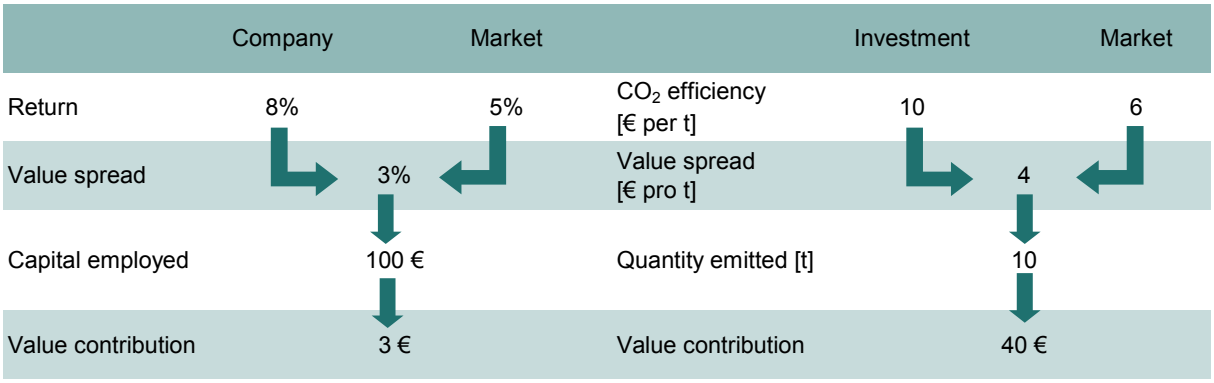


Figure 1: Value-oriented analysis of resource use

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 the 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 a total emission 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 contribution they make to creating value. The costs of resources are determined using the opportunity costs method: i.e. the value 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 2007.

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.[2] In 2007 the BMW Group, for example, generated an EBIT of 3,394 € per ton of CO_2-emissions emitted. The CO_2-efficiency of the BMW Group in 2007 therefore came to 3,394 € / 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.[3] 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 taken from 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 therefore came to 1,053 € EBIT/ t of CO_2 in 2007.

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-

[2] See 3.2 for details of the economic, environmental and social resources examined in this study.
[3] 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 role here.

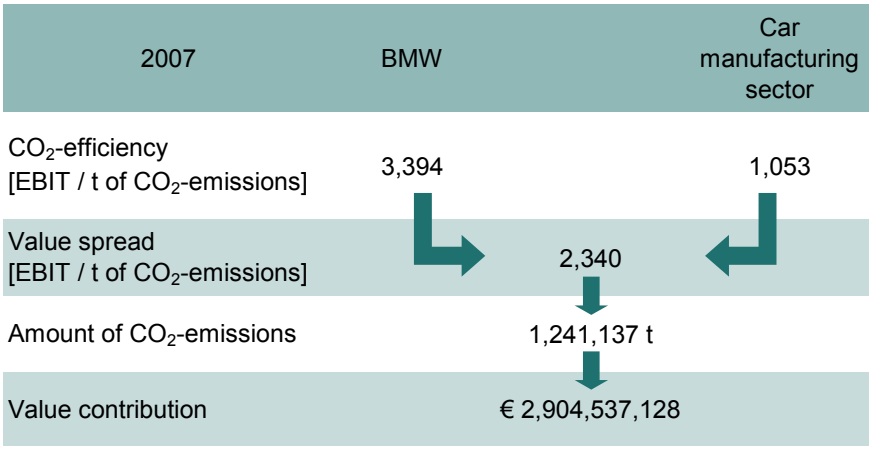


Figure 2: Calculation of the value contribution from BMW Group CO_2-emissions in 2007

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 2,340 € / t CO_2. In other words, the BMW Group generates 2,340 € 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 value added the company creates for the quantity of resource used compared with the benchmark. In 2007, for example, the BMW Group emitted 1,241,137 tons of CO_2. Having calculated the value spreads in step three, we know that the BMW Group creates roughly 2,340 € 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 2.9 billion €. 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 company's entire EBIT was attributed to the use of a single resource. Obviously this does not reflect the real world, since the return is only produced once, through the use of the entire re-

source 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 2.82 billion € in 2007. The Sustainable Value expresses how much value has been created as a result of the BMW Group using the resources in question in 2007, as opposed to other industry peers.

	Amount of resources used		Efficiency of BMW Group [€/unit]		Efficiency of the car sector [€/unit]		Value contribution
			①		②		④
Total assets [€]	88,997,000,000	* (	0.047	-	0.042	) =	510,456,121 €
CO_2-emissions [t]	1,241,137	* (	3,394	-	1,053	) =	2,904,537,128 €
NO_x-emissions [t]	756	* (	5,571,429	-	1,917,755	) =	2,762,176,958 €
SO_x-emissions [t]	85	* (	49,552,941	-	3,600,132	) =	3,905,988,789 €
VOC-emissions [t]	3,151	* (	1,336,719	-	227,021	) =	3,496,655,431 €
Waste generated [t]	88,180	* (	47,766	-	4,488	) =	3,816,209,720 €
Water use [m³]	3,727,499	* (	1,130	-	165	) =	3,595,702,203 €
Work accidents [nb]	947	* (	4,447,730	-	1,843,666	) =	2,466,048,044 €
Employees [nb]	107,539	* (	39,167	-	21,549	) =	1,894,635,219 €
Sustainable Value of BMW Group in 2007							**2,816,934,401 €**
							⑤

Figure 3: Sustainable Value of the BMW Group in 2007

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 2007 the

BMW Group created 5.03 € Sustainable Value per 100 € of sales, i.e. the Sustainable Value Margin came to 5.03 %.

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, Daihatsu, DaimlerChrysler (Daimler AG as of 2007), Fiat Auto, Ford, GM, Honda, Hyundai, Isuzu, Mitsubishi, Nissan, PSA, Renault, Suzuki, Toyota and the Volkswagen Group. Tata Motors has been included as of 2007. Other manufacturers such as KIA 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 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	Total assets
NO_x-Emissions	No. of employees	
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 the

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[4] 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.

[4] 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 the combustion process. 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 nine-year period from 1999 to 2007. It was not possible to collect data for the year 2008 for around half the companies, since the corporate publications containing the environmental and social indicators for 2008 were not yet available when we prepared the data for our study. The 2009 financial year was not yet finished at the time the data were collated.

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 Auto, 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, Hyundai 2001, Nissan 2002, Tata 2007). Daihatsu could only be considered until 2005 as the company has yet to publish environmental and social data for the years 2006 and 2007. 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 2001-2007. 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.

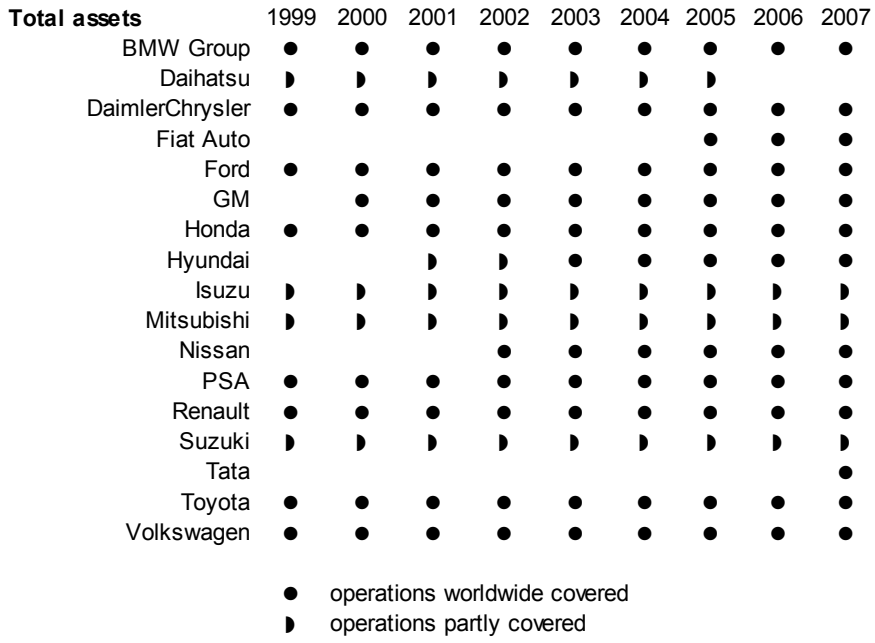


Figure 4: Data coverage for the use of capital

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 Daihatsu, FIAT Auto, Hyundai, Nissan, Tata and Volkswagen. Suitable emissions data are available for all the other automobile producers over the entire review period. The Asian manufacturers Daihatsu, Honda, Isuzu, Mitsubishi and Suzuki, and Hyundai to some extent, only provide data on CO_2-emissions in their home country.[5] In these cases the review of CO_2-emissions is

[5] In some cases, the environmental and social impacts in selected global production facilities or supply companies are reported by way of example. In all the above-mentioned cases, however, a sufficient data set could not be established for the manufacturers' international activities, and the consolidation scope is therefore limited to the home country.

therefore limited to their domestic production facilities. 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 2002-2007. Tata has been included as of 2007; Daihatsu has not been included for the years 2006 and 2007 due to the lack of data availability.

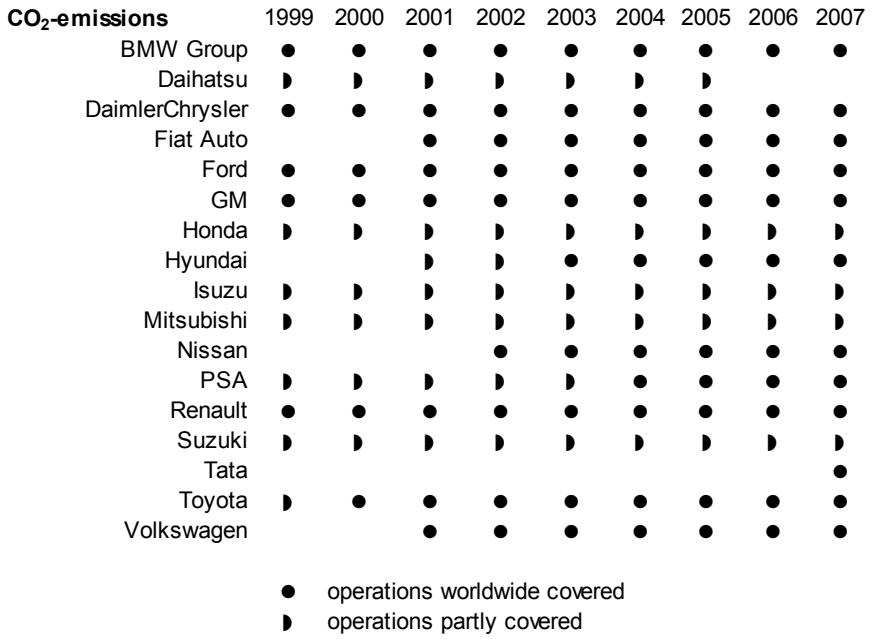


Figure 5:
Data coverage for CO_2-emissions

NO_x-emissions

Figure 6 shows the data coverage for the indicator NO_x-emissions. We can see that only five 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, GM and DaimlerChrysler, the data for the other manufacturers apply for a limited number of years, for just part of the corporation (PSA), or for the entire review period (Mitsubishi) but only for domestic production facilities. In seven other cases (Hyundai, Isuzu, Renault, Suzuki, Tata, Toyota and Volkswagen) annual emissions data are only published after 1999 either for global operations or limited to activities in the home market. Four of the companies have yet to publish acceptable data on nitrous oxide-emissions (FIAT Auto, Ford, Honda, Nissan and Tata). No data has been available for Daihatsu for the years 2006 and 2007.

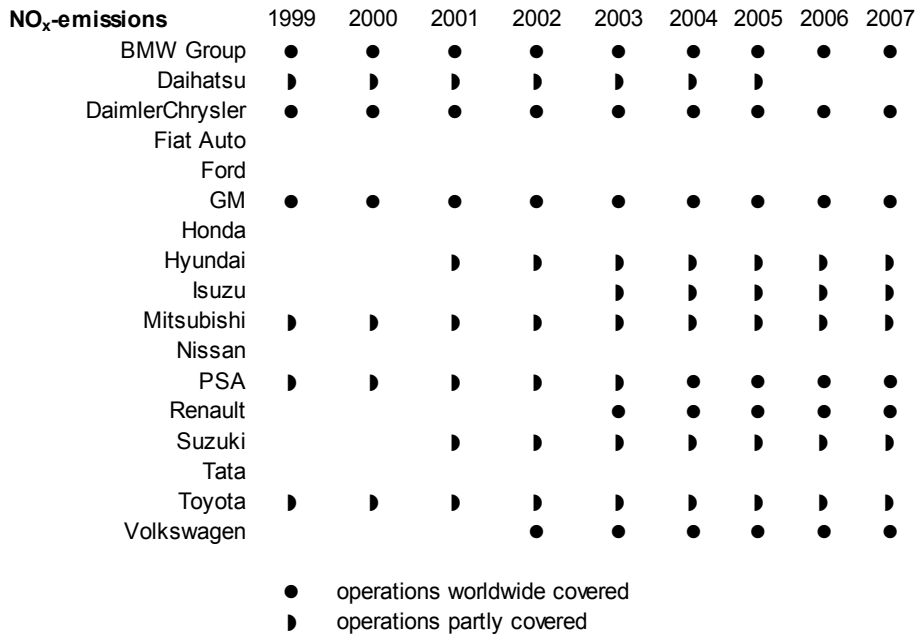


Figure 6:
Data coverage for NOx-emissions

SO_x-emissions

The picture is virtually identical in the case of data coverage for sulphur oxide-emissions (Figure 7). Once again there are limitations regarding the data availability and the scope of consolidation for 14 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 Fiat Auto, Ford, Honda and Tata.

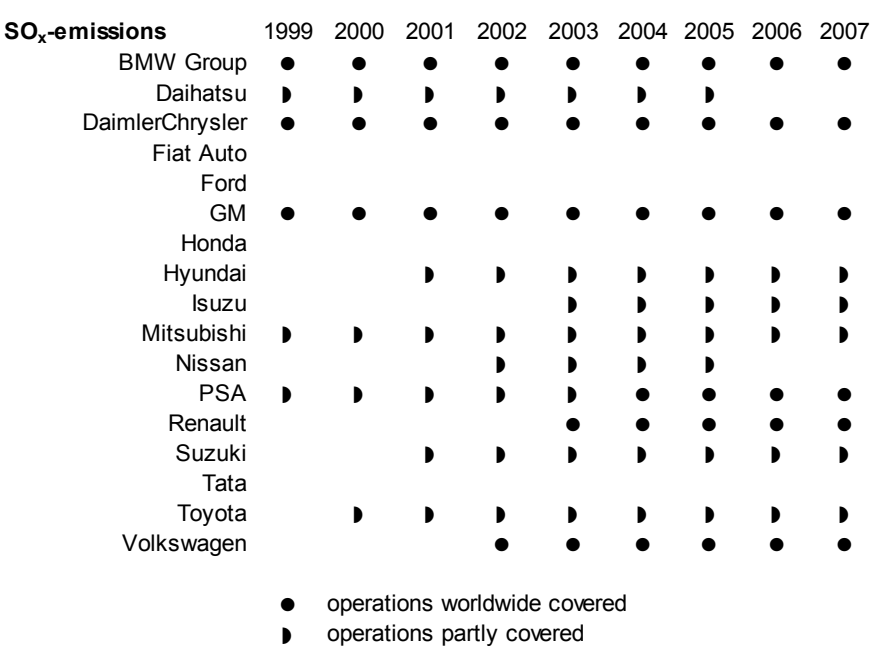


Figure 7:
Data coverage for SOx-emissions

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 11 of the 17 manufacturers. Since 2001 Ford, Hyundai, Mitsubishi 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. 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 has not been included in the years 2006 and 2007. In the case of PSA, emissions data for the review period are available only for its PCA division. No data was available for Tata throughout the whole review period.

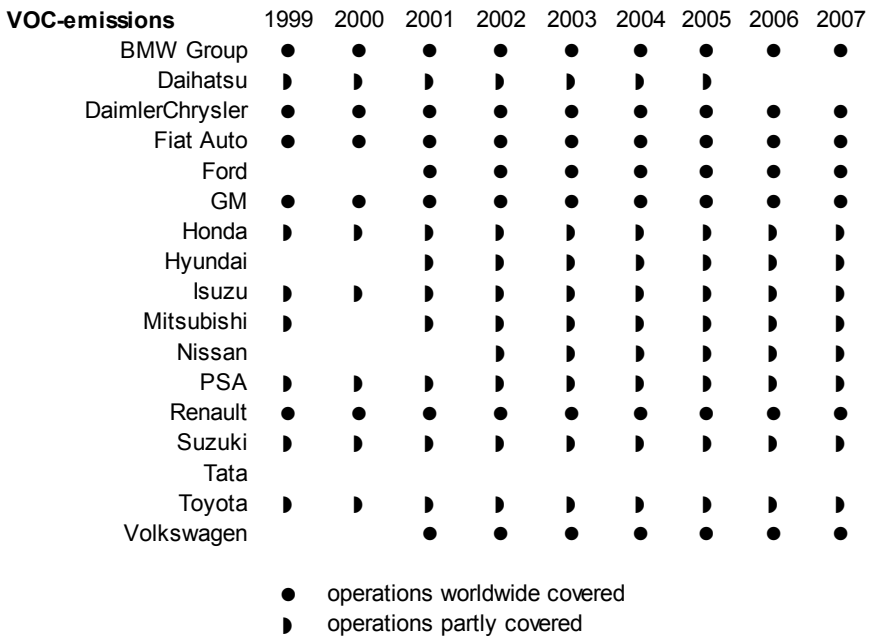


Figure 8:
Data coverage for VOC-emissions

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. A consistent data set over the entire review period is only missing for Suzuki. Tata, which as generally been included as of 2007, does not provide waste data of sufficient quality. Honda, Hyundai, Nissan 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 Asian manufacturers (with the exception of Isuzu, Nissan and also Hyundai to some extent), waste data are only available for domestic production facilities. No data is available for Daihatsu for the years 2006 and 2007. In the case of PSA, the data for the period 1999-2001 relate to its PCA division.

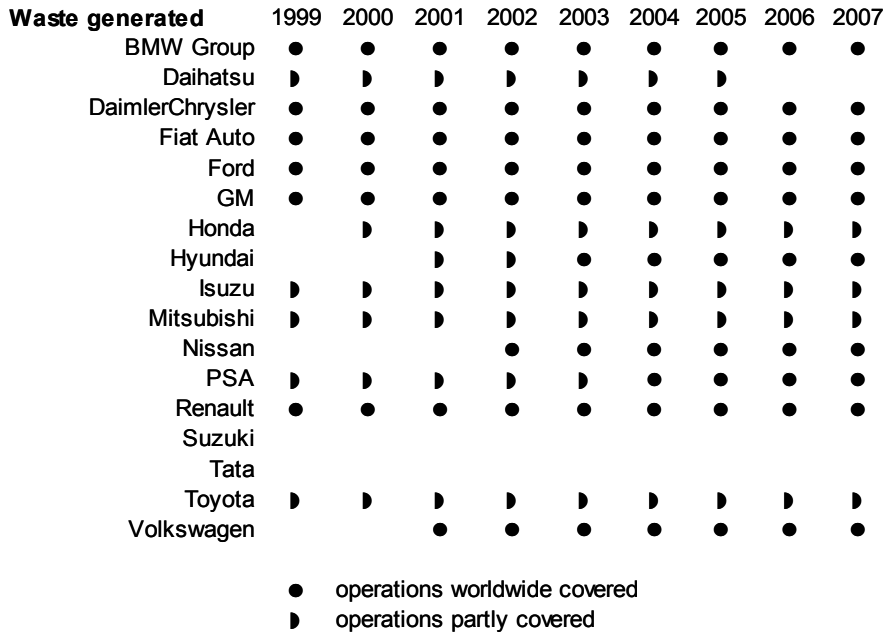
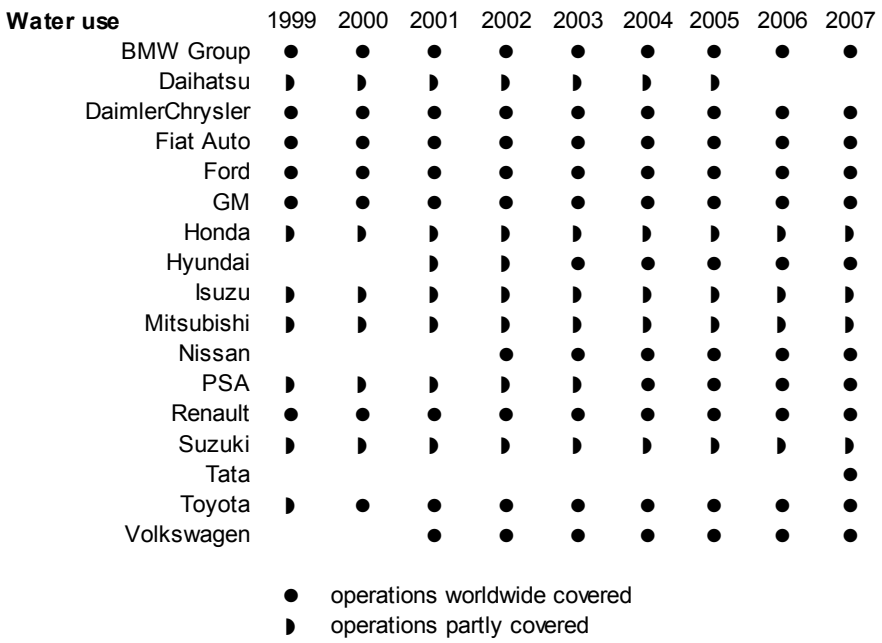


Figure 9:
Data coverage for waste generation

Water consumption

A similar picture emerges for data coverage for water consumption. Here data are available for all manufacturers except Tata for the period 2002-2005. Hyundai, Nissan and Volkswagen have only started to systematically collect and publish data on group wide water consumption during the course of the review period. Tata has been included as of 2007. In the case of Asian manufacturers (with the exception of Nissan and also Hyundai and Toyota to some extent), water consumption data are only available for domestic production facilities. No



data is available for Daihatsu for the years 2006 and 2007. 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 from 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.

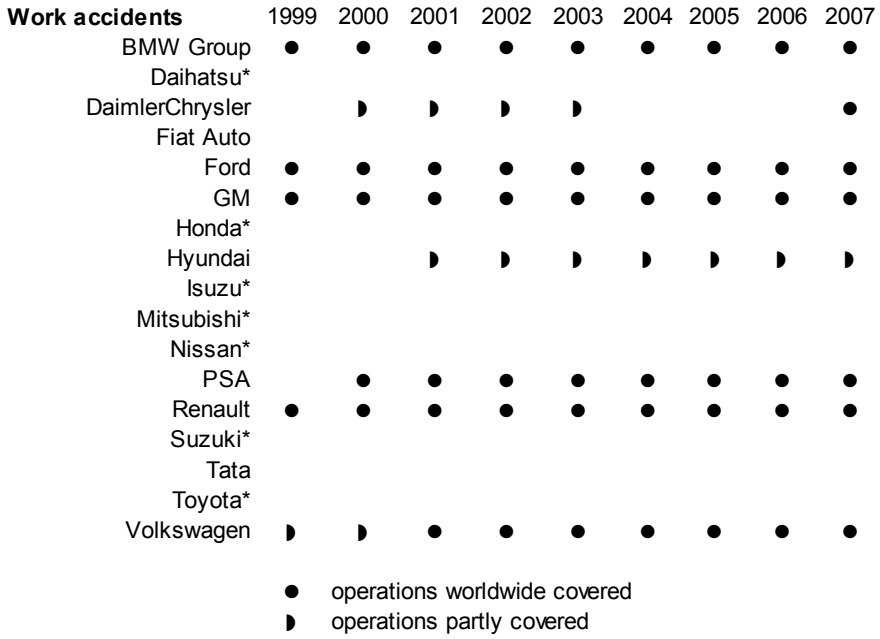


Figure 11: Data coverage for work accidents (* excluding the Japanese manufacturers)

In the case of DaimlerChrysler, and also Volkswagen to some extent, no work accident data is available, but only specific accident rates for blue collar workers in the vehicle production plants (Mercedes Car Group in the period 2000-2003) or in certain parts of the corporation (Volkswagen AG in the period 1999-2000). For 2007, work accident data is available for Daimler AG.

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, Hyundai, Isuzu, Mitsubishi and Suzuki, only the number of domestic employees was recorded. As already mentioned, data are only available for Hyundai for the period 2001-2007, for Nissan from 2002 to 2007, for Daihatsu from 1999 to 2005 and in the case of Tata as of 2007.

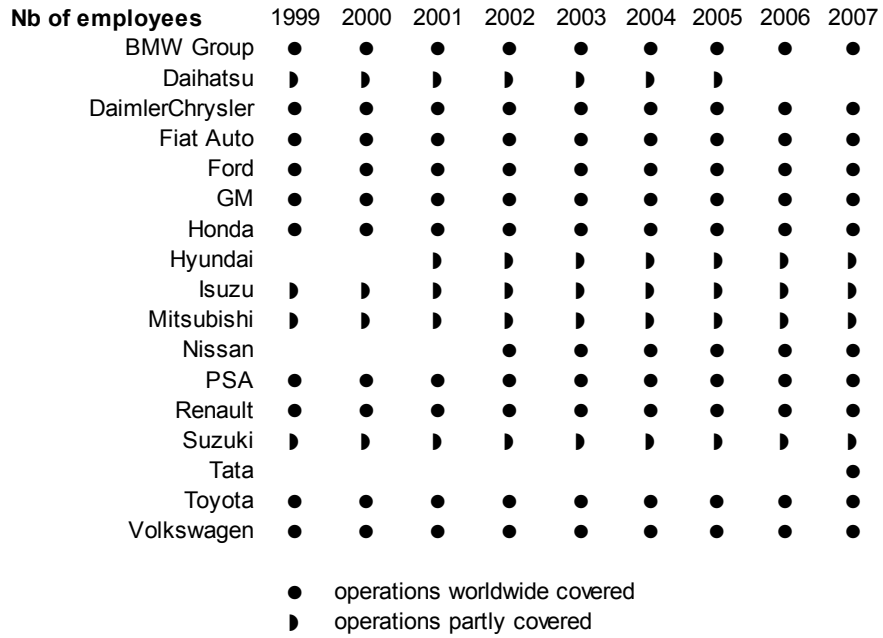


Figure 12: Data coverage for number of employees

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 DaimlerChrysler AG: While company data is available for the period 2000-2003, allowing appropriate efficiency ratios to be calculated, no data exist for the years 1999 and 2004 to 2006. We therefore made the assumption that DaimlerChrysler'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 DaimlerChrysler for the years 1999 and 2004 to 2006 is therefore 0 €.

Another example of this approach is the work accident rates for all Japanese car manufacturers. As already mentioned (see page 24), 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 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 2002-2007, 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 2002-2007, the analysis of resource efficiency therefore com-

pares the VOC-emissions of the PCA division with the financial data reported for this business segment, whereas all the other indicators 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. Seven of the 17 companies do not report VOC-emissions for the entire group, but rather VOC-emissions per bodywork surface area painted (FIAT Auto, Ford, Isuzu, Mitsubishi, Nissan, 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 seven manufacturers.

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

Company	Average bodywork surface area painted (estimate)
FIAT Auto	80 m^2
Ford	110 m^2
Isuzu	90 m^2
Mitsubishi	90 m^2
Nissan	100 m^2
Suzuki	80 m^2
Toyota	100 m^2

A similar approach was used to determine the annual work accidents of different companies. Some of the manufacturers (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.

PSA, Renault, Hyundai, Mercedes Car Group). 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 FIAT Auto, 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. Mercedes Car Group, 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 1999-2007. 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 1999-2007

Figure 13 provides an initial overview of the absolute Sustainable Value created by 17 automobile manufacturers studied during the period 1999-2007. The Sustainable Value produced by these companies ranges from -13.36 billion € (GM, 2005) to +7.44 billion € (Toyota, 2006). One salient feature is that three manufacturers managed to consistently produce a positive Sustainable Value over the entire review period (BMW Group, Honda, Toyota). In the case of two other manufacturers, no complete time series are available; in those years for which data are available, however, they also produce consistently – or mostly – positive Sustainable Value (Hyundai, Nissan). Tata was only included with one year (2007) and scores a moderately positive Sustainable Value. In addition, two companies were identified as generating negative Sustainable Value over the entire review period (FIAT Auto, GM). The nine remaining companies show both positive and negative Sustainable Value figures.

	1999	2000	2001	2002	2003	2004	2005	2006	2007
BMW Group	1,501,732	1,994,929	2,733,607	2,439,773	2,296,344	2,648,734	2,986,741	3,224,266	2,816,934
Daihatsu	-224,142	-59,724	44,995	-171,797	-95,668	-80,680	7,075	n/a	n/a
DaimlerChrysler	4,349,228	-186,310	-2,321,165	1,407,408	1,177,407	1,798,905	1,483,721	2,151,231	3,918,822
Fiat Auto	-1,410,984	-1,201,759	-1,211,875	-1,726,769	-1,373,669	-1,322,501	-936,640	-555,391	-754,673
Ford	259,158	1,338,977	-3,538,640	-3,089,081	-2,009,273	-748,786	-1,265,656	-5,356,987	-3,263,710
GM	-3,425,480	-3,133,286	-5,397,841	-8,667,365	-6,276,460	-7,466,090	-13,362,505	-8,659,373	-9,874,113
Honda	358,791	701,926	1,637,889	1,171,532	860,932	793,888	1,882,573	1,175,825	1,101,237
Hyundai	n/a	n/a	1,777,799	1,375,061	832,087	315,677	769,012	674,861	541,429
Isuzu	-432,073	-242,352	-59,113	-55,517	324,682	286,814	258,100	296,600	126,193
Mitsubishi	-605,289	-1,099,094	-196,122	-96,853	-221,874	-796,901	-303,701	-251,764	96,681
Nissan	n/a	n/a	n/a	1,902,383	1,837,363	1,619,980	2,077,359	1,258,378	-79,917
PSA	-894,203	-403,885	349,742	193,197	-351,622	-322,624	159,468	-444,977	-603,548
Renault	-236,811	-195,879	-823,905	-524,293	-524,613	540,553	-103,656	-290,690	-713,957
Suzuki	-68,963	-5,373	155,673	78,339	115,791	84,753	103,546	99,979	-15,714
Tata	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	22,816
Toyota	1,326,944	2,719,925	5,114,023	4,803,193	5,429,324	4,793,832	6,286,917	7,443,699	5,262,013
Volkswagen	-497,907	-228,095	1,734,933	960,789	-2,020,752	-2,145,554	-42,355	-765,657	1,419,506

Figure 13: Absolute Sustainable Value of car manufacturers (in 1,000 €)

During the review period, clearly positive trends in absolute Sustainable Value were reported for Toyota (1999: 1.33 billion €; 2007: 5.26 billion €), BMW Group (1999: 1.50 billion €; 2007: 2.82 billion €) and Honda (1999: 359 million €; 2007: 1.10 billion €). Those companies showing a very negative trend in their Sustainable Value include Ford (1999: 259 million €; 2007: -3.26 billion €) and General Motors (1999: -3.43 billion €; 2007: -9.87 billion €). The negative performance of these two sector heavyweights 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 and 10 out of 14), the relationship changes in subsequent years. In the period 2001-2004 at least half of the 16 companies report a positive Sustainable Value (2001: 8/15; 2002: 8/16; 2003: 8/16; 2004: 9/16). In 2004, only seven of the 16 manufacturers fall below the industry average. 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. In 2006, eight of the now 15 companies report a positive Sustainable Value. In the final year of the review period, nine of the 16 manufacturers are above the industry average.

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 Ford and General Motors can be clearly seen. DaimlerChrysler shows a very negative trend from 1999 to 2001, but subsequently recovers continuously. In 2007, only Daimler AG is included in the analysis, now with the company creating the second largest Sustainable Value in 2007. Toyota shows the strongest positive trend (starting from an already high initial level). The trend is also positive for the BMW Group, which also has a high starting point. Another conspicuous trend is the isolated position of General Motors, whose performance in the area of absolute Sustainable Value is by far the worst in the industry.

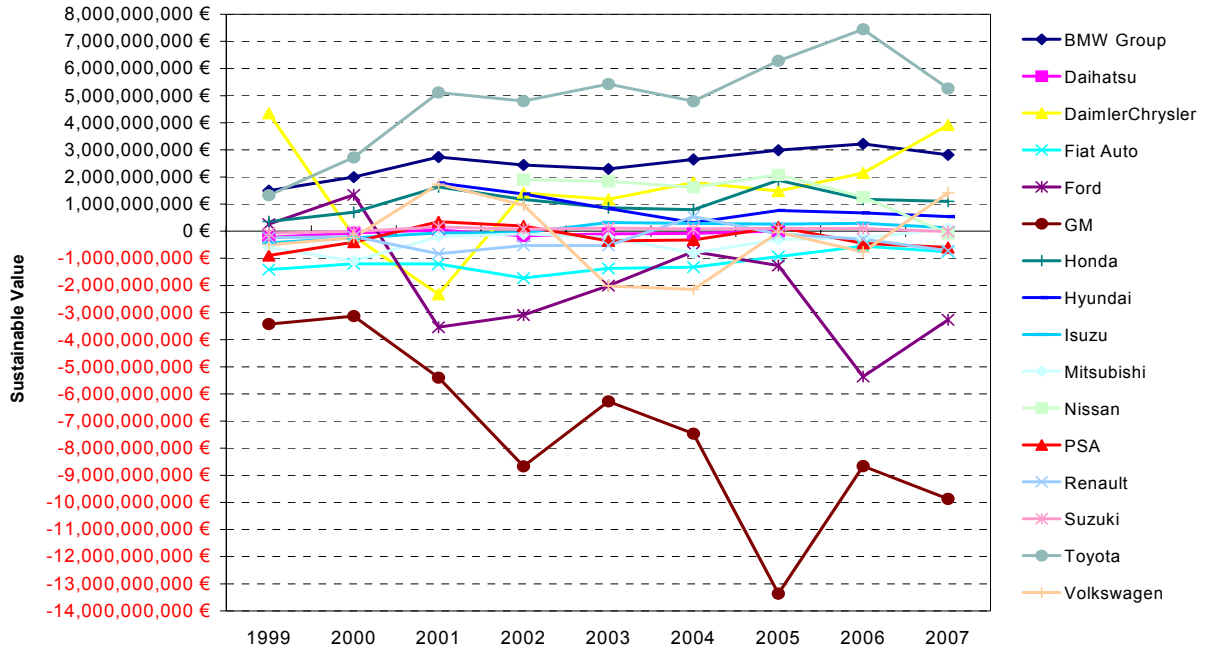


Figure 14: Absolute Sustainable Value of car manufacturers (graphic representation)

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 Auto, PSA, Renault). The exceptions to these two groups are DaimlerChrysler, whose Sustainable Value curve follows a convex path, and Volkswagen, whose curve fluctuates significantly over time.

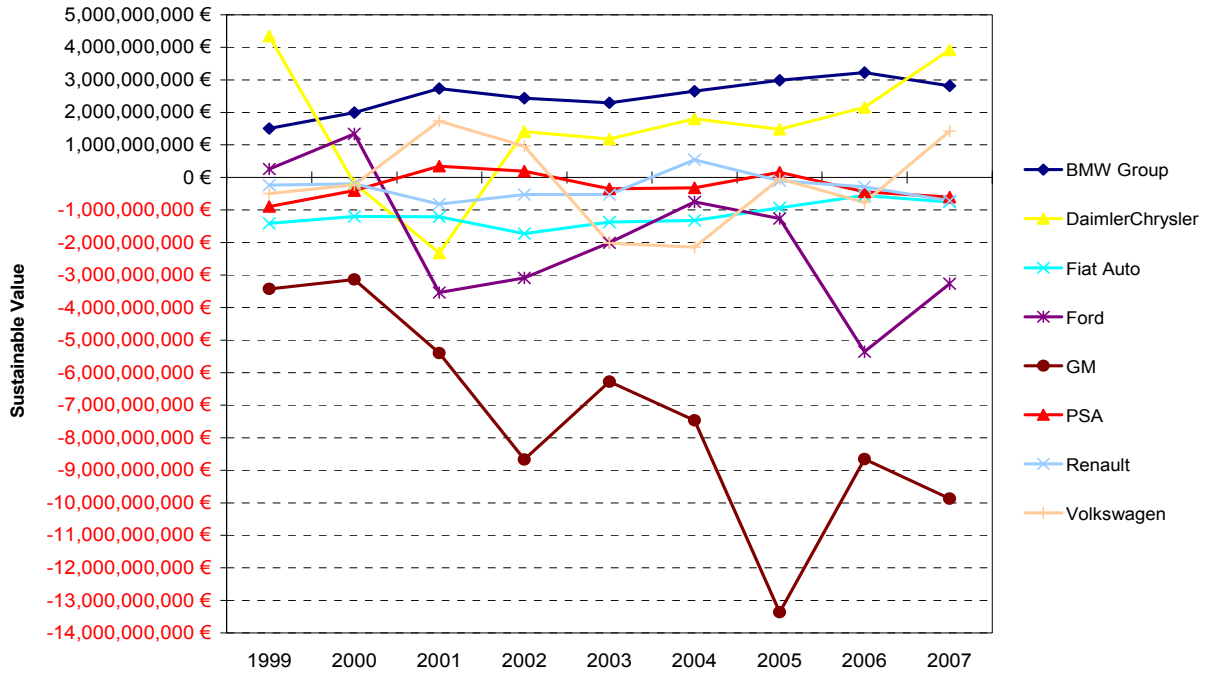


Figure 15: Sustainable Value trends: European and North American manufacturers

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 -1.1 billion € and +2.1 billion € 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 2003-2007 only one or two of all eight (2006: 7) Asian manufacturers show a negative Sustainable Value.

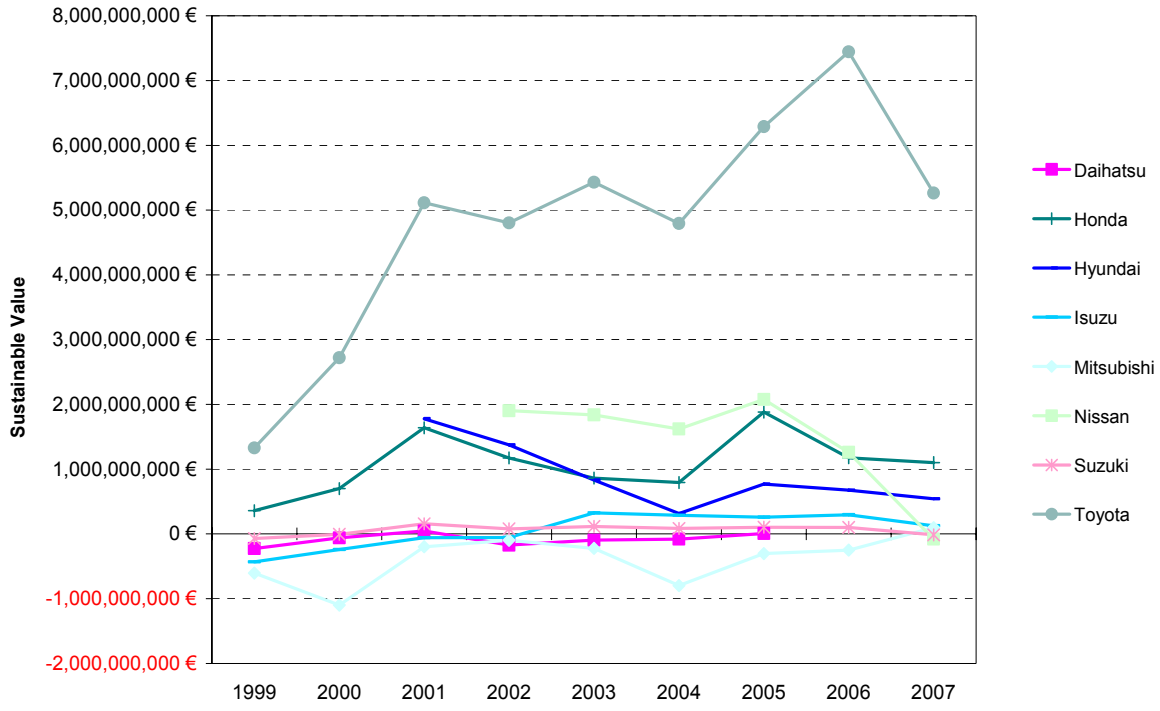


Figure 16: Sustainable Value trends: Asian manufacturers

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*
BMW Group	4.37%	5.36%	7.11%	5.75%	5.53%	5.97%	6.40%	6.58%	5.03%
Daihatsu	-2.27%	-0.68%	0.60%	-2.35%	-1.38%	-1.02%	0.08%	n/a	n/a
DaimlerChrysler	2.90%	-0.11%	-1.52%	0.94%	0.84%	1.30%	0.99%	1.42%	3.94%
Fiat Auto	-2.93%	-4.80%	-4.96%	-7.80%	-6.86%	-6.44%	-4.80%	-2.34%	-2.81%
Ford	0.17%	0.73%	-1.95%	-1.79%	-1.38%	-0.54%	-0.89%	-4.20%	-2.59%
GM	-2.07%	-1.57%	-2.73%	-4.62%	-3.83%	-4.80%	-8.64%	-5.25%	-7.47%
Honda	0.69%	1.43%	3.49%	2.43%	2.05%	1.78%	4.25%	2.38%	3.08%
Hyundai	n/a	n/a	5.23%	3.60%	2.44%	0.86%	1.72%	1.37%	1.08%
Isuzu	-5.22%	-2.62%	-0.80%	-0.84%	4.53%	4.07%	3.60%	4.21%	1.86%
Mitsubishi	-2.86%	-5.03%	-0.92%	-0.75%	-2.34%	-8.56%	-3.09%	-2.72%	0.75%
Nissan	n/a	n/a	n/a	3.83%	3.69%	3.04%	3.72%	2.02%	-0.03%
PSA	-2.64%	-1.02%	0.75%	0.48%	-0.70%	-0.65%	0.23%	-0.86%	-1.08%
Renault	-0.63%	-0.49%	-2.27%	-1.44%	-1.40%	1.33%	-0.25%	-0.70%	-1.75%
Suzuki	-0.57%	-0.04%	1.20%	0.62%	1.00%	0.71%	0.78%	0.72%	-0.12%
Tata	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.32%
Toyota	1.97%	2.80%	5.28%	5.14%	5.62%	4.66%	5.65%	6.61%	4.91%
Volkswagen	-0.79%	-0.36%	1.96%	1.11%	-2.32%	-2.41%	-0.04%	-0.73%	1.30%

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, Honda and Toyota have a consistently positive Sustainable Value Margin; FIAT Auto and GM always fall below the industry average in every year studied.

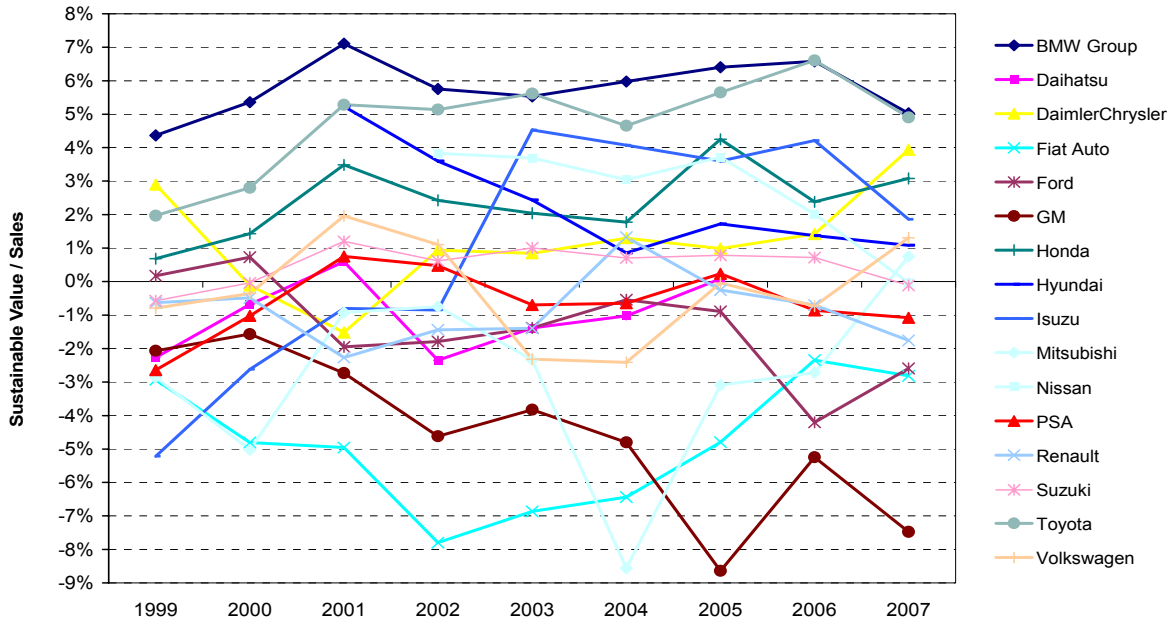


Figure 18: Sustainable Value Margin of car manufacturers (graphic representation)

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 Auto 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 seven of the nine years studied, while the performance of FIAT Auto 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 -5.22% in 1999, its performance significantly improved in the second half of the review period, reaching a positive value of 4.53% 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 this region. BMW is the only carmaker in this group 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. This is especially so in 2001, when the BMW Group shows a Sustainable Value Margin of around 7%. FIAT Auto and GM lie well into negative territory over the entire review period. FIAT Auto, however, recovers towards the end of the review period. DaimlerChrysler stages a marked recovery and in 2007 finally manages to revert to the relatively high level of a Sustainable Value Margin it achieved in 1999. 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 second among European and North American manufacturers. In the three following years, however, Renault drops back below the industry average. The Volkswagen Group only manages to achieve a positive Sustainable Value Margin in 2001, 2002 and 2007. Ford and PSA achieve a very modest Sustainable Value Margin over the entire review period and towards the end of it are positioned in the negative and slightly positive zone respectively. Ford also achieves a modest Sustainable Value Margin from 1999 to 2005, revolving around the benchmark, but subsequently drops markedly.

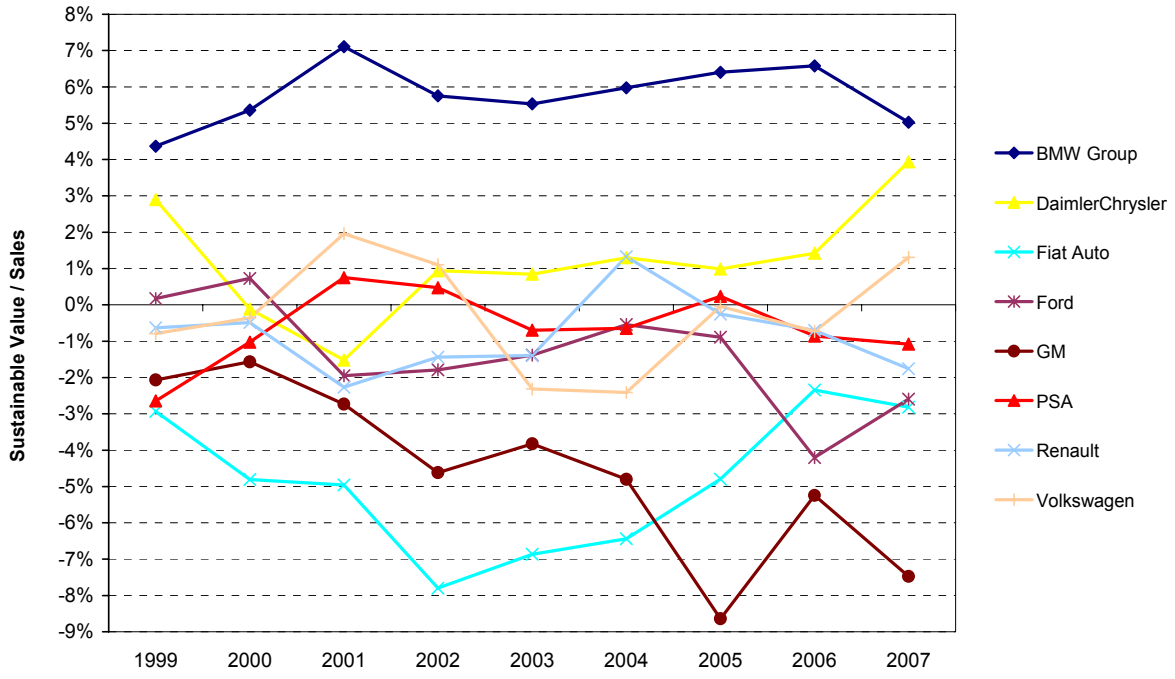


Figure 19: Sustainable Value Margin trends for European and North American automobile manufacturers

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 Sustainable Value Margin of most Asian manufacturers declined slightly and in some cases did not start to improve again until 2003. In 2004 six of the eight Asian manufacturers managed to

maintain more or less the same level. The only exceptions were Hyundai and especially Mitsubishi, which both fell away sharply. In 2005, six 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 in every single year of the review period. Suzuki, and above all Isuzu, showed a clearly positive trend over the years studied, but suffer a decline in 2007, with Suzuki falling below the sector average. Although Hyundai had quite a high Sustainable Value Margin of well over 5% in 2001, it suffered a sharp and continuous decline over the next three years and achieves a Sustainable Value Margin of between 1% and 2% towards the end of the review period. Honda also shows a consistently positive Sustainable Value Margin. With the exceptions of 1999 and 2007, Nissan achieves a moderately positive Sustainable Value Margin of around 1%. By contrast, Mitsubishi and Daihatsu fall well behind other Asian manufacturers. 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.

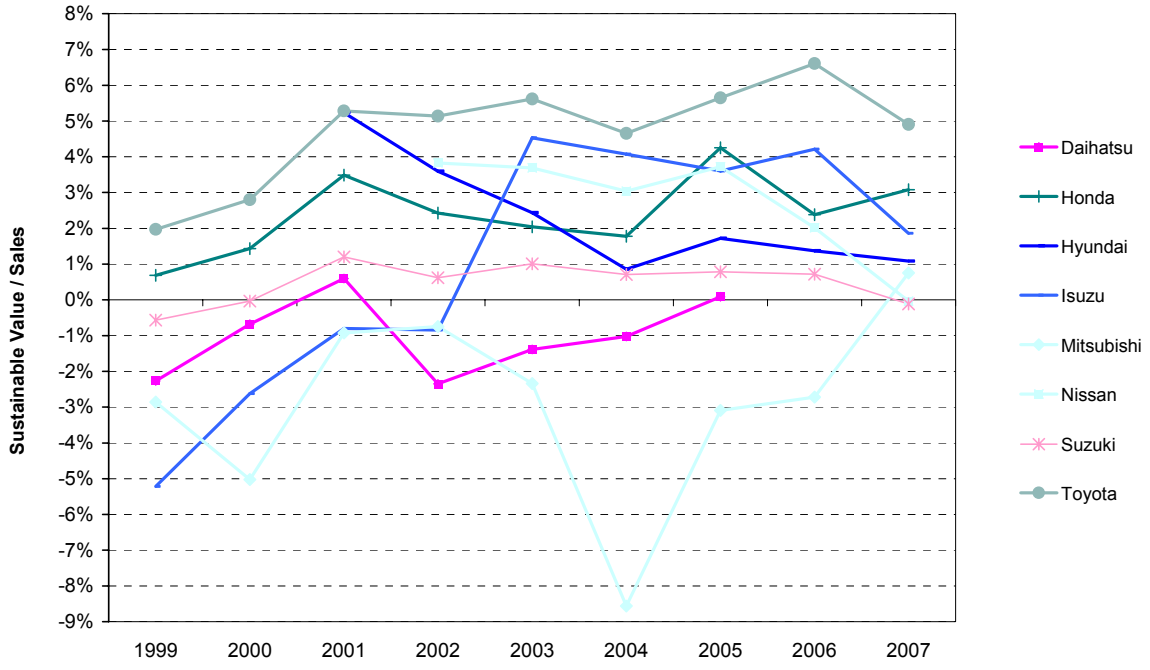


Figure 20: Sustainable Value Margin trends for Asian automobile manufacturers

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 consistently top the rankings. 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, apart from 2003 and 2006, when Toyota leads the rankings. Aside from the BMW Group and Toyota, Honda consistently features in the top

third. Hyundai and Nissan also appear high up in the rankings in those years for which sufficient data are available for them. DaimlerChrysler ranks second in 1999 before suffering a prolonged decline and only in 2007, now as Daimler AG, again ranking in the top three.

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

Figure 21: Manufacturers' Sustainable Value Margin rankings

Over the review period it is generally FIAT Auto, General Motors, Isuzu and Mitsubishi that bring up the rear. While Isuzu only comes in last place in 1999, FIAT Auto 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 last in 2000 and 2004. General Motors is also consistently low down in the rankings, coming last in the years 2005 to 2007. 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 2001-2007.

Other companies showing a negative performance trend compared with their industry peers over the review period include Ford (1999: 5th; 2005: 14th), Renault (1999: 7th; 2007: 13th) and Suzuki (1999: 6th; 2007: 11th). By contrast, the performance trend was positive for Isuzu (1999: 14th; 2007: 5th). When analysing company-specific trends, it should be noted that in the period 2001-2007 two new companies joined the rankings: Hyundai (2001) and Nissan (2002), both of whom occupy high positions. Mitsubishi, for example, improved from 12th to 8th place between 1999 and 2007; in the rankings for the original group of manufacturers, however the company would actually have finished in 6th place in 2007.

One group of companies features relatively consistently in the middle of the rankings (apart from the odd year): Daihatsu, PSA and Volkswagen, although Volkswagen drops away in 2003 and 2004 when it ranks 14th and 13th respectively in the list of 16 manufacturers. Tata – which has been included as of 2007 – ranks ninth in this year, slightly above 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
Rank SVM	1	1	1	1	2	1	1	2	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 1999-2007. 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
		Value contributions in million €								
Resources	Total assets	1,000	1,535	2,093	1,683	1,363	1,546	1,905	1,887	510
	CO_2-emissions	1,549	1,977	2,787	2,538	2,313	2,580	2,811	3,139	2,905
	NO_x-emissions	1,265	2,156	2,859	2,618	2,506	2,891	3,210	3,233	2,762
	SO_x-emissions	2,421	2,787	3,369	2,854	2,726	3,316	3,600	3,811	3,906
	VOC-emissions	1,845	2,291	2,903	2,805	2,745	3,233	3,369	3,667	3,497
	Total waste generated	2,097	2,494	3,118	3,115	3,033	3,480	3,540	3,823	3,816
	Water use	2,001	2,380	3,065	3,059	2,876	3,250	3,399	3,663	3,596
	No. of work accidents	633	1,412	2,506	1,769	1,801	1,880	2,932	3,379	2,466
	No. of employees	704	922	1,903	1,516	1,303	1,662	2,115	2,414	1,895
Sustainable Value		**1,502**	**1,995**	**2,734**	**2,440**	**2,296**	**2,649**	**2,987**	**3,224**	**2,817**
Sustainable Value Margin		**4.37%**	**5.36%**	**7.11%**	**5.75%**	**5.53%**	**5.97%**	**6.40%**	**6.58%**	**5.03%**

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

We can see that the BMW Group managed to use all the resources considered to create value in every single year of the review period. Over the period 1999-2007 the Sustainable Value almost doubled, from 1.5 billion € to 2.8 billion €. This means, for example, that an additional 2.8 billion € EBIT was created in 2007 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 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 and 2006). The Sustainable Value Margin of 7.11% in 2001 is the highest achieved by any of the 17 companies throughout the review period.

4.3.2 Daihatsu

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	10	9	8	14	10	12	10	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.[6] Figure 23 shows the value contributions of the resources considered 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 and 2007 due to a lack of data availability.

		1999	2000	2001	2002	2003	2004	2005	2006	2007
		Value contributions in million €								
Resources	Total assets	-129	18	130	-63	11	56	117	n/a	n/a
	CO_2-emissions	-263	-78	81	-177	-105	-81	4	n/a	n/a
	NO_x-emissions	-136	12	88	-153	-64	-26	89	n/a	n/a
	SO_x-emissions	2	150	223	59	141	195	241	n/a	n/a
	VOC-emissions	-527	-211	-29	-329	-227	-302	-93	n/a	n/a
	Total waste generated	-465	-214	-126	-408	-324	-341	-229	n/a	n/a
	Water use	-410	-274	-90	-375	-278	-270	-176	n/a	n/a
	No. of work accidents								n/a	n/a
	No. of employees	-89	59	129	-101	-15	43	110	n/a	n/a
Sustainable Value		-224	-60	45	-172	-96	-81	7	n/a	n/a
Sustainable Value Margin		-2.27%	-0.68%	0.60%	-2.35%	-1.38%	-1.02%	0.08%	n/a	n/a

Figure 23: 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 -224 million € (1999) to 45 million € (2001). The low rating is primarily down to the consistently negative value contributions from VOC-emissions, waste and water consumption. 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 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.

[6] 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.

4.3.3 DaimlerChrysler/Daimler AG

DAIMLER

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	2	6	11	7	8	7	7	6	3

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. In 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.

		1999	2000	2001	2002	2003	2004	2005	2006	2007
		Value contributions in million €								
Resources	Total assets	2,330	-1,785	-3,855	-319	-84	367	81	318	2,248
	CO_2-emissions	2,298	-1,633	-3,221	-300	-371	113	-342	505	3,673
	NO_x-emissions	7,046	2,072	-1,557	1,910	1,476	3,094	2,959	3,254	5,983
	SO_x-emissions	9,195	4,536	734	4,745	4,580	4,131	4,367	5,173	7,473
	VOC-emissions	6,760	2,637	-551	3,524	3,482	3,993	3,093	3,769	5,905
	Total waste generated	6,799	1,528	-769	3,685	3,317	3,865	3,079	4,160	6,023
	Water use	3,860	-652	-2,799	875	287	1,671	1,002	2,197	4,980
	No. of work accidents		-5,261	-4,571	-112	-665				-2,803
	No. of employees	854	-3,120	-4,301	-1,341	-1,427	-1,045	-885	-14	1,787
Sustainable Value		**4,349**	**-186**	**-2,321**	**1,407**	**1,177**	**1,799**	**1,484**	**2,151**	**3,919**
Sustainable Value Margin		**2.90%**	**-0.11%**	**-1.52%**	**0.94%**	**0.84%**	**1.30%**	**0.99%**	**1.42%**	**3.94%**

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

The Sustainable Value of DaimlerChrysler drops from 4.35 billion € in 1999 to 2.15 billion € in 2006. In 2007, Daimler AG achieves a Sustainable Value of 3.92 billion €. At times the Sustainable Value drops heavily into the red, down to -2.32 billion € (2001). This steep fall can be explained by a sharp drop in profits in 2001 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. Only in 1999, all resources are used in a value creating way.

The Sustainable Value Margin drops from 2.90% (1999) to -1.52% (2001), before continuously recovering towards the end of the review period. In 2007, the company achieves its highest Sustainable Value Margin of 3.94 %, ranking third in this year. Apart from 1999 (ranked 2nd) and 2007, DaimlerChrysler finishes up in the middle of the rankings.

4.3.4 FIAT Auto

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	13	13	15	16	16	15	15	12	15

The analysis of FIAT Auto's Sustainable Value encompasses this division's entire global activities. No adequate data set could be established for the indicators NO_x-emissions, SO_x-emissions and number of work accidents. CO_2-emissions data are available for the period 2001-2007. The figure for the company's use of capital could only be recorded for the years 2005 to 2007. Figure 25 shows the Sustainable Value (and its composition) and the Sustainable Value Margin of FIAT Auto.

		1999	2000	2001	2002	2003	2004	2005	2006	2007
		Value contributions in million €								
Resources	Total assets							-820	-177	45
	CO_2-emissions			-1,936	-2,856	-2,547	-2,554	-1,743	-1,106	-1,611
	NO_x-emissions									
	SO_x-emissions									
	VOC-emissions	-3,361	-3,156	-2,757	-4,061	-3,129	-2,996	-1,869	-1,498	-2,380
	Total waste generated	-2,290	-1,732	-1,806	-2,623	-2,096	-1,957	-1,224	-904	-1,635
	Water use	-5,254	-4,485	-3,022	-3,686	-2,737	-2,656	-1,760	-1,354	-1,903
	No. of work accidents									
	No. of employees	-1,794	-1,442	-1,385	-2,315	-1,854	-1,739	-1,012	-395	-286
Sustainable Value		-1,411	-1,202	-1,212	-1,727	-1,374	-1,323	-937	-555	-755
Sustainable Value Margin		-2.93%	-4.80%	-4.96%	-7.80%	-6.86%	-6.44%	-4.80%	-2.34%	-2.81%

Figure 25: Value contributions, Sustainable Value and Sustainable Value Margin of FIAT Auto

FIAT Auto has consistently created a negative Sustainable Value. Over the review period the Sustainable Value ranges between -1.73 billion € (2002) and -0.55 billion € (2006). In each of the areas examined, FIAT Auto uses the bundle of resources in question less efficiently than the benchmark over the entire observation period. In 2007 the company used a single resource more efficiently than the benchmark (total assets) for the first time. The company is particularly inefficient when it comes to VOC-emissions and water consumption, where negative value contributions of up to -5.25 billion € arose (1999). Another interesting point is that the expansion of the set of indicators to include CO_2 in the period 2001-2007 has virtually no perceptible impact on the Sustainable Value of FIAT Auto. With value contributions ranging between -1.11 billion € (2006) and -2.86 billion € (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 FIAT Auto's Sustainable Value Margin is heavily in the red, with values between -2.34% (2006) and -7.80% (2002). As a result, FIAT Auto's Sustainable Value Margin puts it in one from last place (1999, 2000, 2004, 2005, 2007) and last place (2001 to 2003) in the rankings. The only exception is 2006 when FIAT Auto ranks 12th of 15 manufacturers.

4.3.5 Ford

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	5	4	12	13	11	10	13	14	14

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 2007; NO_x and SO_x are not assessed due to lack of available data. Total waste generated has not been included for the year 2007 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 2007.

		1999	2000	2001	2002	2003	2004	2005	2006	2007
		Value contributions in million €								
Resources	Total assets	-2,174	-452	-7,276	-7,631	-5,629	-3,170	-3,017	-9,277	-7,870
	CO_2-emissions	-713	901	-5,431	-4,727	-3,853	-2,657	-3,195	-7,635	-5,506
	NO_x-emissions									
	SO_x-emissions									
	VOC-emissions			-3,248	-2,011	-629	942	-179	-5,583	-3,140
	Total waste generated	5,339	6,506	-2,328	-838	251	1,691	48	-5,416	
	Water use	1,766	2,776	-4,912	-4,456	-3,323	-1,968	-2,887	-8,127	-5,398
	No. of work accidents	-3,911	-1,069	-3,738	-3,886	-1,875	241	138	-4,622	-2,763
	No. of employees	2,025	3,389	-4,914	-4,252	-3,025	-1,819	-2,298	-7,553	-4,697
Sustainable Value		**259**	**1,339**	**-3,539**	**-3,089**	**-2,009**	**-749**	**-1,266**	**-5,357**	**-3,264**
Sustainable Value Margin		**0.17%**	**0.73%**	**-1.95%**	**-1.79%**	**-1.38%**	**-0.54%**	**-0.89%**	**-4.20%**	**-2.59%**

Figure 26: Value contributions, Sustainable Value and Sustainable Value Margin of Ford

Over the review period Ford's Sustainable Value ranges from -5.36 billion € (2006) to 1.34 billion € (2000). Ford's Sustainable Value drops heavily 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. While the company managed to produce positive Sustainable Value in 1999 and 2000, Ford lagged the industry average over the next seven years – quite significantly in some cases. The use of capital produced consistently negative value contributions. 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 is also down to the performance of corporate profits. In four of the nine years (2001, 2002, 2006, 2007) under review, Ford uses each single resource less efficiently than the industry on average.

Ford's Sustainable Value Margin ranges between -4.20% (2006) and 0.73% (2000). 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. This reflects in Ford's comparatively inefficient use of resources.

4.3.6 General Motors

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	9	11	14	15	15	14	16	15	16

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 1999-2007.

		1999	2000	2001	2002	2003	2004	2005	2006	2007
		Value contributions in million €								
Resources	Total assets		-2,882	-5,686	-9,833	-8,623	-9,758	-15,184	-5,056	-3,104
	CO_2-emissions	-6,266	-5,125	-5,478	-8,395	-6,882	-7,799	-13,763	-8,073	-8,636
	NO_x-emissions	-7,793	-7,667	-10,340	-14,254	-10,404	-11,409	-15,334	-14,261	-17,756
	SO_x-emissions	-12,929	-10,658	-12,737	-21,555	-15,881	-16,779	-20,796	-20,867	-28,427
	VOC-emissions	827	1,431	-1,901	-3,516	-1,985	-3,998	-10,965	-6,081	-7,370
	Total waste generated	-10,450	-9,365	-9,324	-13,080	-10,188	-10,670	-15,275	-9,984	-12,859
	Water use	-143	-670	-2,829	-4,911	-3,294	-4,773	-11,885	-6,924	-7,597
	No. of work accidents	4,588	5,890	1,871	1,422	2,965	1,497	-6,240	-1,392	738
	No. of employees	1,336	847	-2,157	-3,885	-2,196	-3,505	-10,820	-5,298	-3,855
Sustainable Value		-3,425	-3,133	-5,398	-8,667	-6,276	-7,466	-13,363	-8,659	-9,874
Sustainable Value Margin		-2.07%	-1.57%	-2.73%	-4.62%	-3.83%	-4.80%	-8.64%	-5.25%	-7.47%

Figure 27: Value contributions, Sustainable Value and Sustainable Value Margin of General Motors

General Motors reports a very 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 -3.43 billion € (1999) to -9.87 billion € (2007). In 2005 GM has by far the worst negative Sustainable Value within the industry in absolute terms with -13.36 billion €.. 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 1999-2007. The SO_x value contributions of General Motors range between -10.66 billion € (2000) and -28.43 billion € (2007), 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 -1.57% (2000) and -8.64% (2005). The latter value of -8.64% 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 2007, GM is ranked last of all manufacturers.

4.3.7 Honda

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	4	3	4	5	6	5	3	4	4

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 1999-2007. The indicators NO_x-emissions, SO_x-emissions and number of work accidents were not studied, due to the lack of available data.[7]

		1999	2000	2001	2002	2003	2004	2005	2006	2007
		Value contributions in million €								
Resources	Total assets	1,755	2,068	4,206	3,615	2,491	2,397	4,364	3,483	2,641
	CO_2-emissions	484	972	1,978	1,265	1,070	961	2,359	1,201	1,791
	NO_x-emissions									
	SO_x-emissions									
	VOC-emissions	-780	9	1,082	460	542	394	1,916	799	1,151
	Total waste generated		708	1,665	903	817	739	2,139	970	1,291
	Water use	349	799	1,859	1,092	891	732	2,154	1,017	1,517
	No. of work accidents									
	No. of employees	1,421	1,761	3,951	3,209	1,937	1,921	4,011	3,112	1,520
Sustainable Value		**359**	**702**	**1,638**	**1,172**	**861**	**794**	**1,883**	**1,176**	**1,101**
Sustainable Value Margin		**0.69%**	**1.43%**	**3.49%**	**2.43%**	**2.05%**	**1.78%**	**4.25%**	**2.38%**	**3.08%**

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

Honda created a positive Sustainable Value in every year of the review period. The company used all the resources considered more efficiently than its industry peer group. Honda's Sustainable Value increases from 359 million € (1999) to 1.88 billion € (2005), before dropping to 1.10 billion € in 2007. The Sustainable Value Margin rose accordingly, from 0.69% (1999) to 4.25% (2005), before dropping slightly towards the end of the review period with 3.08% in 2007.

In the Sustainable Value Margin table Honda ranks between 3rd (2000, 2005) and 6th place (2003), whereby it must be remembered that two of the companies ahead of Honda 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.

[7] 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 24.

4.3.8 Hyundai

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	n/a	n/a	3	4	5	8	6	7	7

The calculation of Hyundai's Sustainable Value is limited to the company's South Korean production facilities. No consolidated financial data are available for the years 1999 and 2000, so the analysis provided in this study is limited to the period 2001-2007. All nine resource indicators are 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 2001-2007.

		1999	2000	2001	2002	2003	2004	2005	2006	2007
					Value contributions in million €					
Resources	Total assets	n/a	n/a	1,710	1,235	717	329	487	-113	-499
	CO_2-emissions	n/a	n/a	1,685	1,238	740	259	500	246	218
	NO_x-emissions	n/a	n/a	2,353	2,242	1,859	1,431	1,554	1,584	1,975
	SO_x-emissions	n/a	n/a	2,377	2,210	1,587	1,176	1,311	1,473	1,954
	VOC-emissions	n/a	n/a	530	-345	-531	-361	88	523	-299
	Total waste generated	n/a	n/a	1,956	1,709	1,189	788	1,147	901	709
	Water use	n/a	n/a	1,466	1,039	488	-276	132	-330	-223
	No. of work accidents	n/a	n/a	2,206	1,657	482	-984	926	1,003	269
	No. of employees	n/a	n/a	1,718	1,391	958	480	776	786	770
Sustainable Value		**n/a**	**n/a**	**1,778**	**1,375**	**832**	**316**	**769**	**675**	**541**
Sustainable Value Margin		**n/a**	**n/a**	**5.23%**	**3.60%**	**2.44%**	**0.86%**	**1.72%**	**1.37%**	**1.08%**

Figure 29: Value contributions, Sustainable Value and Sustainable Value Margin of Hyundai

Hyundai achieves a positive Sustainable Value in all of the seven 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. In this year, Hyundai uses every single resource more efficiently than the industry on average, for the only time after 2001. In the last two years under review, the company created a moderately positive Sustainable Value of 675 million € (2006) and 541 million € (2007), with seven and six of its nine resources showing positive value contributions, respectively.

Despite the temporary decline in performance, Hyundai achieves consistently positive value contributions from the majority of its resources. Only in the case of total assets (2006-2007), VOC-emissions (2002-2004, 2007), water consumption (2004, 2006-2007) and number of work accidents (2004) does Hyundai dip below the benchmark and thus produce negative value contributions. The company's absolute Sustainable Value drops from 1.78 billion € (2001) to 316 million € (2004), and recovers again towards the end of the review period to 541 million €. Hyundai's Sustainable Value Margin subsequently drops from 5.23% (2001) to

0.86% (2004), and then rebounds to 1.08% (2007). Hyundai finishes consistently in the top half of the Sustainable Value Margin rankings, with positions between 3rd (2001) and 8th (2004).

4.3.9 Isuzu

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	14	12	9	11	3	3	5	3	5

The calculation of Isuzu's Sustainable Value is limited to the company's Japanese production facilities. Due to lack of available data, the resources NO_x-emissions, SO_x-emissions, number of work accidents and number of employees were either ignored or only studied in some years.[8] 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 1999-2007.

		1999	2000	2001	2002	2003	2004	2005	2006	2007
		Value contributions in million €								
Resources	Total assets	-1,040	-625	-103	-85	348	305	283	343	146
	CO_2-emissions	-657	-256	-45	-58	302	243	224	292	-40
	NO_x-emissions					440	383	343	355	174
	SO_x-emissions					479	418	360	370	237
	VOC-emissions	-766	-369	-45	-27	488	474	406	469	298
	Total waste generated	-714	-295	-112	-115	279	308	295	363	230
	Water use	-711	-347	-130	-174	228	149	140	184	-39
	No. of work accidents									
	No. of employees		-289	-97	-41	358	303	271	293	130
Sustainable Value		-432	-242	-59	-56	325	287	258	297	126
Sustainable Value Margin		-5.22%	-2.62%	-0.80%	-0.84%	4.53%	4.07%	3.60%	4.21%	1.86%

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

Isuzu achieves a negative Sustainable Value in four of the nine years studied; even so, the value follows a positive pattern. In 2003 Isuzu created a positive Sustainable Value for the first time (325 million €). 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 negative territory. 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 -5.22% (1999) to 4.53% (2003). However, it subsequently retreated slightly to 4.21% (2006), before suffering a sharp decline to 1.86% in 2007.

[8] 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 24.

Nevertheless, in terms of the Sustainable Value Margin rankings, this results in a rise from 14th place (1999) to 5th place (2007) – the best improvement by any manufacturer within this study.

4.3.10 Mitsubishi

MITSUBISHI MOTORS

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	12	14	10	10	14	16	14	13	8

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[9] 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
		Value contributions in million €								
Resources	Total assets	-835	-1,409	-287	-4	-142	-834	-287	-266	203
	CO_2-emissions	-612	-1,166	-119	-39	-162	-832	-324	-265	109
	NO_x-emissions	-318	-950	-142	6	-141	-774	-220	-150	336
	SO_x-emissions	-45	-677	132	294	80	-615	-135	-91	423
	VOC-emissions	-1,599		-731	-839	-866	-1,347	-602	-502	-248
	Total waste generated	-559	-1,076	-109	27	-174	-807	-316	-230	84
	Water use	-979	-1,552	-435	-354	-472	-1,179	-578	-537	-276
	No. of work accidents									
	No. of employees	-500	-1,097	-74	38	-119	-785	-271	-225	238
Sustainable Value		-605	-1,099	-196	-97	-222	-797	-304	-252	97
Sustainable Value Margin		-2.86%	-5.03%	-0.92%	-0.75%	-2.34%	-8.56%	-3.09%	-2.72%	0.75%

Figure 31: Value contributions, Sustainable Value and Sustainable Value Margin of Mitsubishi Motors

Mitsubishi's Sustainable Value is consistently negative. The minimum value is -1.10 billion € (2000) and the maximum 97 million € (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 -2.86% (1999) to -5.03% (2000), but then recovers to -0.75% (2002). Towards the end of the review period the Sustainable Value Margin tumbles heavily to -8.56% (2004), and then recovers to 0.75% in 2007. 2007 is the first year in which Mitsubishi achieves a positive Sustainable Value Margin. Mitsubishi generally ranks between 8th and 16th place in the Sustainable Value Margin table. In 2000 and 2004 it came last.

[9] 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.

4.3.11 Nissan

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	n/a	n/a	n/a	3	4	4	4	5	10

The analysis of Nissan's Sustainable Value encompasses the company's entire global activities. However, meaningful environmental data are only available for Nissan for the period 2002-2007. 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.[10] SO_x-emissions could not be considered for the years 2006 and 2007 due to the lack of data availability.

		1999	2000	2001	2002	2003	2004	2005	2006	2007
		Value contributions in million €								
Resources	Total assets	n/a	n/a	n/a	4,100	4,299	4,008	4,246	2,917	1,821
	CO_2-emissions	n/a	n/a	n/a	3,531	3,391	3,207	3,774	2,642	1,240
	NO_x-emissions	n/a	n/a	n/a						
	SO_x-emissions	n/a	n/a	n/a	2,039	1,383	1,087	1,779		
	VOC-emissions	n/a	n/a	n/a	1,961	1,417	1,312	1,952	1,091	441
	Total waste generated	n/a	n/a	n/a	-11	814	-271	1,323	962	-2,944
	Water use	n/a	n/a	n/a	1,912	1,447	1,131	2,201	1,394	-1,326
	No. of work accidents	n/a	n/a	n/a						
	No. of employees	n/a	n/a	n/a	3,590	3,785	4,108	3,420	2,319	50
Sustainable Value		**n/a**	**n/a**	**n/a**	**1,902**	**1,837**	**1,620**	**2,077**	**1,258**	**-80**
Sustainable Value Margin		**n/a**	**n/a**	**n/a**	**3.83%**	**3.69%**	**3.04%**	**3.72%**	**2.02%**	**-0.03%**

Figure 32: 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 1.26 billion € (2006) and 2.08 billion € (2005). In 2007, Nissan's Sustainable Value is negative for the first time with -80 million €. All of the resources considered except total waste generated and water use are used more efficiently than the industry average. 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 3.04% (2004) and 3.83% (2002). In the last two years of the review period, Nissan's Sustainable Value Margin suffers a decline, finishing in the red with a value of -0.03%. In the Sustainable Value Margin rankings this equates to positions between 3rd place (2002) and 10th place (2007).

[10] 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.

4.3.12 PSA

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	11	10	7	9	9	11	9	11	12

The calculation of PSA's Sustainable Value is based on the company's global activities. In the years 1999-2001 all the environmental indicators refer to the PCA division. In the years 2002 to 2007 the figures for VOC-emissions refer to the PCA division. Figure 33 provides an overview of the value contributions of the individual resources, the Sustainable Value and the Sustainable Value Margin of PSA.

		1999	2000	2001	2002	2003	2004	2005	2006	2007
		Value contributions in million €								
Resources	Total assets	-283	472	1,263	1,075	316	190	189	-770	-1,117
	CO_2-emissions	238	778	1,423	1,506	1,161	1,258	1,209	464	739
	NO_x-emissions	-64	481	845	1,389	711	776	1,020	97	269
	SO_x-emissions	-2,187	-454	-509	84	-403	586	975	382	1,283
	VOC-emissions	-1,635	-1,375	-395	-1,017	-1,640	-1,698	-1,044	-1,394	-1,693
	Total waste generated	-605	-362	402	864	338	269	383	-221	-704
	Water use	-1,827	-1,489	-325	-194	-1,165	-1,318	-679	-772	-925
	No. of work accidents		-357	710	-986	-750	-1,020	750	339	-558
	No. of employees	-1,686	-1,328	-266	-982	-1,732	-1,947	-1,367	-2,131	-2,727
Sustainable Value		**-894**	**-404**	**350**	**193**	**-352**	**-323**	**159**	**-445**	**-604**
Sustainable Value Margin		**-2.64%**	**-1.02%**	**0.75%**	**0.48%**	**-0.70%**	**-0.65%**	**0.23%**	**-0.86%**	**-1.08%**

Figure 33: Value contributions, Sustainable Value and Sustainable Value Margin of PSA

During the reporting period, PSA's Sustainable Value lies between -894 million € (1999) and 350 million € (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 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 in permanently negative value contributions.

With values ranging between -2.64% (1999) and 0.75% (2001), PSA commonly positioned in the bottom half the Sustainable Value Margin rankings, positioned in 11th place (out of 14 companies) in 1999 and finishing in 12th place (out of 16) in 2007.

4.3.13 Renault

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	7	8	13	12	12	6	12	9	13

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 1999-2007. 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
		Value contributions in million €								
Resources	Total assets	83	197	-784	-264	-485	410	-409	-818	-1,482
	CO_2-emissions	1,547	1,417	66	875	765	1,778	798	594	656
	NO_x-emissions					201	1,274	573	161	119
	SO_x-emissions					-137	1,237	612	535	865
	VOC-emissions	-599	-465	-1,487	-1,197	-1,058	-12	-539	-587	-1,421
	Total waste generated	-1,277	-1,182	-1,938	-1,712	-1,758	-515	-1,271	-1,597	-2,811
	Water use	-553	-533	-1,286	-1,085	-1,210	-146	-695	-544	-877
	No. of work accidents	-302	104	-331	-222	126	1,023	683	555	-23
	No. of employees	-1,029	-1,301	-1,656	-1,113	-1,167	-184	-685	-915	-1,451
Sustainable Value		-237	-196	-824	-524	-525	541	-104	-291	-714
Sustainable Value Margin		-0.63%	-0.49%	-2.27%	-1.44%	-1.40%	1.33%	-0.25%	-0.70%	-1.75%

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

Renault only managed to generate positive Sustainable Value in 2004, with a figure of 541 million €. In the years 1999 to 2003 the company's Sustainable Value is consistently negative, ranging between -824 million € (2001) and -196 million € (2000). In the final three years of the review period Renault's Sustainable Value is also just in the red. The value contributions from the indicators VOC-emissions, waste generation, water use and number of employees are consistently negative. Only CO_2-emissions provide positive value contributions over the entire period.

With a Sustainable Value Margin of between -2.27% (2001) and 1.33% (2004) Renault's ranking in the Sustainable Value Margin table is between 13th in the years 2001 and 2007, and 6th in 2004.

4.3.14 Suzuki

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	6	5	6	8	7	9	8	8	11

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.[11]

[11] 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
		Value contributions in million €								
Resources	Total assets	83	170	275	261	306	275	267	276	243
	CO_2-emissions	4	113	245	169	200	162	160	184	78
	NO_x-emissions			306	252	298	308	325	350	356
	SO_x-emissions			361	320	354	353	315	326	312
	VOC-emissions	-682	-393	-70	-401	-253	-368	-253	-392	-921
	Total waste generated									
	Water use	-136	-94	36	-102	-94	-178	-98	-99	-372
	No. of work accidents									
	No. of employees	110	155	248	207	231	212	216	254	163
Sustainable Value		-69	-5	156	78	116	85	104	100	-16
Sustainable Value Margin		-0.57%	-0.04%	1.20%	0.62%	1.00%	0.71%	0.78%	0.72%	-0.12%

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

Over the review period Suzuki's Sustainable Value improved from -69 million € (1999) to -16 million € (2007). After rising to 156 million € (2001) in the first half of the review period, the Sustainable Value has been relatively steady in subsequent years. One point worth noting is that the only negative value contributions came from VOC-emissions, and also from water consumption (except for 2001). Otherwise value contributions were generally positive for all the remaining indicators.

With a Sustainable Value Margin between -0.57% (1999) and 1.20% (2001), Suzuki is ranked in the top of the mid-field between 1999 and 2006. In 2007, the company is ranked 11th which is the company's worst position in the nine years under review.

4.3.15 Tata

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9

The calculation of Tata's Sustainable Value is limited to the year 2007, and includes that company's use of capital, CO_2-emissions, water use and number of employees. Figure 36 shows the value contributions of these resources considered as well as the Sustainable Value and Sustainable Value Margin of Tata for 2007.

		1999	2000	2001	2002	2003	2004	2005	2006	2007
		Value contributions in million €								
Resources	Total assets	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	414
	CO_2-emissions	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-4
	NO_x-emissions	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	SO_x-emissions	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	VOC-emissions	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	Total waste generated	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	Water use	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-377
	No. of work accidents	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	No. of employees	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	172
Sustainable Value		**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**23**
Sustainable Value Margin		**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**0.32%**

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

In the only year considered, Tata uses its resources slightly more efficiently than the sector on average. Despite the comparatively low number of indicators, the analysis provides interesting insight into Tata's performance. Tata used the resources total assets and number of employees more efficiently than the 16 "Northern" manufacturers on average. CO_2-emissions are used in a moderately inefficient way when compared to Tata's market peers. In contrast, water use is clearly inefficient in 2007, with a negative value contribution of -377 million €.

Consequently, Tata's Sustainable Value Margin ranges slightly above the industry average in 2007 with a value of 0.32%. This corresponds to ninth position in the ranking of Sustainable Value margins in this year.

4.3.16 Toyota

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	3	2	2	2	1	2	2	1	2

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, CO_2-emissions and water consumption in 1999). Where available, data was collated for the group's global activities (use of capital, number of employees as well as CO_2-emissions and water consumption for the period 2000-2007). The number of work accidents is not taken into consideration.[12] 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 1999-2007.

[12] 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
		Value contributions in million €								
Resources	Total assets	-461	1,920	5,510	5,043	7,186	6,441	8,355	8,982	5,695
	CO_2-emissions	2,391	2,100	6,109	5,308	7,179	6,801	8,993	10,000	5,042
	NO_x-emissions		3,895	5,588	5,431	4,876	3,865	5,077	6,579	5,222
	SO_x-emissions	3,543	4,316	6,049	6,070	5,355	4,255	5,561	7,225	6,530
	VOC-emissions	516	1,566	4,193	4,032	3,563	2,728	4,440	6,121	4,365
	Total waste generated	2,125	2,990	5,175	5,159	4,515	3,367	4,685	6,232	4,674
	Water use	2,037	4,142	7,256	6,856	8,823	8,611	10,373	11,527	8,593
	No. of work accidents									
	No. of employees	1,792	3,551	6,146	5,330	7,367	7,076	9,098	10,328	7,237
Sustainable Value		**1,327**	**2,720**	**5,114**	**4,803**	**5,429**	**4,794**	**6,287**	**7,444**	**5,262**
Sustainable Value Margin		**1.97%**	**2.80%**	**5.28%**	**5.14%**	**5.62%**	**4.66%**	**5.65%**	**6.61%**	**4.91%**

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 1.33 billion € (1999) and 7.44 billion € (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 across the entire review period. The highest absolute value contribution comes from the resource water consumption (up to 11.53 billion €, 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. Generally Toyota's SVM of between 1.97% (1999) and 6.61% (2006) place it in the top three over the entire observation period. In 2007, Toyota's Sustainable Value Margin drops slightly to 4.91%, amounting to second position in the ranking of manufacturers.

4.3.17 Volkswagen

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rank SVM	8	7	5	6	13	13	11	10	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 2002-2007. Adequate data for considering CO_2-emissions, VOC-emissions, waste generation and water consumption are available for the years 2001 to 2007. 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 1999-2007.

		1999	2000	2001	2002	2003	2004	2005	2006	2007
		Value contributions in million €								
Resources	Total assets	-329	773	2,806	1,187	-2,076	-2,563	-577	-1,728	105
	CO_2-emissions			1,854	125	-3,201	-3,438	-1,464	-2,187	-654
	NO_x-emissions				558	-1,757	-1,813	404	-1,355	384
	SO_x-emissions				2,881	-265	641	1,810	1,378	4,643
	VOC-emissions			2,507	961	-1,918	-1,994	280	-402	1,816
	Total waste generated			4,196	3,325	-15	53	1,676	940	4,126
	Water use			2,147	502	-2,466	-2,781	-643	-1,296	627
	No. of work accidents	-1,007	-720	1,348	358	-2,085	-2,636	811	737	2,674
	No. of employees	-3,145	-2,106	756	-1,250	-4,403	-4,779	-2,679	-2,977	-945
Sustainable Value		**-498**	**-228**	**1,735**	**961**	**-2,021**	**-2,146**	**-42**	**-766**	**1,420**
Sustainable Value Margin		**-0.79%**	**-0.36%**	**1.96%**	**1.11%**	**-2.32%**	**-2.41%**	**-0.04%**	**-0.73%**	**1.30%**

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 -498 million € (1999) to roughly 1.74 billion € (2001), but then falls back again to -2.15 billion € by 2004. Subsequently, it recovers up to 1.42 billion € in 2007. The individual indicators for which data are available over the full review period basically follow a similar pattern. Clearly positive value contributions come from the use of capital (2001), waste generation (2001, 2002), water consumption (2001) and SO_x-emissions (2007), while clearly negative value contributions are provided by CO_2-emissions (2003, 2004) and the number of employees (1999, 2003, 2004). In six of the nine years studied, the company's negative Sustainable Value reflects the fact that it uses 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 1.96% (2001) and then sinks back to -2.41% (2004), but finishing the review period above the industry average at 1.30%. In terms of Sustainable Value Margin, the company ranks between 13th (2003, 2004) and 5th position (2001).

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 updated study considered new performance data 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 nine-year period, from 1999 to 2007.

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. Both companies create extremely positive Sustainable Value over the entire review period, and use all the 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 7.1% in 2001 and Toyota 6.6% in 2006. 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 in 2004 and 2005. Ford's performance has deteriorated sharply within the review period. General Motors is consistently in negative territory. It always has the worst negative Sustainable Value in absolute terms, while in the Sustainable Value Margin rankings it finishes every year in the bottom third of all companies studied. Volkswagen only generates a positive Sustainable Value in 2001, 2002 and 2007, and finishes in mid-field in the latter half of the review period.

The group of medium-sized manufacturers (with an annual production of over one million vehicles in 2007) includes not just the BMW Group, but PSA, Nissan, Honda, Hyundai, Renault, FIAT Auto, Suzuki, Mitsubishi, and Daimler AG in the year 2007 [25]. Apart from the

BMW Group, the only companies that managed to consistently achieve positive Sustainable Value were Hyundai, Nissan, Honda and Suzuki (with the exceptions of 2007 in the case of Nissan and 1999 in the case of Suzuki). A comparison of the Sustainable Value Margin shows these companies experienced a gradual downtrend in 2004, partly based on a comparatively high starting point, however (Nissan, Hyundai). There was a slight recovery in 2005, with the exception of Renault. In the group of medium-sized manufacturers, it is interesting to note that only the BMW Group and Asian producers were able to consistently generate positive Sustainable Value. Out of the European manufacturers in this group, only PSA showed a relatively consistent performance overall, generally ranking in mid-field and creating a positive Sustainable Value in three of the nine years under review. During the review period, Renault only achieves a positive Sustainable Value in the year 2004, and overall drops from 7th position in 1999 to 13th position in 2007. FIAT Auto consistently achieves a negative Sustainable Value and comes last (by a long chalk in some cases) in the Sustainable Value Margin rankings during the period 2001-2003.

Daihatsu and Isuzu have an annual production of up to approximately 1 million vehicles in 2007, making then the two smallest manufacturers examined in this study [25]. 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 1.9% in 2007. Daihatsu, by contrast, revolves around the industry average with a Sustainable Value Margin ranging between -2.4% in 2002 and 0.6% in 2001. In this update we considered Tata for the first time. With a Sustainable Value Margin of about 0.3% this company shows a market average performance.

If we compare the creation of Sustainable Value between the regions Europe, North America and Asia, the prominence of Asian manufacturers is very noticeable, with far more of them reporting a positive Sustainable Value. Compared with them, both the North American automobile groups 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, DaimlerChrysler, PSA, Renault and Volkswagen manage to do this in at least some of the years during the period studied. 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. 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 update, reinforcing the view that the quality of sustainability reporting has still been mixed at best in 2006 and 2007.

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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