SARASIN

Background Paper

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The Sarasin Industry Rating

Methodology and results of sector sustainability analysis

Sustainable Investment

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Summary

Basic concept of the Sarasin Sustainability Rating

Companies are confronted with environmental and social risks which can ultimately affect their commercial performance. These risks are closely linked to the production and use of products and services, so in the first place they are industry-specific. In the second place, what matters is how the individual company deals with these industry-specific risks. In its sustainability assessment of companies, Sarasin combines these two aspects into a two-dimensional sustainability rating, consisting of an industry rating and a company rating. The rating determines whether a company is a suitable investment for Sarasin's sustainable investment funds and portfolios.

Industry rating methodology

The industry rating measures the environmental and social impacts specific to the industry. This concerns not only the direct effects of producing the products and services, but also indirect influences along the product chain, from the production of raw and input materials to the use of the products. Four main criteria are applied, namely resource consumption (energy, water) and emissions (air, water, waste) in the environmental domain, plus "internal" (workplace) and "external" (society as a whole) conflict potential in the social domain.

Results of the industry rating

Industries with higher risks (and hence below-average sustainability ratings) include the primary industries (chemicals, energy, energy utilities, metal production, mining, paper, cement) in view of their substantial direct impact on the environment; sectors where consumption of the product has a large impact on the environment (automotive, construction, consumer electronics); sectors with significant direct environmental and social risks and/or interlinking with other industries (automotive parts, mechanical engineering, food, transport); and the pharmaceutical industry where the risks are primarily in the social sphere. Industries with lower risks (and consequently above-average sustainability ratings) include service sectors with relatively low direct environmental and social impact and/or relatively little interlinking with other industries (media, software, telecommunications, insurance), and those with direct environmental and social benefits (renewable energies, healthcare services, environmental technology, water utilities).

Relevance for share performance

It is precisely because of the higher risks that companies in less sustainable industries can reap particularly large economic benefits by engaging in "sustainable practices". For example, companies in energy-intensive primary industries can cut their costs substantially by increasing their energy efficiency. Therefore in the more critical industries, companies with above-average sustainability ratings will tend to deliver above-average share performance. This is confirmed by case studies from the Sarasin research universe and by the findings of other research organisations.

The industry rating: The key element of the sustainability rating

Sarasin Sustainability Matrix®

In sustainable investment, the environmental and social analysis of companies is a key decision-making tool, used in addition to financial analysis. It is based on an analytical method developed by Sarasin. It incorporates two dimensions which are combined in the Sarasin Sustainability Matrix®:

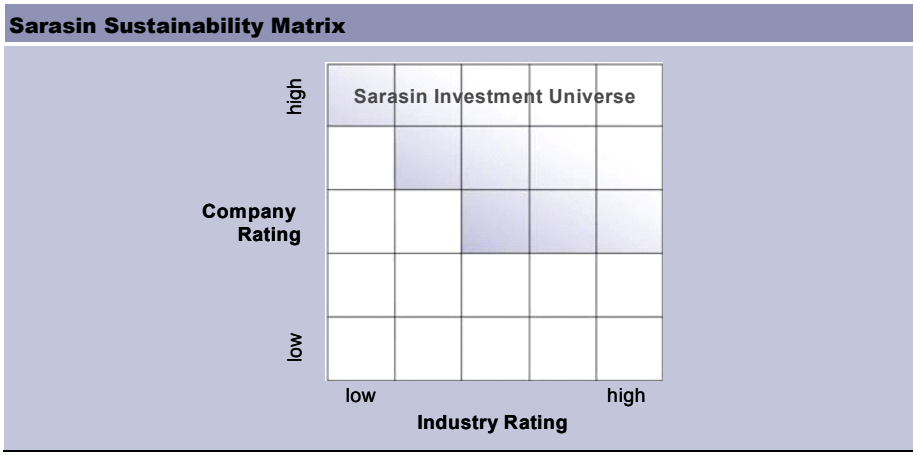
- **Industry rating:** Comparative assessment of industries using selected environmental and social criteria,
- **Company rating:** Comparative environmental and social analysis of companies within their sector.

This methodology is based on the notion that companies are confronted with certain environmental and social risks which are essentially determined by their products and hence by the sector to which they belong. This aspect is measured by the industry rating. The company rating then assesses how the company in question deals with these industry-specific environmental and social risks and takes advantage of the corresponding opportunities. Sarasin has developed a detailed criteria matrix which evaluates a company by comparison with the industry average.

Sustainability rating determines eligibility for investment

Only the companies positioned in the Sarasin investment universe (shaded) qualify for Sarasin sustainability funds.

Sarasin Sustainability Matrix



Source: Bank Sarasin

The role of the industry rating

The environmental and social rating of industries determines the threshold of eligibility for investment: The lower the sustainability of the industry, the higher are the demands that companies must meet in order to qualify. In industries with a "low" sustainability rating – that is to say, with high environmental and social risks – only those companies with a "high" company rating will qualify. In industries with high sustainability and low risks, an "average" company rating is sufficient.

Objective: Overview of methodology and results of the industry rating

This paper provides an overview of the principles, methodology and results of the industry rating and also discusses the effects on the financial performance of companies.

Industry rating methodology

Basic philosophy

Sustainable development

The concept of sustainable development holds that economic growth must take place within certain natural and social boundaries. Companies, industries and the economy as a whole operate within society and the natural environment and interact with them. “Sustainable development” guarantees the long-term stability of society and the natural environment.

Harm caused to the stability of the environment and society will eventually have repercussions for the stability of the economic system – for example due to shortages of natural resources, social conflict and labour unrest. These repercussions will be felt throughout the global economic system, down to the level of individual companies.

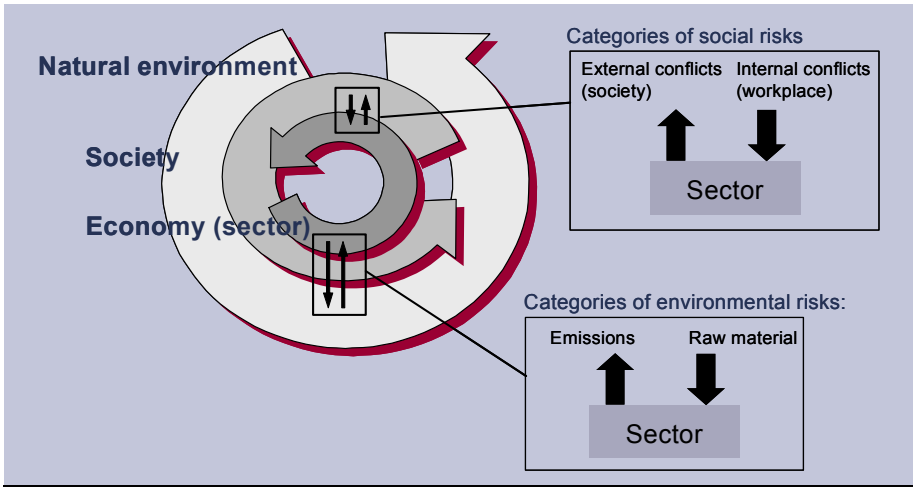
Environmental and social risks show “non-sustainability”

Current global economic development fails in many respects to meet the requirement of sustainability. This manifests itself in various environmental and social risks at the “interfaces” between the economic system and society on the one hand, and the economic system and the environment on the other (see diagram):

- Environmental risks: On the “input side”, the economy relies on natural resources (oil, gas, ore, timber etc.) to keep industrial production going. However, the availability of natural resources is limited. Energy supplies, for example, are largely based on non-renewable resources (oil, natural gas, coal) with limited reserves. On the “output side”, pollutants (air and water emissions, waste) endanger the stability of our environment, resulting for example in the climate change caused by carbon dioxide and other greenhouse gases.

- Social risks: On the “input side”, the economy relies on having well-trained, motivated and fit workers. Economic development generates potential conflicts (“internal conflict potential”), through downsizing of workforces in certain industrialised countries and inadequate working conditions (low wages, long working hours, occupational accidents and illnesses etc.) in some emerging economies in the wake of globalisation. On the “output side”, the economy impacts on society as a whole due to “external conflict potential”, through health risks caused by products and production methods, concentration of economic power, corruption and ethical conflicts (for example in the case of genetic engineering).

Environmental and social risks



Source: Bank Sarasin

Industry rating based on risk approach

Economic development will be more sustainable if these risks for the environment and society are reduced; rising risks indicate the opposite.

Individual companies, as building blocks of the economic system, are linked to these risks to a varying degree. A company's exposure to risk largely depends on its product range and therefore the industry to which it belongs. For example, the chemical industry has a high risk potential, being one of the largest consumers of natural resources (oil and natural gas for energy production and as raw materials for plastics and other products) and generates many substances harmful to health and the environment. On the other hand, the environmental and social impact of an industry such as telecommunications is comparatively small (leaving aside the controversial issues of 'electrosmog' and workforce downsizing).

The industry rating measures these industry-specific risks (see 2.3 below), in other words it is based on a risk approach:

The smaller the environmental and social risks of an industry, the more sustainable it is and the higher its sustainability rating. The greater the risks of an industry, the lower its sustainability rating.

Lifecycle and product chain approach

Industry risks arise from the risks of the products

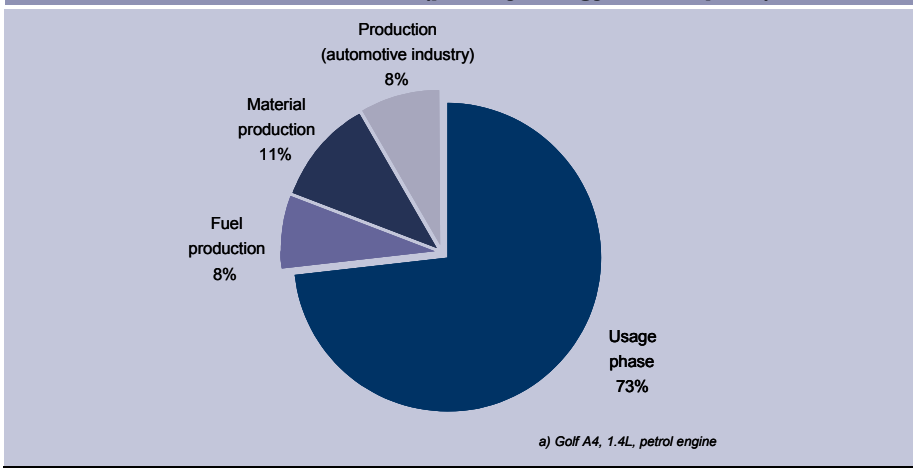
The industry-specific environmental and social risks of companies therefore result from the specific risks linked to the products of the industry.

Assessment of product risks requires a lifecycle analysis

To assess these risks, it is necessary to analyse not only the direct environmental and social impacts of producing the products in question, but also the indirect effects arising from the production of the raw and input materials used in manufacturing the products and resulting from the use of the products. These indirect effects are often more significant than the direct impacts caused during production. For example, approximately 80% of the energy consumption associ-

ated with the automotive industry is caused during use (fuel consumption and fuel production), and less than 10% during manufacture of vehicles (see chart).

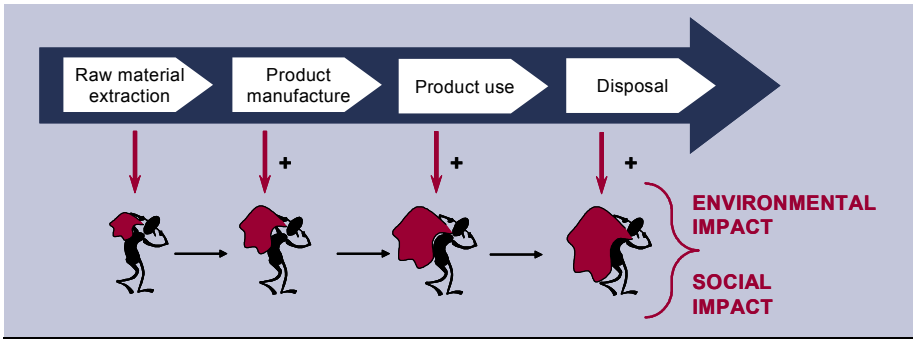
Environmental audit of a VW Golf [a] (primary energy consumption)



Source: Volkswagen 2000

The concept of 'product lifecycle' or 'product chain' is useful in assessing the direct and indirect environmental and social impacts (see chart): From the extraction of raw materials (e.g. metal ores in the case of the automotive industry), to the production of materials, intermediate products and components (steel, tyres etc.), to the manufacture of the vehicle itself, the use of the vehicle and finally its disposal (scrapping etc.) at the end of its life, environmental and social impacts will occur. The overall environmental (and social) impact of a product results from the summation of these effects.

Product lifecycle



Source: Bank Sarasin

The lifecycle approach considers the environmental and social risks of an industry in the context of its links to other industries. Consequently the question of individual polluters becomes less relevant: If, for example, we look at the environmental impact of road haulage (diesel consumption, air pollutant emissions, noise, land use), we can identify the hauliers who operate the lorries, the lorry manufacturers or the hauliers' clients who generate the transport demand in the first place as polluters. From the risk point of view though, it is ultimately the product chain as a whole which is important, because each of these players contributes to the environmental and social risks and is affected by the possible consequences: For example, the vehicle manufacturers have to fulfil environmental obligations (such as emission limits requiring engine modifications or the

installation of filter systems) based on the principle of product responsibility (enshrined in the environmental policy of the EU); hauliers may be faced with taxes or regulations designed to make road freight less attractive compared with rail (such as road tolls, higher taxes on fuels or vehicles); and for the clients these measures will lead to higher transport costs overall.

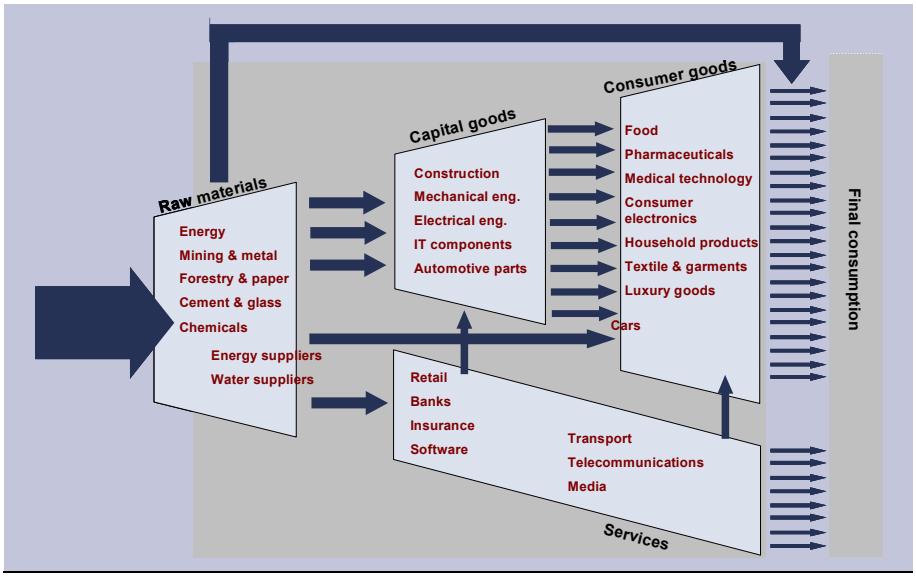
Product chains in the economy as a whole

Based on these considerations, the environmental and social risks of an industry arise from the environmental and social effects of their product chains (as a whole).

Within the economy as a whole, product chains follow the general pattern illustrated below (see chart):

- At the start of the chains are the raw material sectors (energy, mining, chemicals etc.) which supply the materials and energy for manufacturing consumer goods and capital goods and, to a lesser extent, for the service sectors.
- At the end of the chains is the final consumption (households, public sector, investment, export), which in turn generates material flows (particularly energy consumption of heating systems and electrical equipment).

Pattern of material flows through the economy



Source: Bank Sarasin

The environmental impacts within the economy are closely linked to the material flows through the economy (see chart). The material flows are concentrated at the start of the product chains. The direct environmental impacts of the raw material sectors are correspondingly large. As they progress “downstream”, the material flows increasingly branch out so that the direct environmental impacts of individual sectors are reduced.

For the social impacts, on the other hand, the interrelationships are different. The effects do not correlate with the size of the material flows.

The environmental and social risks of the individual sectors are rated according to the environmental and social impacts of the product chains of which they form part. A brief account of the method can be found in the annex.

Environmental and social criteria

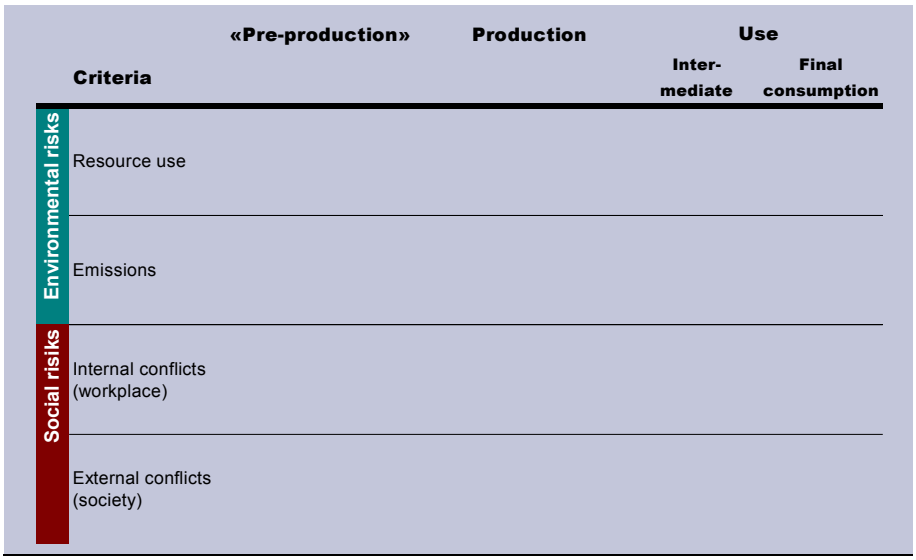
Four environmental and social criteria

In accordance with the basic philosophy outlined in 2.1, when analysing the environmental and social risks we consider two main environmental criteria and two social criteria (see table):

- Use of natural resources (particularly fossil fuels, i.e. oil, gas, coal)
- Emissions (air pollutants, waste)
- Internal conflicts (impact on employees)
- External conflicts (impact on society generally)

The whole product lifecycle, from the upstream production stages (pre-production), through the production processes, to the use of the products (both intermediate – i.e. in other sectors – and final consumption) is taken into account (as described in 2.2).

Environmental and social criteria for the industry rating



Source: Bank Sarasin

All four main criteria contribute equally (25% each) to the overall rating of the industries. We measure the criteria with the indicators listed in the following table.

Indicators for the industry rating

	Criteria	Sub-criteria	Indicators	Weight
Environmental risks	Resource use	Energy consumption	Energy consumption per sector and final consumption (households, cars)	18%
		Water consumption	Water consumption per sector [b)]	7%
	Emissions	Toxic wastes and emissions	Total quantities of waste and toxic emissions (industry) [c)]	8%
		Mass air pollutants (not energy-related)	Nitrous oxide (NO_x-)Emissions [d)] Hydrocarbon- (VOC-)Emissions [d)]	16%
Social risiks	Internal conflicts (workplace)	Health risks	Frequency of occupational accidents [e)]	10%
		Wealth contribution	Wage level [f)] Employment fluctuations [g)]	10%
		Workers' rights	Prevalence of child labour and forced labour [h)]	5%
	External conflicts (society)	Health risks	Incidents (industrial) [c)] Products harmful to health and accidents during use of product [i)]	5%
		Economic and political power	Degree of concentration of the industry [j)] Lobbying expenditure [k)]	5%
		Contribution to international/ intercultural conflicts	Activity in producer countries with low social and political standards [i)] Production of armaments [l)]	8%
		Contribution to ethical controversies	Corruption [m)] Ethically controversial products and production methods [i)]	8%

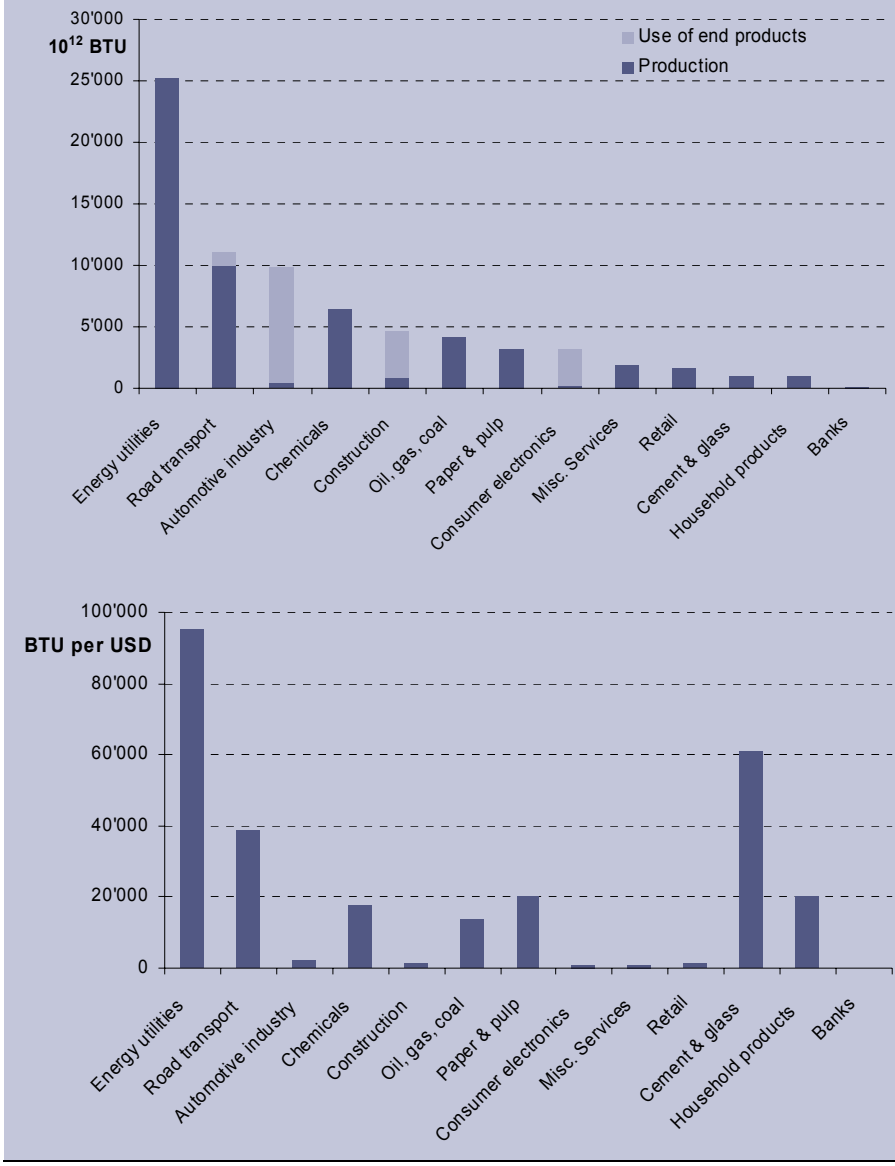
Source: Bank Sarasin
Underlying data (supplemented by our own estimates):
a) Data for USA (source: IEA and EIA for 2001 and 1998)
b) Data for USA (source: OECD)
c) Data for USA (source: US-EPA, Toxic Release Inventory 2002)
d) Data for USA (source: US-EPA 2002)
e) Data for EU (source: EuroStat 2001)
f) Data for USA (source: OECD 1995-2000)
g) Data for USA (source: OECD 1980-2000)
h) Worldwide data (source: own estimates based on ILO 1997)
i) Own qualitative estimate
j) Worldwide data (source: Morgan Stanley/MSCI indices for 2005)
k) Data for USA (source: www.opensecrets.org 2000 - 2004)
l) Data for USA (source US Department of Commerce 1997)
m) Worldwide data (source: Transparency International 2002)

Both quantitative and qualitative indicators are used here. The quantitative indicators are based mainly on US data. Our rating is based not only on “absolute” data (for example the absolute level of energy consumption of a sector), but also on “specific” data which is standardised relative to the size of the sector (e.g. energy consumption per unit of production value – corresponding to the energy intensity).

Resource use

Resource use is measured using the indicators of energy consumption and water consumption. Energy consumption is doubly relevant in environmental terms, firstly in view of the limited availability of fossil energy resources and secondly as the main cause of climate change. It therefore has a higher weighting. The industries with the highest direct energy consumption (in absolute terms) during production are energy utilities (mainly conversion losses during power generation), road transport, the chemical industry, the paper and pulp industry and the oil and gas sector (refineries and pipeline transport). The automotive and consumer electronics industries have to be added if one includes energy consumed during use of the end products. Relevant sectors in terms of specific energy consumption (see chart below) also include the cement and glass industry and production of household products (detergents etc.).

Absolute and specific energy consumption of selected industries (USA 1997)



Source: International Energy Agency and Energy Information Agency (USA), supplemented by Sarasin estimates

In terms of water consumed during production, agriculture is by far the largest consumer. Among the manufacturing industries, the chemical industry, mining and metal production, pharmaceuticals and the paper industry are the largest water consumers.

Emissions

This criterion measures the generation of waste, toxic emissions and emissions of "mass air pollutants". In terms of toxic emissions and wastes, the mining and metal industry, energy utilities, chemicals, pharmaceuticals, the paper industry and waste disposal are the industries with the greatest impact.

The precursor substances leading to the formation of summer smog, namely volatile organic compounds (VOC) and nitrous oxides (NO_x), are used as indicators of air pollutants. The largest NO_x emitters are transport, energy utilities, chemicals and the cement and glass industry. The automotive industry (passen-

ger transport) has to be added if one includes NO_x emissions during use of the end products. The greatest VOC emitters are transport, the oil and gas industry and construction. The automotive industry (passenger transport) and producers of household products (products containing solvents) have to be added if one includes VOC emissions during use of the end products.

Energy-related emissions, particularly of the greenhouse gas carbon dioxide (CO_2), are included within the criterion of energy consumption (see previous page).

Internal conflicts

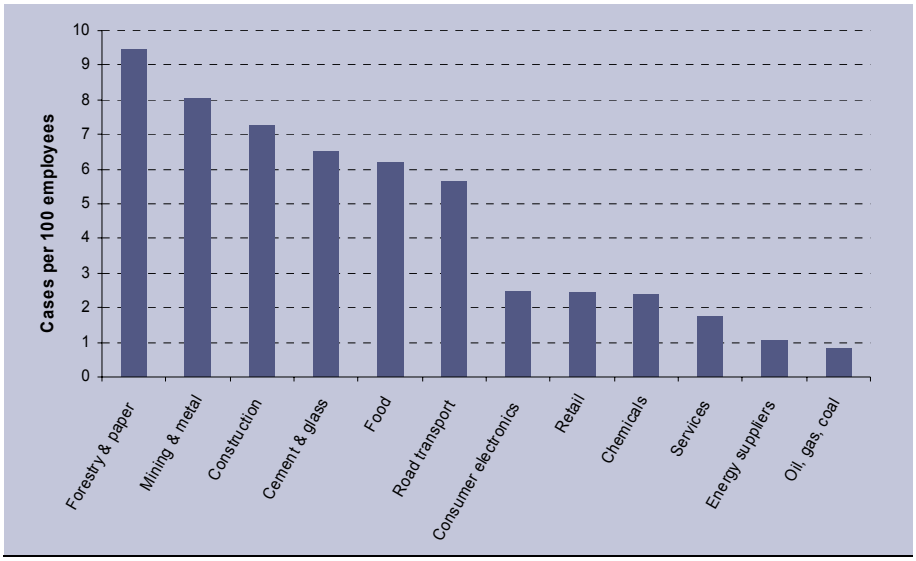
As indicators of conflict potential in the workplace, we use the wealth contribution (wage level, stability of employment), health risks and observance of workers' basic rights in the individual industries.

In terms of wealth contribution, the agricultural sector, the textile and garments industry, retail, the furniture industry, hotels and catering, the aerospace industry and the energy sector have major disadvantages (low wage levels and/or major fluctuations in employment).

With regard to observance of workers' basic rights (measured on the basis of the prevalence of child labour and forced labour worldwide), the agricultural sector is the most heavily exposed.

Severe health risks (measured on the basis of the frequency of occupational accidents) exist in the wood and paper industry, in mining and metal, construction, cement and glass and in the transport industry (see chart):

Frequency of occupational accidents (EU 2002)



Source: EuroStat

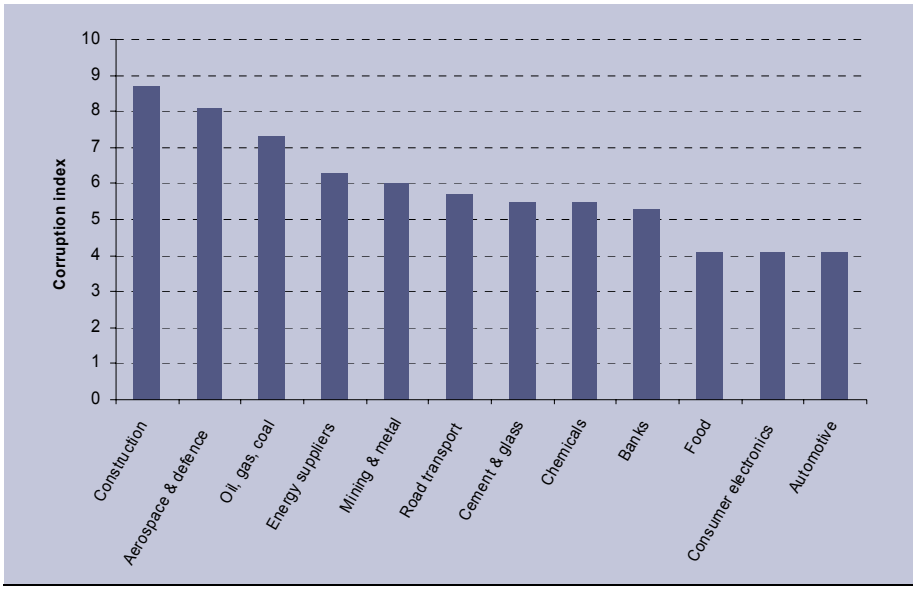
External conflicts

Potential sources of conflict resulting from the effects of the industries on society as a whole include health risks, economic and political power structures, the contribution to international or intercultural conflicts and, lastly, ethically controversial business practices and activities.

An important indicator in terms of business ethics is the prevalence of corruption. According to studies by Transparency International, the construction industry,

the aerospace and defence industry, the energy sector and the mining and metal industry are particularly affected by this problem.

Corruption in selected industries (worldwide)



Source: Transparency International

To determine the health risks, we measure the release of pollutants in case of incidents (US data). The sectors with the greatest risks in this respect are the oil, gas and coal industry, mining and metal, chemicals, paper, cement and glass and the pharmaceutical industry.

In relation to the criterion of economic and political power structures (lobbying and concentration of companies), the pharmaceutical industry, cement & glass, aerospace and defence and the airlines are the most heavily exposed.

Regarding the contribution to (or exacerbation of) international and intercultural conflicts, exposed sectors include, on the one hand, those which undertake activities in the field of armaments (aerospace and defence, electrical engineering and electronics, software, automotive), and on the other hand industries with production facilities in countries regarded as “critical” in terms of their political and social standards (energy sector, mining, consumer electronics, textile and garments industry).

Results and use of the industry rating

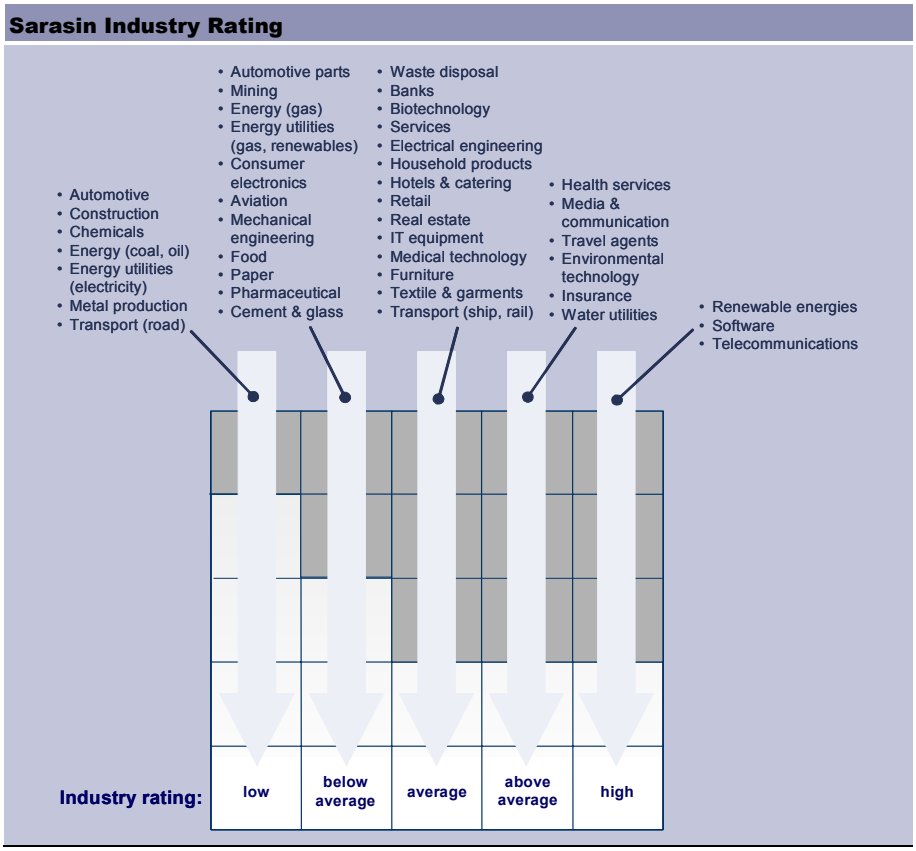
Risk ranking of sectors ...

Aggregation of the individual criteria described in 2.3 produces a measure of "overall risk" for each industry. All industries can be ranked according to this measure.

... provides the basis for the sustainability rating

Based on this ranking, industries can be placed in five risk categories, ranging from "low" to "high" (see chart).

Rating of different sectors in the Sarasin Sustainability-Matrix®



Source: Bank Sarasin

Industries with high risks = low sustainability rating

Industries with higher risks ("low" and "below average" sustainability ratings) include primary industries with a substantial direct impact on the environment (chemicals, energy, utilities, metal production, mining, paper, cement); sectors where consumption of the product has a large impact on the environment (automotive, construction, consumer electronics); sectors with significant direct environmental and social risks and/or interlinking with other industries (automotive parts, mechanical engineering, food, transport); and the pharmaceutical industry where the risks are primarily in the social domain (in view of ethically controversial business and marketing activities etc).

Industries with low risks = high sustainability rating

Industries with lower risks ("high" and "above average" sustainability ratings) include service sectors with relatively low direct environmental and social impacts and/or relatively little interlinking with other industries (media, software, telecommunications, insurance) and those with direct environmental and social

benefits (renewable energies, healthcare services, environmental technology, water utilities).

Use within the Sarasin sustainability rating

Risk assessment provides basis for the company rating

Within the framework of our rating methodology, the risk assessment on the one hand provides the basis for the industry rating, which helps us decide – by referring to the Sarasin Sustainability-Matrix® – whether a company qualifies as a sustainable investment. On the other hand, it defines the environmental and social factors for rating individual companies within a particular industry (company rating).

Example of the automotive industry

To take an example (see chart), the main risk factors for the automotive industry lie in the environmental sphere, during use of the product (energy consumption and pollutant emissions). Therefore the main factors when determining the company rating are the analysis of energy efficiency and pollutant reduction of the vehicle fleet, and the extent to which these aspects are considered in research and development and in vehicle design. Another factor lies in the social sphere, in relation to the working conditions and terms of business of suppliers ("pre-production"). Suppliers are often highly dependent on car manufacturers, resulting in heavy cost pressure with corresponding effects on employees, such as redundancies and relocation of production to countries with low social standards.

Risk profile of the automotive sector

	Phase in the product life cycle		
Risks:	**Pre-production**	**Production**	**Use & Disposal**
Consumption of resources	●		●●●●●
Emissions	●		●●●●
Internal conflict potential	●●	●	
External conflict potential	●	●	●

Source: Bank Sarasin

The risk factors of the different sectors identified in this way help us to work out the company rating: On the one hand they are used to determine the weighting of the individual environmental and social criteria, and on the other hand they form the basis for defining industry-specific, individual criteria.

Impact on share performance

Environmental and social risks become "extra-financial risks" for the company's success

As explained in section 2, the development of all companies is bound up with society and the natural environment. The environmental and social risks considered in the industry rating will therefore have an effect on the business development of companies over the long term and thus ultimately on their share price performance. From the point of view of financial analysts, they constitute "extra-financial risks".

Companies in less sustainable industries are the most heavily exposed ...

Companies are affected to varying degrees by these extra-financial risks, depending on which sector they belong to. Those in less sustainable industries (chemicals, energy, automotive etc.) are the most heavily affected.

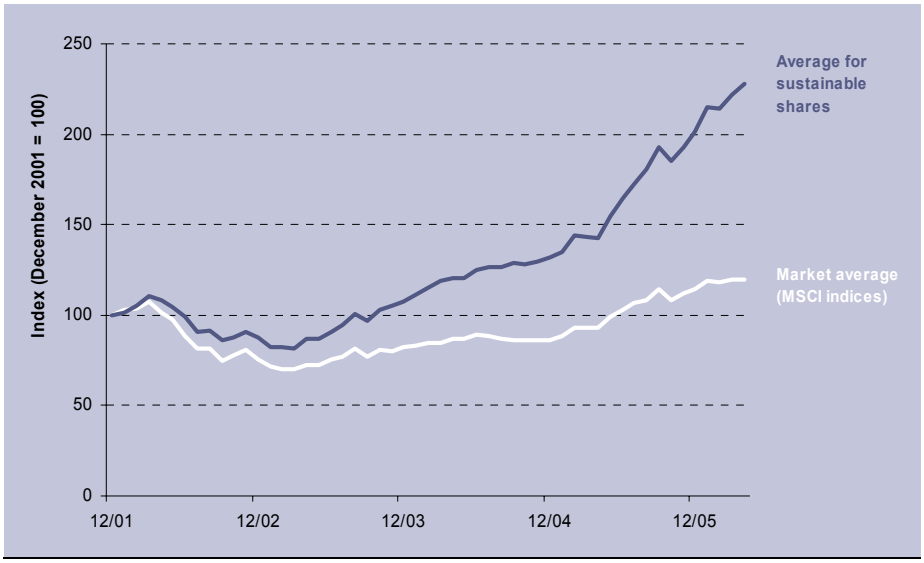
... but for proactive companies this is precisely where the biggest opportunities lie ...

Because the risks in these industries are higher, this is precisely where "sustainable practices" offer the greatest commercial opportunities. By increasing their energy efficiency (for example through process optimisation, conversion to more efficient power plant technologies, combined heat and power generation or greater use of renewable energies), companies operating in the energy-intensive primary industries and in energy production can not only make substantial savings on their energy costs – which represent a considerable proportion of their overall costs – but in future they can also achieve additional revenues through trading in CO_2 emission certificates.

... resulting in above-average share price performance

In terms of share price performance, companies with above-average sustainability ratings, particularly those operating in the more critical sectors, can expect a higher than average risk/return ratio, i.e. higher returns and/or lower share price risks, over the long term. This is confirmed by the following examples and studies.

Average performance of shares suitable for sustainable investment in seven sectors with low sustainability ratings[a)]



a) **Market average:** Weighted (with the relevant MSCI World weightings) average performance of sub-indices for the 7 sectors: automotive & automotive parts, energy, energy utilities, mechanical engineering, food and pharmaceuticals; **average sustainable shares:** Average performance of companies rated as eligible for investment in the 7 sectors, weighted across all sectors with the weights of the relevant sub-indices in the MSCI World
Source: Datastream

In seven sectors regarded as critical in terms of sustainability ("low" and "below average" industry rating), the share price performance of most of the companies eligible for sustainable investment based on their rating within the Sarasin Sustainability-Matrix® was above the sector average (see chart). The average outperformance compared with the relevant industry index (across all seven sectors) during the period from December 2001 to April 2006 was an impressive 100 percentage points. The outperformance of the pharmaceutical and automotive & automotive parts sectors was of the order of 50 percentage points, of the mechanical engineering, food and paper & pulp sectors approximately 70 percentage points, of energy utilities around 100 percentage points and for the oil and gas sector about 300 percentage points.

Other studies have likewise concluded that sustainable companies in "critical" sectors have tended to achieve an above-average share price performance (see following table).

Results of studies of share price performance of "sustainable" companies

Analysed sector	Object of the analysis	Outperformance	Authors
Forestry and paper	Difference in average share performance of 15 companies rated above average with regard to environmental protection compared with 9 companies rated below average (May 1999 – March 2003)	approx. 40%	Innovest[a)]
US electric utilities	Difference in average share performance of 9 companies rated above average with regard to environmental protection compared with 9 companies rated below average (Feb. 1999 – Feb. 2002)	approx. 30%	Innovest[a)]
EU electric utilities	Difference in average share performance of 7 companies rated above average with regard to environmental protection compared with 5 companies rated below average (July 2000 – July 2003)	approx. 40%	Innovest[a)]
Integrated oil and gas sector	Difference in average share performance of 6 companies rated above average with regard to environmental protection compared with 5 companies rated below average (June 1997 – June 2002)	approx. 18%	Innovest[a)]
Diversified portfolios	Difference in average share performance of companies rated above average with regard to environmental protection (across all sectors: 207) compared with market average (Jan. 2001 – Aug. 2004)	Materials: 3% Industrials: 15% Utilities: 25% Energy: 20% Healthcare: 10%	Oekom/ Morgan Stanley[b)]

a) Innovest: Corporate Environmental Performance; study carried out on behalf of the British Environment Agency; September 2004.

b) Morgan Stanley: Outperformance through sustainability? – The "best in class" recommendations of Oekom Research on the test bench; November 2004.

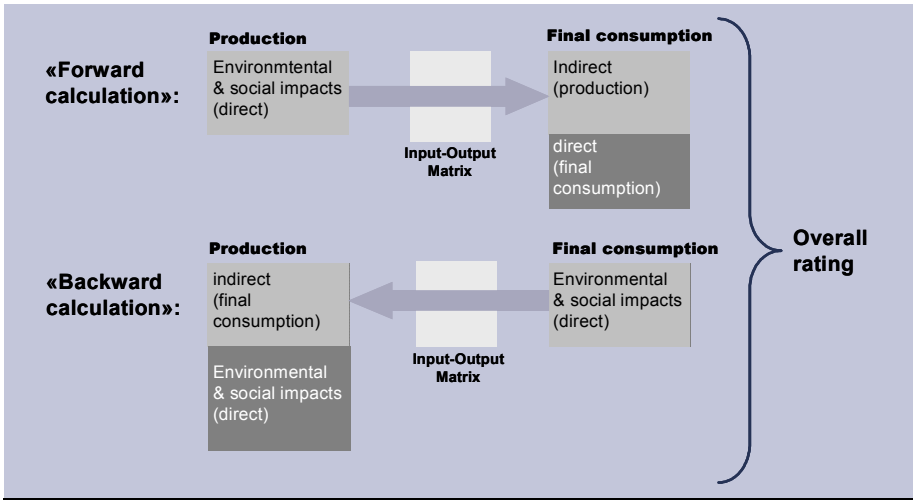
Annex: Product chain analysis

End-consumer and producer perspective

The task of assigning the product chains associated with a sector to the relevant environmental and social risks can be considered from two different points of view:

- The “end-consumer” or “upstream” perspective: The product chains are considered from the perspective of the end-product of the industry concerned, or that of the final consumer: In this case, the overall environmental and social risks result from the direct effects of its final consumption (e.g. fuel consumption of cars in the case of the automotive industry) plus the indirect effects of the different stages of production of the end product (e.g. energy consumed in the automotive assembly process and in manufacturing the necessary steel and plastic raw materials and components). This is carried out within the framework of a “forward calculation”, in which the environmental and social impacts of the different stages in the production chain (based upon the proportion of the output to subsequent stages in total output) are attributed to the end-products of the industry concerned (see chart).
- “Producer” or “downstream” perspective: The product chains are considered from the perspective of the industry concerned: The overall environmental and social risks result from the direct effects of production (e.g. energy consumed in the manufacture of components and during assembly in the automotive parts industry) plus the indirect effects of the supplied goods in industries which manufacture the end-products which have environmental and social impacts during their final consumption (the automotive industry in the case of automotive parts suppliers). This viewpoint corresponds to a “backward calculation” in which the environmental and social impacts of the end-products (during their final consumption) are attributed to the upstream production stages (based upon the proportion of the input from previous stages in total input) (see chart).

Determining the environmental and social risks of product chains



Source: Bank Sarasin

Basis of calculation: monetary input-output matrix

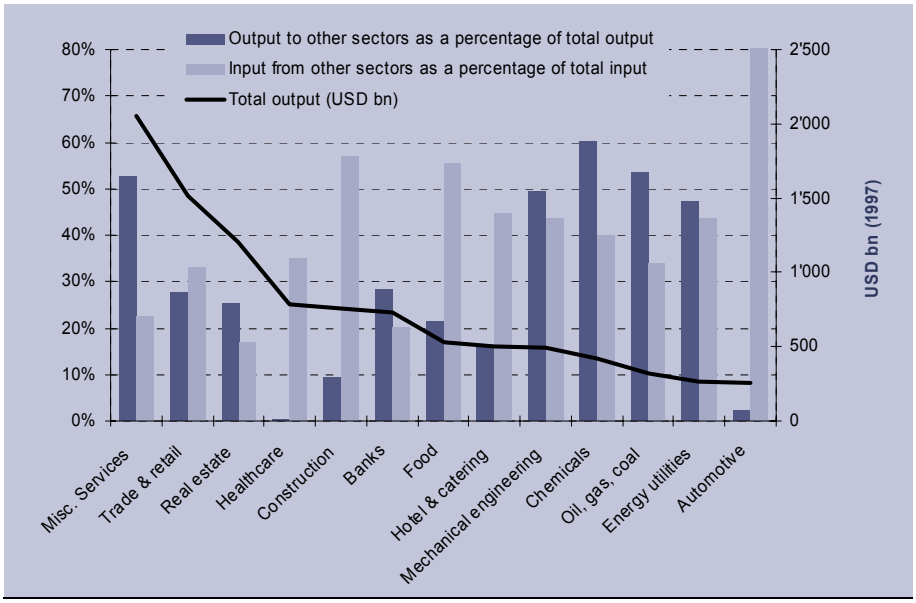
The industry rating is then based on a combination of the two approaches. The input and output relationships between the individual production stages and sectors are charted with the aid of an general economic input-output matrix. This approach provides only a very rough representation of reality. It depicts the monetary flows within the economy (e.g. what percentage of steel industry production is supplied to the automotive industry?), while for example the environmental impacts are linked to the physical material flows (material volumes) (e.g. what percentage of the produced quantity of steel is supplied to the automotive industry?).

As the underlying data for these calculations we have used the input-output matrix of the USA, on the one hand due to the availability of the data, and on the other hand in view of the size of the economy and the fact that foreign trade plays a relatively small part compared with other industrialised countries, thus providing a better approximation to the world economic situation.

Size and interlinking of sectors

In the USA (as in most industrialised countries), the service sector (including trade and retail, real estate and healthcare) is the largest sector in terms of its contribution to total economic output (see chart, solid line). The interlinking of the different sectors within the economic system ultimately determines their position in the product chains, and this forms the basis for the industry rating. In the case of less strongly interlinked sectors (limited input and output connections with other sectors), the direct environmental and social impacts of production and/or product use tend to dominate. Examples of these are the healthcare sector and the automotive industry (in relation to outputs), as they produce largely for final consumption. In the case of more strongly interlinked sectors (significant input and output connections with other sectors), the indirect environmental and social impacts of upstream and downstream sectors play a greater role. Such sectors include the chemical industry, energy utilities and mechanical engineering (see chart).

Size and interlinking of selected industries (USA 1997)



Source: US Department of Commerce (input-output matrix)

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