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Foresight

SustainEx

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Schroders

SustainEx

SustainEx quantifies the positive contributions and negative impacts companies have on society. Viewing those costs and benefits through a hard economic lens provides an objective measure of companies' credit or deficit with society, which will become more important as they crystallise into financial costs or benefits. SustainEx analysis helps our analysts, fund managers and clients measure and manage those social and environmental impacts and risks more effectively.

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Executive summary

Companies historically enjoyed unencumbered growth...

Companies do not operate in a vacuum. They are part of the societies from which they draw their employees, to which they sell their products and under whose laws they compete. For most of the last few decades, large companies have grown and thrived even as social and environmental challenges have intensified. Corporate tax contributions fell, real wages stagnated and environmental damage went unpenalised. Companies were largely able to focus on maximising current profits without too much concern for the costs their actions created elsewhere in societies or economies.

...the social and environmental impact of which is starting to be realised

In recent years, that strategy has started to unravel and will become more untenable going forward. Costs are growing and governments are less able to absorb them. As a result, social pressure and government intervention are forcing companies to take responsibility for the costs their actions create. Among other measures, minimum wage legislation, sugar taxes, gambling restrictions or carbon prices are all spreading, creating financial expenses in place of previously unaccounted social problems.

As a result, costs that were previously externalised to society will become internalised on companies' financial statements. As that transfer plays out, companies whose profitability have relied on avoiding the costs their products or operations impose on society will find their business models come under growing pressure. The size and distribution of profit pools in many industries is at risk as winners and losers are reordered.

SustainEx quantifies a company's cost or benefit to society...

New approaches to investment analysis are needed to identify, measure and manage the risks those externalities impose on companies' profitability. SustainEx measures the costs companies would face if all of their negative externalities were priced, or the boost if benefits were recognised financially.

SustainEx is designed to help our analysts, fund managers and clients identify those risks, to help ensure they are reflected in investment decisions and valuations. It attributes previously unaccounted social and environmental costs and benefits to individual companies, using economic logic to systematically combine robust academic analysis with company data. Our research has identified and examined 47 externalities to date, drawing on over 400 academic studies and applied to around 9,000 global companies.

...and how that cost or benefit might impact profitability

Our analysis highlights the growing costs listed companies create, and the rising importance of considering the risks those externalities pose to future earnings. The US$4.1 trillion earnings listed companies generate for shareholders would fall by 55% to US$1.9 trillion if all of the social and environmental impacts our research identifies crystallised as financial costs. One third of companies would become loss-making. The risk to profit pools and competitive positions is clear.

By quantifying social and environmental impact in economic terms, SustainEx provides our analysts, fund managers and clients with a measurement approach that is comparable across companies, funds and indices. Impacts can be assessed through ESG, SDG[1] or other lenses for investors with specific priorities. It helps focus analysts' attention on companies facing the greatest risks and the sources of those risks. Finally, it yields a measure of corporate sustainability which we have integrated into systematic investment strategies. It focuses on the risks companies face, not how they manage those risks; we view the analysis as part of our firm's sustainable investment tool kit, not a universal "answer".

[1] ESG stands for environmental, social and governance, while SDG stands for the United Nations' Sustainable Development Goals.

SustainEx combines a wide range of sources and measures to examine companies' social and environmental impact

47 measures of social or environmental impact

Over 400
academic and industry studies of social and environmental impacts and externalities

70
reported data points for each company, estimated where not disclosed e.g. wages, taxes

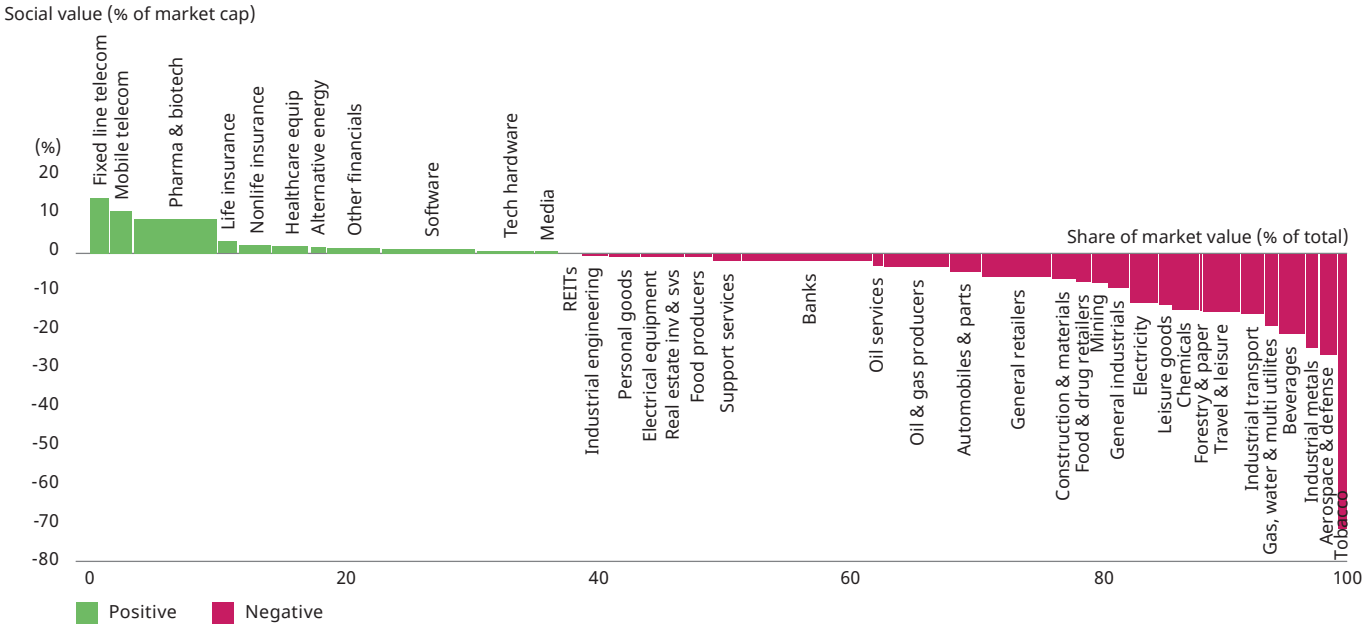
Unconventional data
from public sources e.g. patent registrations, stress perceptions

~9,000 large global companies examined

Source: Schroders.

Bottom-up analysis of around 9,000 global companies using the SustainEx model demonstrates a wide range of impacts across companies and sectors. In this report we have examined a comprehensive range of impacts, drawing on the best sources of information we can find to analyse each one. We will continue to add measures and strengthen existing analysis where possible. We use a subset of those measures when reporting publically on portfolio positions or constructing portfolios using SustainEx, which we will strengthen as our research develops.

Figure 1: Wide range of impacts across sectors



Source: Schroders.

Sustainable investing is maturing as a field, but too often remains vague and idealistic in its application. By examining both current profits and potential externalities through a common monetary lens, SustainEx aligns social and environmental impact with investment risk. As a result, it is uniquely placed to help our analysts, fund managers and clients identify the threats and opportunities companies face from social and environmental trends, before they become financial costs.

The social cost of corporate growth

For decades, companies became freer to pursue unencumbered growth. Large corporations benefited from less regulation, open trade and a political conviction that free markets lead to the best economic outcomes.

As a result, large businesses have become bigger and more powerful. Their shares of employment, business revenue, exports or economic output have risen by 20-30% over the last 20 years in most developed countries[2]. The large multinationals listed in the Fortune Global 500 now generate revenues close to 40% of the value of global GDP (Fig 2).

The expanding role of large companies has come in tandem with intensifying social and environmental challenges, exacerbated by larger, wealthier, consumption-hungry populations putting further pressure on finite global resources and ecosystems (Fig 3). Climate change is perhaps the highest profile outcome; close to 90% of the world's population is now connected to an electricity grid, 70% of the power on which comes from fossil fuel combustion[3], around one-third of it generated by listed utilities[4], tracing a direct link from economic expansion and corporate growth to environmental damage.

Similar challenges are evident across a spectrum of trends spanning areas such as wage stagnation, government pressures, social unrest and inequality.

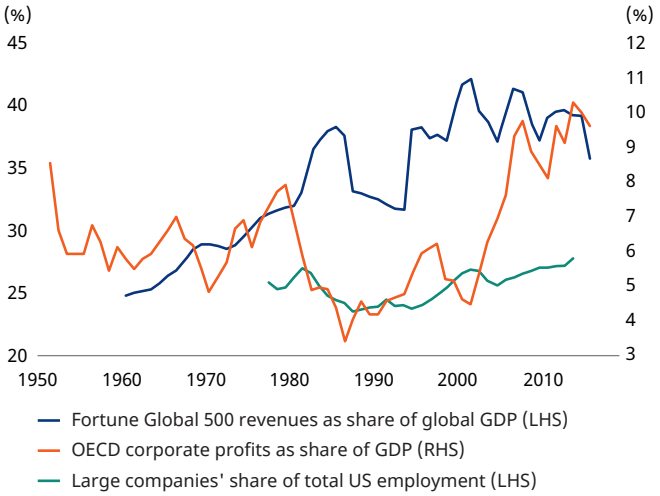
On the other hand, the public sector has become less and less able to absorb those social and environmental challenges. The World Inequality Lab calculates the capital controlled by each sector of major economies, net of debt, showing that the public wealth of developed economies has sunk into the red while their private sectors have thrived (Fig 4). That divergence has reached a breaking point in those countries; social and environmental costs cannot continue to be absorbed by societies and governments.

2 See for instance the US Census Bureau showing the share of the top 200 US companies in total business revenue, or the Annual Economic Survey of Employee Share Ownership in European Countries (2017).

3 Data from the International Energy Agency's (IEA) 2017 Energy Technology Perspectives model shows 69% of global electricity generation is from fossil fuel sources.

4 Based on World Bank analysis.

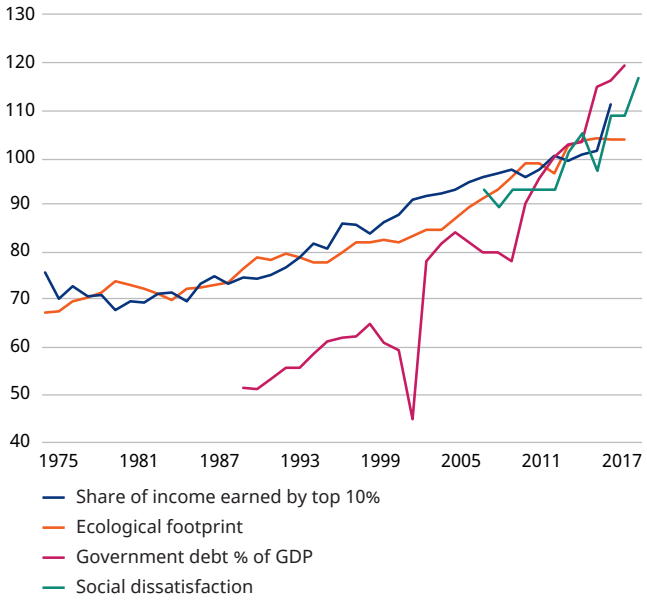
Figure 2: Multinational companies have become more important to the global economy



Source: Fortune, IMF, OECD, BEA, Grullon et al. Note: Fortune data is not available prior to the 1990s; we have estimated the equivalent values, using data from Thomson Reuters.

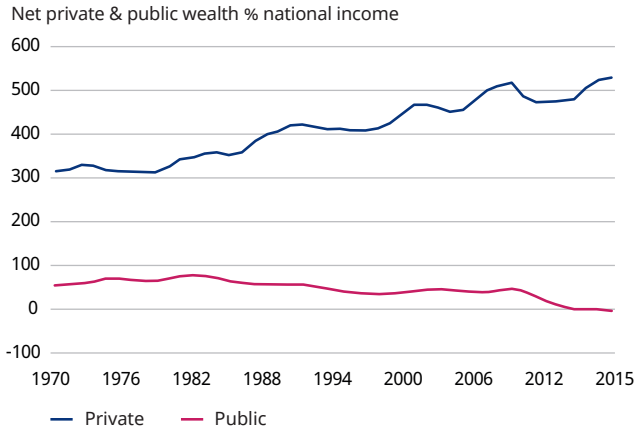
Figure 3: Rising social and environmental challenges; ecological damage, social inequality & public debt

Indexed so that 2007-18 average value of each series is 100



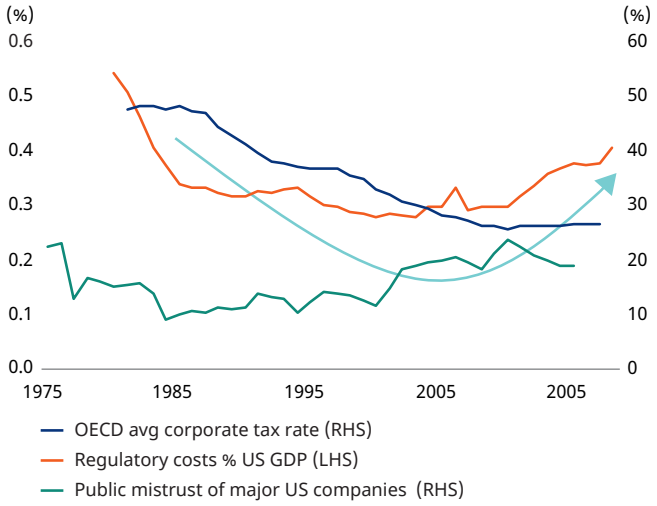
Source: World Bank, Global Footprint Network, World Inequality Database, Schroders calculations.

Figure 4: Private sector has gained while public sector has lost, across major developed economies



Source: World Inequality Lab. Based on data for Germany, Spain, France, UK, Japan & US, weighted by their respective GDPs.

Figure 5: Growing signs of increased government intervention to control corporate behaviour



Source: OECD tax database, General Social Survey, American Action Forum, Heritage Foundation, Schroders calculations and estimates.

Companies face growing costs from government intervention

The blame for these social and environmental problems cannot be laid solely at the door of big business. However, as their impacts have grown, and governments have become more equipped to intervene and more empowered to regulate, the threat companies face has risen. Those whose business models create the most social and environmental damage will come under increasing pressure to shrink or compensate for the costs they impose.

That shift has already begun; we are passing an inflection point that could redefine cost structure and leadership in many industries. Over the last decade – spurred by changes in social attitudes following the global financial crisis – governments have already begun to move costs they have borne back to the private sector (Fig 5). Some of the steps they have taken so far include:

- Minimum wages: 28 of the 36 OECD countries have established minimum wage legislation, doubling since the turn of the century[5]
- Carbon pricing: Following China's announcement last year that it will roll out a national carbon trading scheme, just under one-quarter of the world's carbon emissions will be subject to a financial penalty
- Tax clampdowns: In 2014, the G20 countries agreed to coordinate their efforts to crack down on corporate tax avoidance[6]
- Sugar taxes: 35 countries have established sugar taxes; more of the world's soft drink market is now covered by a sugar tax than the proportion of carbon emissions which are priced
- Gambling restrictions: The UK and Australia, two of the five largest gambling markets in the world, have introduced legislation to protect vulnerable gamblers over the last few years[7]
- Water pricing: Average global municipal water prices have roughly doubled over the last decade[8]

We expect this trend of rising government intervention to continue, reversing the imbalances that built during the decades in which public finances and future generations disproportionately shouldered the burden of companies' negative externalities.

The rules of business and investment success are being rewritten

The scale of the externalities companies impose has grown so large that in many industries, those costs exceed their total earnings. Moves to push those costs back to the corporate sector will have dramatic impacts on many companies' financial statements. Some previously winning business models may unravel while others will prove robust.

Building business models that are resilient to changes in cost structures will be critical to companies' continued profitability. By extension, forward-looking risk analysis demands investors consider the effects of internalising new costs on earnings and valuations. We have developed the SustainEx model to provide our analysts, fund managers and clients with a systematic and objective view of companies' social and environmental impacts and the risks they face as a result. By gauging where those threats are largest, investors will be better prepared for the risks they pose and better able to engage with management teams on their plans to manage those risks.

5 The five Nordic countries are notable exceptions. While they have not introduced legal minimum wages, union agreements achieve a similar result.

6 See for example this FT article: G20 governments agree to crackdown on tax avoidance.

7 See for example this Statista chart: Americans lose 199 billion through gambling.

8 Based on a simple average of municipal water prices monitored by Global Water Intelligence.

SustainEx: A proprietary framework to measure social and environmental impacts

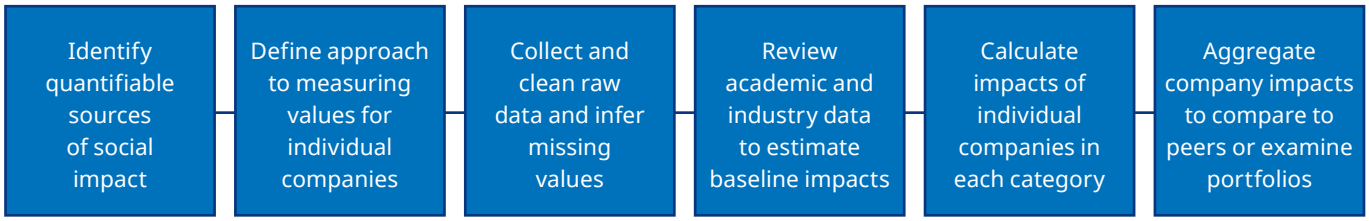
SustainEx is a robust, objective framework to measure the social and environmental costs companies impose, or the benefits they provide, which are not currently recognised as financial costs or benefits. It combines economic logic with sustainability expertise, industry knowledge, company data and academic research to deliver a transparent, impartial and robust measure of corporate impact across around 9,000 global companies.

Most approaches to impact measurement compare portfolios to their benchmarks across a few discrete indicators, such as carbon footprints or workforce diversity, which are widely disclosed by public companies. That approach allows comparisons across fund managers and can be valuable for many investors.

However, those measures can't provide meaningful conclusions on companies' overall impact, the relative importance of different measures or the financial risks companies face. SustainEx overcomes those shortfalls by translating companies' social benefits or costs into economic terms. It translates hazy ESG concepts into hard figures.

The SustainEx model identifies the corporate sector's impacts, quantifies them and systematically examines the impacts of individual companies. It represents an annual cost or benefit based on the company's activity during the year, rather than the "pent-up" impact of their resources or assets. For instance, ownership of unexploited fossil fuel reserves is not included whereas annual CO_2 emissions are counted.

Figure 6: Translating principles into practice



Source: Schroders.

Mapping the range of impacts

We start by mapping as many ways companies impact society, positively or negatively, as possible. The stakeholder model that underpins much of our sustainability analysis across Schroders provides a framework, focusing on the constituencies with which companies have an economic exchange.

To ensure comparability between companies, the measures we select are:

- Quantifiable so that costs and benefits can be measured and compared objectively
- Attributable to ensure impacts can be sensibly allocated between companies
- Disclosed widely enough that comparison between global companies is possible
- Transparent so that users can understand their meaning

We initially hoped to draw on existing work in this area. Surprisingly, there are few analyses or studies mapping or measuring corporate externalities and we have found none which provide comprehensive views. The Economics of Ecosystems and Biodiversity (TEEB) has examined natural capital and the costs of its damage[9]. Consultants including KPMG and PWC have developed frameworks to assess companies' social and environmental impacts, but focus on companies seeking to measure their own footprint using proprietary data, rather than systematic analysis across companies using public data[10]. A number of companies have developed and applied their own analyses, a summary of which the World Business Council for Sustainable Development (WBCSD) has helpfully compiled[11], but this too comprises a series of case studies rather than a comprehensive framework.

We have reviewed all of those public reports, and many others, to develop the list of externalities on which our analysis is based. The large majority come from our own insights, rather than those existing studies. The impacts we have included in our analysis are summarised below, with many combined in the interests of readability (Fig7).

Our goal is to be comprehensive, rather than to pre-judge the most important externalities – by putting economic costs to companies' impacts the most important externalities will automatically assume more importance. By quantifying all impacts, we sidestep debates over which factors are most material to each industry.

9 See TEEB website.

10 KPMG's True Value framework is framed as a tool to connect corporate and societal value creation. PWC's Total Impact Measurement framework is designed to help companies understand how their activities contribute to the economy, environment and society.

11 See Measuring and valuing social capital: Insights into employment, skills and safety.

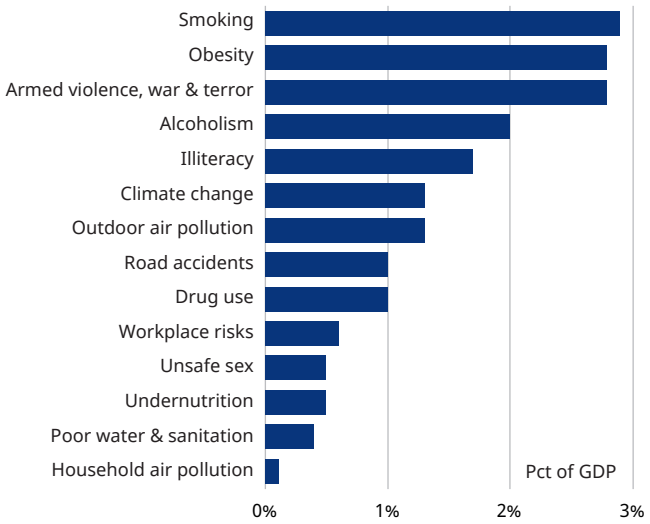
Figure 7: Mapping impacts across stakeholders

Source: Schroders. Note: Some impacts are combined to aid readability. Please see figure 14 for the full list of impacts.

We have undoubtedly missed some impacts from our list, but believe we have captured the most important aspects.

For instance, the World Health Organisation (WHO) and consultancy firm McKinsey have examined the activities with the largest social and environmental costs which are currently unpaid or uncompensated for (Fig 8). We have included all but four in our analysis, reflecting the difficulties of attributing robust estimates of the effects of illiteracy, road accidents, illegal drug use or household air pollution to individual companies.

Figure 8: WHO's assessment of the biggest unpriced social burdens



Source: McKinsey, WHO, Schroders.

Similarly, we also recognise that some social benefits, although potentially significant, cannot be quantified robustly enough to include them in our analysis. For instance, consumer rent is created when companies price products below the level buyers would be willing to pay, which represents a benefit to customers. Search engines allow users to access information and knowledge at minimal cost, which similarly provides social benefits we have been unable to quantify objectively.

Going forward, we will continue to seek ways to bring additional costs or benefits into our research, as well as refine our analysis of impacts already examined.

Translating impacts to costs

We translate all of the impacts we identify into economic costs or benefits, measured in monetary terms. That quantification relies on systematic analysis of global impact costs or benefits, company exposures and impact attribution. We use three approaches depending on the type of impact we examine (Fig 9). Those approaches are described in more detail on the following pages.

We realise that a systematic model distilling multifaceted externalities into dollar values for individual companies cannot fully reflect the complexity of the issues, individual company positions or the nuances of which actors in value chains should bear the burden of those impacts. It is deliberately blunt, forces values on activities that are not typically priced and aggregates very different activities in a single monetary figure.

Nonetheless, the analysis provides a valuable insight into companies' exposures. Costs are thoroughly researched and transparent, and their translation to company impacts is systematic and objective.

Figure 9: Three approaches to measuring social and environmental impacts

Global value	Estimated annual global social burden / impact (e.g. alcohol production)	Define activity responsible for impact	Share global cost between companies based on activity	
Unit activity	Estimated impact of individual actions (e.g. GHG emissions)	Quantify or estimate level of activity for each company	Calculate burden associated with company actions	
Geographically defined	Impacts which vary between countries (e.g. tax payments)	Calculate baseline requirement based on company exposure	Compare actual contribution to required baseline	

Source: Schroders.

Global value: attributing impact in proportion to companies' share of the activity (e.g. tobacco, alcohol)

In cases where social and environmental costs or benefits are most reliably estimated at a global level, we attribute that total cost or benefit to individual companies in proportion to their market share of the activity responsible for the impact.

We examine as many credible academic and industry studies as possible, quantifying the scale of the damage or benefit created by each activity. Those studies are based on analysis of different countries and different years. For each estimate:

- We translate regional or national cost estimates into global equivalents by scaling them according to the country's share of world GDP.
- We rebase historical cost estimates into 2018 terms using the global GDP price deflator.
- We remove any estimates more than two standard deviations above or below the mean, and use the average of the remaining values to estimate the global cost of that externality.

Insofar as most academic studies focus on societal or economic costs or benefits, irrespective of who caused them, we also estimate the share of that global cost or benefit attributable to publically traded companies, by combining estimates of:

- The contribution of the corporate sector to each impact.
- The proportion of the corporate sector's output attributable to listed companies. On average, listed businesses represent around one-third of corporate output globally, which we adjust upward or downward as appropriate for each sector.

For example, virtually all cigarettes or tobacco products are produced by companies. Listed companies represent approximately half of the world's cigarette production (CNTC, the state-owned Chinese company represents over 40% of global production, with other unlisted companies totalling close to 10%[12]). We therefore attribute half of the global cost estimate to listed companies.

To gauge that global cost, we have examined 12 independent studies of smoking's social damage, translated to current US dollars and reach an average estimate of US$1.2 trillion. Of that total, $0.6 trillion is therefore attributable to listed companies. Cigarette maker BAT has a global market share of just under 11%, resulting in attributed costs of $65 billion.

We show a worked example of the approach (Figure 10), using a different example – global alcohol production – translating global cost analysis to individual companies.

Figure 10: Worked example of global cost attribution: Alcohol production

1 Source documents examined and key parameters extracted from relevant studies: Geography covered, year on which the analysis is based and estimated cost in monetary terms or as a percentage of GDP

2 Monetary costs converted to US$, then expressed as a share of GDP in that year, then as a current cost by multiplying that GDP share by current global GDP

Source	Geography	Study year	Total cost (local currency)	Cost as % GDP	Total cost US$ mn	Cost as share of GDP	Current global cost ($bn)	Cost used in analysis ($bn)
2010 National and State Costs of Excessive Alcohol Consumption: Bouchery et al. 2011	United States	2006	($233.5bn)		(234)	(1.7%)	(1,422)	(1,422)
Alcohol in Europe: A public health perspective London: Institute of Alcohol Studies: Anderson et al., 2006	European Union	2003	(EUR125bn)		(102)	(0.9%)	(717)	(717)
Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders: Rehm et al., 2009	Canada, France, Scotland, U.S., Republic of Korea, Thailand	Various years		(2.3%)		(2.3%)	(1,941)	(1,941)
Global Status Report on Alcohol 2004	Australia	1999	(AUD7.56bn)		(10)	(2.4%)	(2,012)	(2,012)
Global Status Report on Alcohol 2004	Canada	1992	($7.52bn)		(8)	(1.3%)	(1,071)	(1,071)
Global Status Report on Alcohol 2004	Italy	2003	(EUR46bn)		(37)	(2.4%)	(2,006)	(2,006)
Global Status Report on Alcohol 2004	United States	1998	($184.6bn)		(185)	(2.0%)	(1,714)	(1,714)
Overcoming Obesity - An Initial Economic Analysis - McKinsey	World	2012	($1400bn)		(1,400)	(1.9%)	(1,586)	(1,586)
Policy paper 2010 to 2015 government policy: harmful drinking: HM Government, 2012	United Kingdom	2009	(£21bn)		(15)	(0.6%)	(532)	(532)
The Cost of Harmful Alchol Use in South Africa - Matzopoulos et al.	South Africa	2009		(1.6%)		(1.6%)	(1,350)	(1,350)
The cost of harmful alcohol use in South Africa: Matzopoulos et al., 2014	South Africa	2009		(11.0%)		(11.0%)	(9,281)	
The Costs of Drug Use to Society	United States	2017	($249bn)		(249)	(1.3%)	(1,085)	(1,085)
The economic costs of alcohol consumption in Thailand, 2006: Thavorncharoensap et al., 2010	Thailand	2003		(2.0%)		(2.0%)	(1,679)	(1,679)
The Economic Impacts of Alcohol: England - Insitute of Alcohol Studies (IAS)	England	2006	($68bn)		(68)	(3.2%)	(2,674)	(2,674)
The Global Economic Burden of Alcohol: A Review and Some Suggestions - Baumberg	World	2002	($437.5bn)		(438)	(1.3%)	(1,063)	(1,063)
The Real Cost of Excessive Alochol Use: USA - Centers for Disease Control and Prevention (CDC)	United States	2010	($249bn)		(249)	(1.7%)	(1,404)	(1,404)
Two methods of estimating health costs linked to alcoholism in France (with a note on social and environmental costs): Reynaud et al. (2001)	France	1996	($2.5bn)		(3)	(0.2%)	(131)	(131)

3 Outlying high or low values removed and the remaining estimates used to calculate the current global cost applied in our analysis

Average	(1,665)
Standard deviation	2,184
Minimum accepted (average - 2 st dev)	(6,034)
Maximum accepted (average + 2 st dev)	2,703

(1,189)

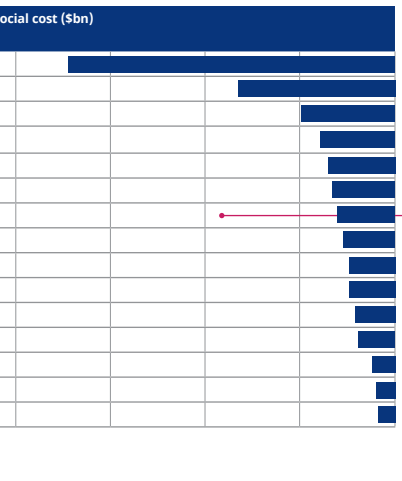
We assume 90% of alcohol production is from the corporate sector

We assume listed companies represent around half of the alcohol industry's production, reflecting a long tail of small local producers particulalry in emerging markets

As a result, we assume $0.6tr of alcohol related costs are attributable to listed companies globally

5 Calculated impact of listed companies combined with companies' market shares to estimate their individual exposures

Company	Alcohol sales	Share of total	Attributed social cost ($bn)
Anheuser-Busch Inbev N.V.	5,414,316,726	14%	-172
Heineken	2,628,241,700	7%	-83
Diageo	1,533,929,124	4%	-49
Ambev	1,241,851,008	3%	-39
Asahi Breweries	1,108,602,844	3%	-35
Pernod Ricard	1,027,628,700	3%	-33
Carlsberg	956,969,952	3%	-30
Kweichow Moutai	839,739,600	2%	-27
Molson Coors Brewing	770,196,000	2%	-24
Kirin Holdings	744,499,170	2%	-24
Louis Vuitton Moet Hennessy (LVMH)	658,380,020	2%	-21
Constellation Brands	606,800,000	2%	-19
Wuliangye Yibin	393,586,010	1%	-12
Brown-Forman	326,400,000	1%	-10
Jiangsu Yanghe Brewery	288,151,986	1%	-9



4 Global social cost translated to the impact attributable to listed companies

6 Impact of every company calculated based on its share of global alcohol production

Sources: Global cost estimate based on academic literature review, IMF, Schroders calculations. Listed company attribution estimates from WHO, Statista, Schroders estimates. Company share estimates from MSCI, Thomson Reuters and Schroders estimates.

Unit activity: Combining company output with unit impact estimates (e.g. GHG emissions)

If academic studies focus on the social and environmental impact of a unit of activity (such as a tonne of carbon dioxide released), we combine that unit measure with each company's reported or estimated level of activity. For example, we have identified 13 academic studies of the social and environmental costs created by greenhouse gas emissions, which yield an average cost of $82/t. Multiplying companies' carbon emissions by that estimate of the damage each tonne creates provides a measure of the costs they impose.

Figure 11: Worked example of unit cost calculation: Carbon emissions

1 Source documents examined and key parameters extracted from relevant studies: Geography covered, year on which the analysis is based and estimated cost in monetary terms or as a percentage of GDP

2 Unit costs converted to US$, then inflated to 2018 USD using the global GDP deflator

Source	Geography	Study year	Estimated cost, money of the day ($)	Units	Estimated cost, 2018 US$/ tonne	Cost used in analysis
Carbon Valuation in UK Policy Appraisal: A Revised Approach.	United Kingdom	2009	(51)	USD per tonne CO2	(64)	(64)
Climate chance in 2017: Implications for businesses	United States	2015	(36)	USD per tonne CO2	(39)	(39)
Estimates of the social cost of carbon: concepts and results from the Dice-2013r model and alternative approaches.	World	2015	(43)	USD per tonne CO2	(47)	(47)
Intertemporal Distribution, Sufficiency, and the Social Cost of Carbon	World	2015	(65)	USD per tonne CO2	(70)	(70)
Risk mitigation and the social cost of carbon	United Kingdom	2002	(29)	USD per tonne CO2	(43)	(43)
Risk mitigation and the social cost of carbon	United States	2013	(100)	USD per tonne CO2	(113)	(113)
Selective reporting and the social cost of carbon	World	2015	(67)	USD per tonne CO2	(72)	(72)
Social Cost of Carbon - EPA Fact Sheet	United States	2007	(81)	USD per tonne CO2	(106)	(106)
Social Cost Of Energy From Coal Powerplant In Šoštanj	Slovenia	2010	(23)	EUR per tonne CO2	(34)	(34)
Stern Review: The Economics of Climate Change - Stern	World	2006	(85)	EUR per tonne CO2	(141)	(141)
Temperature impacts on economic growth warrant stringent mitigation policy	United States	2015	(37)	USD per tonne CO2	(40)	(40)
Temperature impacts on economic growth warrant stringent mitigation policy	United States	2015	(220)	USD per tonne CO2	(237)	
The social cost of carbon	World	2010	(177)	USD per tonne CO2	(216)	(216)

3 Outlying high or low values removed and the remaining estimates used to calculate the current global cost applied in our analysis

Average	(94)
Standard deviation	67
Minimum accepted (average - 2 st dev)	(228)
Maximum accepted (average + 2 st dev)	41

(82)

Source	CO2e emissions (t '000)	Social cost ($bn)
JPMorgan Chase	79,556	-6.5
Apple	34,320	-2.8
Amazon.com	623,583	-51.1
Microsoft	88,486	-7.3
Banco Santander	26,995	-2.2
Tencent	2,784	-0.2
Alibaba Holding	28,545	-2.3
Facebook	7,180	-0.6
HSBC	58,755	-4.8
Industrial Bank	19,522	-1.6
Goldman Sachs	11,520	-0.9
Shanghai Pudong Development Bank	19,986	-1.6
Johnson & Johnson	452,900	-37.1
Anheuser-Busch Inbev N.V.	2,995,200	-245.5
Bank Of Communications	3,491	-0.3
AT&T	1,140,631	-93.5

-300 -250 -200 -150 -100 -50 0

4 Social cost to each tonne of carbon emitted is combined with reported or estimated emissions

5 Impact of every company calculated based on its direct carbon emissions and a consistent global social cost of carbon

Source: Academic literature review, IMF, Schroders calculations.

Where companies do not report the information needed to calculate their impact, we estimate values based on the activity (normalised by sales) of other companies in the same sector. To err on the conservative side, we penalise non-disclosure, by using the 40th or 60th percentile of intensity relative to sector peers, depending whether the impact is positive or negative.

For example, fewer than half of large listed companies disclose carbon emissions. To estimate values for those which do not, we calculate the carbon intensity (emissions divided by sales) for the companies which report data, then assume companies which do not report have carbon intensities equal to the 60th percentile of their sector, based on the data disclosed by reporting companies. Multiplying that estimated intensity by non-reporters' sales provides a conservative estimate of their direct carbon emissions.

To avoid double-counting, we focus on impacts directly attributable to each company. For example, we use reported scope one carbon emissions (from companies' own operations rather than suppliers or customers).

Geographic: Measured relative to sustainable levels in companies' operating countries (e.g. corporate taxes)

Some impacts are affected by the countries in which companies operate. In those cases, we estimate impacts using their geographic exposures and measures of the baseline neutral impact in each country and region.

For example, we take national statutory tax rates compiled by KPMG, from which we estimate the weighted average rate companies face across the countries in which they operate. Comparing the effective group tax rates companies report to that average statutory rate provides a measure of their over- or under-payment, and the value they contribute or detract from society.

Companies' geographic exposures are based on either the segment sales or assets they report, depending which is more relevant. We map those reported exposures to consistent definitions of countries or regions, using the most granular measure possible given each company's reporting. Those company level exposures, defined using consistent geographic names, allow us to map companies' exposures to country tax rates, wages etc.

If companies do not provide information to calculate group values (for instance few US companies disclose their annual wage bill), we estimate their performance based on peers, again applying a penalty for non-disclosure.

Figure 12: Worked example of geographic cost calculation: Tax payments

1 Map the regional segments companies report to a standardised schema of countries or regions

2 Calculate share of sales in those countries or regions

3 Calculate average statutory tax rate, weighted by companies' exposures to each country

Country	Reported description	Mapped description	Sales ($bn)	Share of sales	Statutory tax rate in region
1	United States	United States	1.73	49%	27%
2	Mexico	Mexico	0.49	14%	30%
3	Sweden	Sweden	0.33	9%	22%
4	Italy	Italy	0.20	6%	24%
5	South America	Latin America	0.20	6%	31%
6	India	India	0.14	4%	35%
7	Other European	Western Europe	0.09	3%	26%
8	China	China	0.09	3%	25%
9	Asia/Pacific	Emerging Asia	0.09	3%	27%
10	United Kingdom & Other	United Kingdom	0.15	4%	19%

Average statutory tax rate	27%
Actual Tax Rate	19%
Difference	-8%
Taxation "underpaid" $bn	-1.9%

4 Compare the effective tax rate the company reports to the statutory tax rate it faces in its countries of operation to estimate the value of "avoided taxes"

Source: KPMG, Thomson Reuters, Schroders calculations.

Bringing the analysis together: Overall SustainEx score

We examine all of the social and environmental costs or benefits for each company, using one of the above approaches, to reach an overall view of their annual net credit or deficit with society. In this paper, we have described our analysis of all 47 impacts our research identifies. Most rely on robust, reliable data sources but some require more imaginative approaches which are less suitable for application in portfolio construction or systematic reporting. We will continue to both expand our research and strengthen our analysis of existing measures in the future.

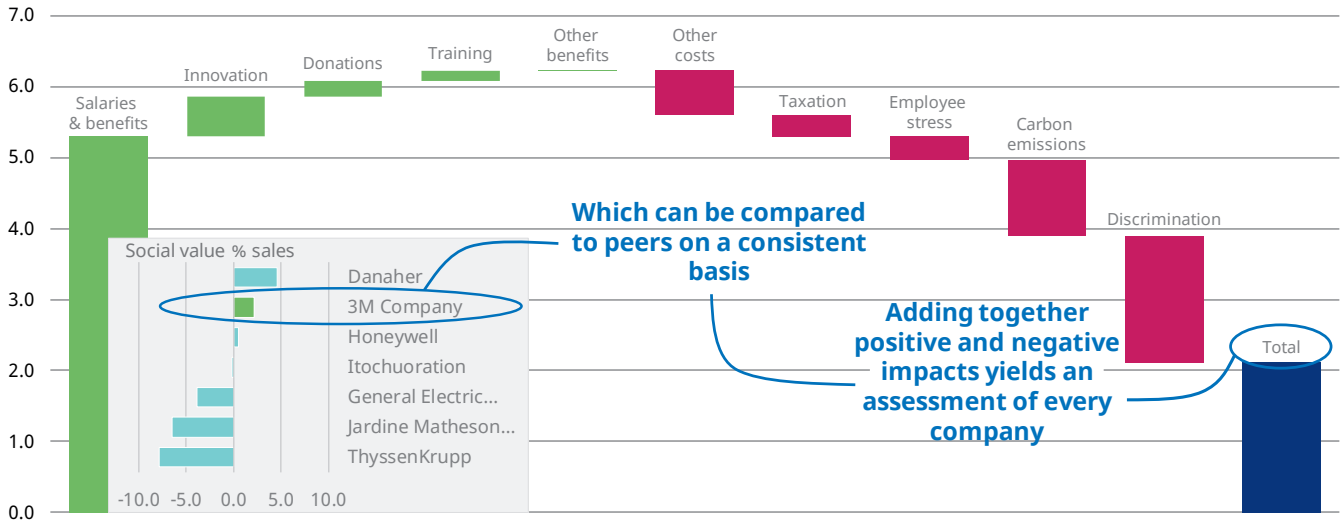
The worked example below shows those costs and benefits, and their summation to reach an overall value for one company.

Because the framework is systematic and quantitative, it can be scaled across a large number of companies. Indeed, a comprehensive universe is necessary to ensure attribution of costs or benefits reflects as complete a universe of companies as possible, so that market shares are based on a full representation of the listed industry, and so that inferred values are based on a wide range of data points. We have examined around 9,000 companies using this framework.

Furthermore, because it includes a long list of impacts, drawing on extensive analysis of academic and industry studies, the framework is not overly sensitive to specific measures or the assumptions on which they are based.

We used 47 areas of social and environmental impact to build the SustainEx framework. Details of other impacts are available on request. The resulting dollar cost or benefit represents the extent to which companies' reported income would be affected if the externalities it creates were crystallised as financial costs or benefits.

Figure 13: Worked example: Bringing the analysis together to gauge overall impacts



Source: Schroders.

Figure 13 shows the key positive and negative impacts of industrial company 3M, as an example of the company-level view SustainEx provides. The overall impact measure is determined starting from a baseline of zero for all companies, to which positive contributions are added and negative impacts deducted, to reach a net impact measure, shown here as a percentage of sales. That impact, normalised by companies' size, can be compared to peer companies or those in other sectors on a consistent basis to help identify sources of potential risk within sectors or portfolios.

Unconventional data

Some of the measures we have identified are not easily captured using commonly available data. Where unconventional data sources provide insights that would not otherwise be possible, we include those sources in our research. We recognise that those data sources do not provide the same robustness as information from the major ESG data providers but consider them valuable to provide a more complete view of key impacts and allow us to expand the scope of our research. The main unconventional data sources we have examined are described below.

Antimicrobial resistance and prescription drug abuse

The medicines pharmaceutical companies develop represent one of the biggest benefits the corporate world contributes to society. We attribute that benefit to individual companies based on their share of global drug sales. However, it is also clear that some pharmaceuticals create negative externalities that offset at least part of those benefits. In particular, we have focused on the costs associated with overuse of antibiotics and opioid addiction. To isolate those costs, we have used data from consumer website Drugs.com, which lists the key drugs sold by pharmaceutical companies, assigned to each treatment class. By examining the products each company manufactures in classes linked to either field, we gauge the contributions of each business to the negative side-effects of those drug classes.

Stress (at work)

Stress is a major health challenge, a large proportion of which stems from experiences at work. It is also clear that differences in organisational cultures have significant impacts on the levels of stress workers feel. To better capture those differences, we use data from employee review sites such as Payscale or Glassdoor, many of which aggregate current and past employees' perceptions of stress levels. For example, Payscale asks reviewers about stress levels in their organisations, Glassdoor asks about work-life balance and other sites ask similar questions, which are typically well correlated. We combine those scores for each company to gauge an aggregate view using as many reviews as possible.

Innovation

Our analysis highlights the value of innovation to societies. In aggregate that value represents one of the biggest positive corporate externalities. Typically, those wider societal benefits can be twice as large as the private gains to the companies that make those advances. Companies' research and development (R&D) expenses put a monetary value to their investment in innovation. However, that data is infrequently disclosed, which would leave our analysis of most companies heavily dependent on inferred estimates. To provide more granularity, we collect data on the number of patents companies register, disclosure of which is mandatory[13]. Patents and R&D spending are well correlated in most sectors, allowing us to estimate the latter for those companies for which spending data is not disclosed.

Discrimination (in wages)

The discrepancy in wages paid to men and women has become a high profile and well documented challenge in recent years. The effects of discrimination spread far wider than pay differences but that gap remains a major and tangible component of the discrimination that affects most societies. Outside a few isolated countries or companies, data on wages paid to men and women remains very sparse. However, some employee review sites – such as Payscale – separate answers to questions on salaries into those provided by men and women, allowing us to estimate the average pay gap at companies with sufficient reviews. We recognise the challenges of relying on survey data but consider that information the most reliable basis upon which to compare companies' approaches to compensation. We aggregate responses for each company based on their worldwide operations[14], estimate the global gender pay gap of each one and multiply that pay gap by each organisation's total wage bill. That value provides a measure of the exposure each company has to the costs of wage discrimination. A company paying similar wages or with small compensation costs would have a low contribution to the global challenge, whereas a large employer with a wide gap would have a significant impact. We have not assigned any benefit for those companies paying higher wages to women than men.

Obesity

Obesity is a major global challenge, in which nutrition is a major factor. Unhealthily formulated food products are a substantial contributor to the problem, implying very different exposures for companies reliant on processed, sugary foods from those focused on natural products. To discriminate between food producers, we have turned to product reviews like those created by Goodguide or EWG, which are designed to inform concerned consumers and provide objective and consistent assessments of the health benefits of individual food and beverage products. Ratings are typically on numerical scales for popular products, allowing us to estimate group level averages by aggregating reviews of all the products they sell. By combining data from different research firms – whose conclusions are typically well-correlated – we draw on the maximum volume of reviews possible to gauge the overall "healthiness" of companies' portfolios. By multiplying that score by the value of food products companies manufacture, we estimate the contribution companies make to obesity[15].

Subsidies

Some industries draw heavily on direct subsidies from national governments, limiting their ability to fund other public services. Companies rarely highlight the level of subsidies they receive, making analysis difficult using their public reporting. However, that data is often required by many countries' laws and a number of civil society groups have emerged to aggregate that data. For example, Subsidy Tracker in the US and the UK's Corporate Welfare Watch document the subsidies companies receive from a range of public agencies, providing us a way to monitor payments to individual companies across major economies. We recognise both that direct payments are one of many types of fiscal support and that because databases are national, a comprehensive global view is not possible. However, the approach provides a relatively rounded and valuable view of the direct drag each company places on public coffers.

13 We use the WIPO database to source patent registration information, using carefully tested search terms for each company. There is typically a 6-12 month lag before patents are registered, so we use annual average patent volumes over the last three full years.

14 Payscale includes survey responses for over 48,000 companies globally, including national subsidiaries of multinational organisations, which we aggregate to estimate group figures, using the numbers of reviews for each national site to weight responses for national subsidiaries.

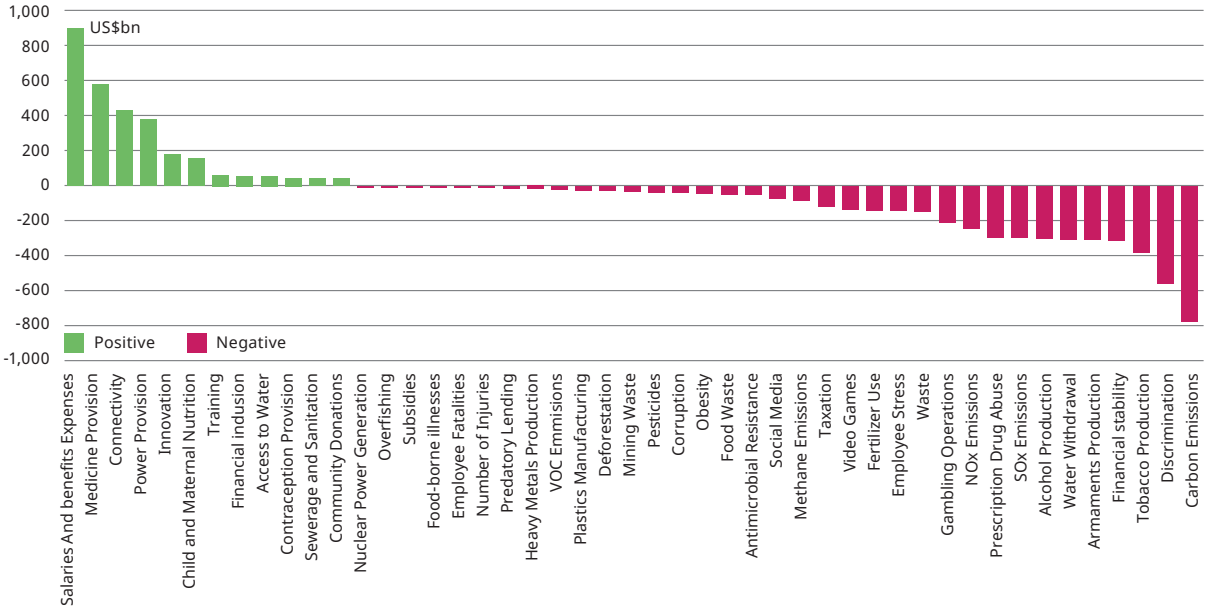
15 Reviews are typically on a 1-10 scale, which we reverse so that higher scores represent less healthy products. As a result, companies selling larger, or more unhealthy foods are attributed higher shares of the global cost whereas smaller producers or those with the most healthy portfolios are assigned lower shares of the global cost.

Summarising the results

The social impact of listed companies

The different impacts we have identified span large positive benefits to large negative costs. The chart below shows the total positive or negative impacts attributable to the ~9,000 listed companies in the global MSCI All Country World Investable Market Index. The most important – by the magnitude of their impact – are generally unsurprising: the wages companies pay and their discrimination in doing so, the medicines they develop, the environmental damage they create. Taxation also plays a critical role for many companies, with the overall value reflecting a combination of positive and offsetting negative effects.

Figure 14: Listed companies' social and environmental impact by measure, $ trillion



Source: Schroders.

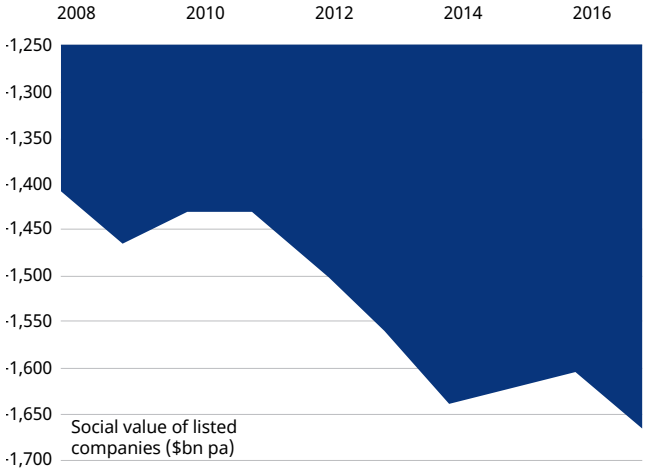
The figures plotted above differ from the global costs that might be more familiar to some readers. Only a share of those global costs and benefits can be attributed to listed companies – in total, net costs attributable to listed companies represent around one-fifth of the gross global costs to society of the externalities we have identified.

Those social and environmental costs are also growing quickly, rising by one-fifth since the global financial crisis. We have plotted that growth in the chart overleaf (Fig 15), applying a consistent approach to the analysis and inflating costs in line with global inflation (using the global GDP deflator series)[16].

Going forward, we expect those costs to continue rising, reflecting the expanding role of listed companies in the global economy and society, making analysis of these impacts increasingly important.

16 To create this timeseries, we have selected a subset of key measures for which historical data is available and tracked those costs over time. As a result the latest global cost shown here does not equate to the global cost calculated using all measures.

Figure 15: Social and environmental costs of listed companies are growing



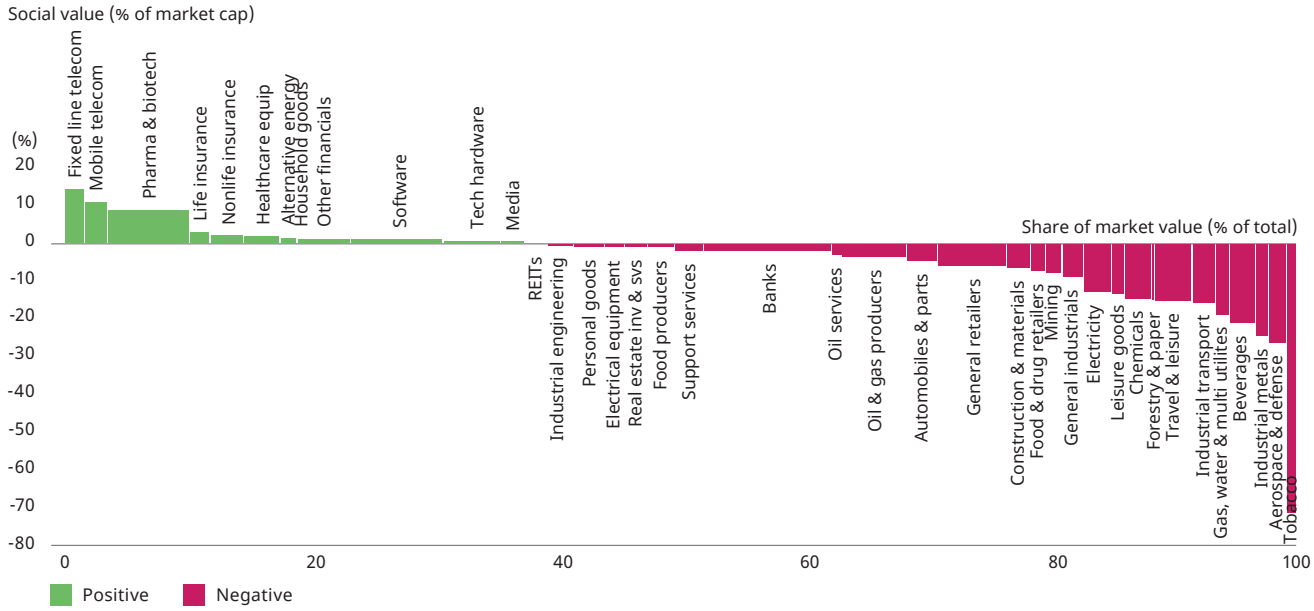
Source: Schroders.

Social and environmental impact across sectors

Looking across sectors, net exposures also vary significantly. The chart below (Fig 16) shows the total positive or negative impact of each sector, relative to the sales of companies in each sector. The height of each bar represents the externalities companies in each sector do not recognise, as a ratio of their market value. The width of each bar represents the market value of each sector.

In general, the sector rankings are relatively predictable: cigarette makers, arms manufacturers and airlines dominate the bottom of the list. Companies developing drugs or providing internet or telephony access sit among the highest social value creators.

Figure 16: Wide range of exposures across sectors



Source: Schroders. The height of each bar represents its total social and environmental impact (separate categories shown) relative to market value. The width reflects the market value of companies in each sector.

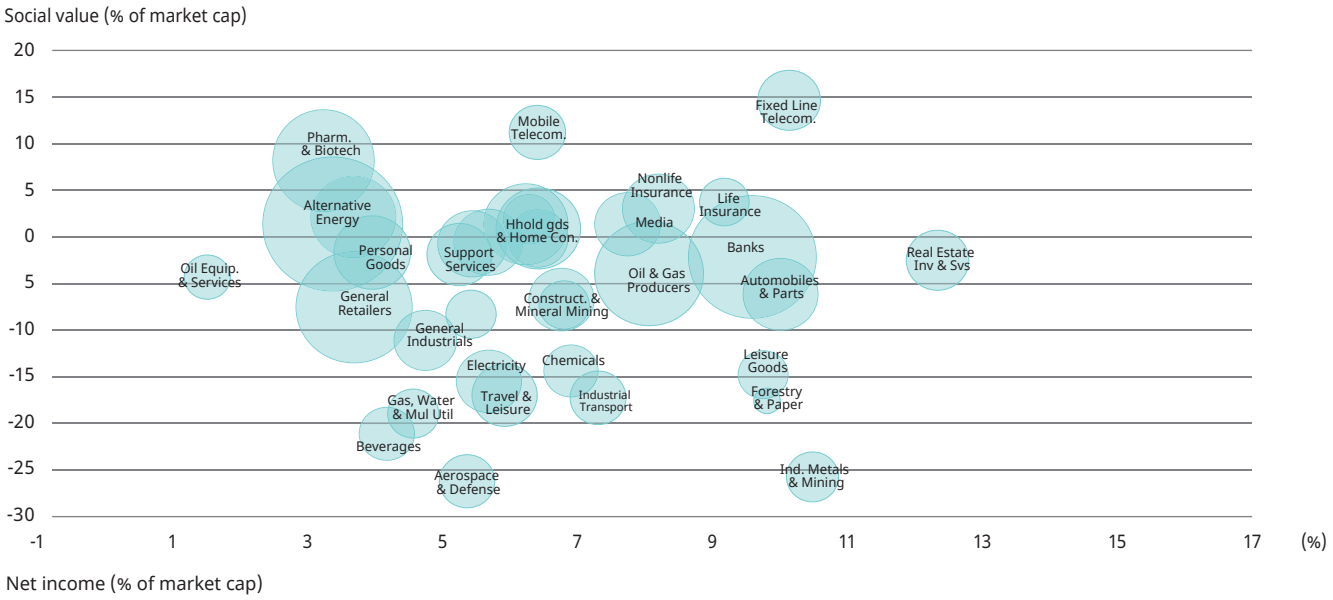
Taking the analysis a step further, the scatter chart below plots social value creation of each sector against its net income, both shown as percentages of market capitalisation. It compares the value companies create for investors with the costs and benefits they impose on other stakeholders. While we have shown sector aggregates here, a similar picture emerges looking at individual companies.

Companies toward the bottom left of this chart – where earnings are low and social externalities are high – face the greatest threats. Those toward the top right, where the earnings they generate for shareholders are supported by strong social benefits, are more secure.

It is also clear that there is no necessary trade-off between the calls shareholders and other stakeholders have on companies' value. Insofar as doubts remain about the compatibility of considering sustainability factors with delivering investment returns, our analysis underscores the opposite conclusion.

It's clear that social and environmental externalities are significant and growing. The negative externalities of listed companies equate to almost half of their combined earnings. We believe many of those economic costs will become tangible financial costs or income in the future, borne out by intensifying regulation and social pressure.

Figure 17: No evidence of trade-off between generating value for shareholders and value for society

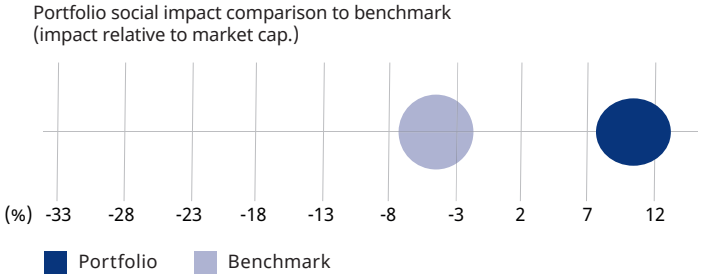


Source: Schroders. Based on analysis of c9,000 global companies, aggregated to Industry Classification Benchmark (ICB) sub-industries. The size of each bubble represents its market value.

Using SustainEx as an investment tool

SustainEx has practical application, as well as compelling theoretical logic. It is designed to help our analysts, fund managers and clients better understand companies' social and environmental impacts, to assess the risks or opportunities they face if, or as, those impacts become financial risks or benefits. Our analysis provides those users with a systematic, quantitative measure of sustainability risk that can be applied across investment strategies.

Figure 18: Assessing overall portfolio exposures (illustrative analysis)



Source: Schroders.

Measuring and monitoring social and environmental impact

Investors have long been able to assess certain aspects of their portfolios through portfolio reporting and question managers on apparent disconnects. We would expect our clients to question us if holdings in a value fund traded on particularly high valuation multiples, if a small cap fund was dominated by large companies or if a healthcare fund took a large position in resource stocks.

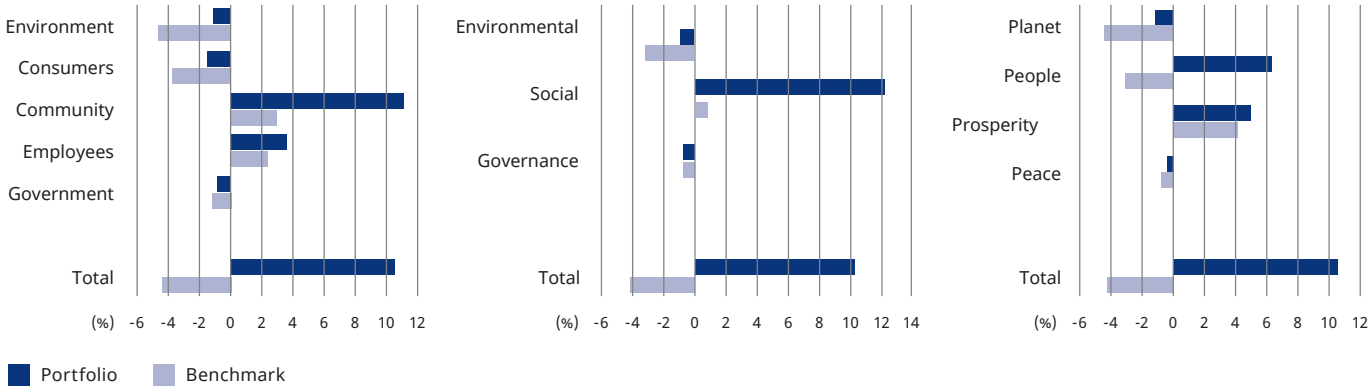
However, similarly objective measures of sustainability-related outcomes have not typically been possible. Investors in these funds have had to rely on the stories managers tell and their trust in them to deliver the outcomes they promise. Alternatively, they have to depend upon generic and generally inappropriate ESG ratings.

Over the last few years, we have been trying to address this blindspot. We have developed tools to allow our clients to assess their portfolios using objective performance measures such as carbon footprints or workforce diversity. We believe SustainEx augments this by providing a more holistic view of social and environmental impact. We will continue to develop tools to help our clients better understand and evaluate the funds we manage for them, along the dimensions that matter to them.

For example, we can use SustainEx analysis to compare portfolio exposures to benchmarks, or to identify outlying companies within a portfolio. Because economic costs or benefits are measured for each impact separately, they can be combined in different ways, for instance by assigning each impact to relevant SDGs, by mapping them to the stakeholders impacted or by separating them into ESG categories. The total costs remain the same, irrespective of how they are allocated.

Figure 19: Examining impacts through different category lenses

Social and environmental impact relative to sales



Source: Schroders. Based on a hypothetical portfolio and benchmark.

Impact measurement vs. impact investing

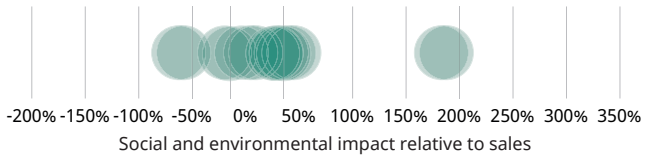
There is a distinction between impact measurement and impact investing.

Every company has a positive or negative social and environmental impact, which can be measured and aggregated to examine the impact associated with every dollar invested in a portfolio. Insofar as most funds invest in public markets, there is rarely a causal relationship between investment in a fund and the portfolio's impact. Investing in a fund may lead the manager to buy more of a company's shares in the secondary market but the money they spend goes to other investors rather than to the company. Impact measurement is valuable in these cases, both to assess future risks and for investors keen to track impacts in specific areas.

This differs from traditional impact investment, which creates a direct link between portfolio investment and social and environmental impact. By putting money into a fund, investors provide capital to portfolio companies and have direct influence on establishing or expanding socially beneficial activities. In equity investing, this almost always requires direct investment in unlisted assets, so that money invested in a fund reaches portfolio companies.

Impact measurement is important in both cases, but there is a clear distinction between measuring the impact of a portfolio of companies and affecting their impact by directly influencing the capital they are able to spend.

Figure 20: Monitoring exposures of individual holdings



Source: Schroders. Based on a hypothetical portfolio. Portfolio chart has a x-axis minimum and maximum fixed at 10th and 90th.

Figure 21 shows the combination of net earnings and social and environmental costs or contributions in each sector, based on SustainEx modelling. The dark blue bars represent the profits of each sector and the green bars the offsetting externalities, most of which are negative. While all sectors are at least slightly profitable currently, close to half would become loss making if invoiced for their social and environmental impacts.

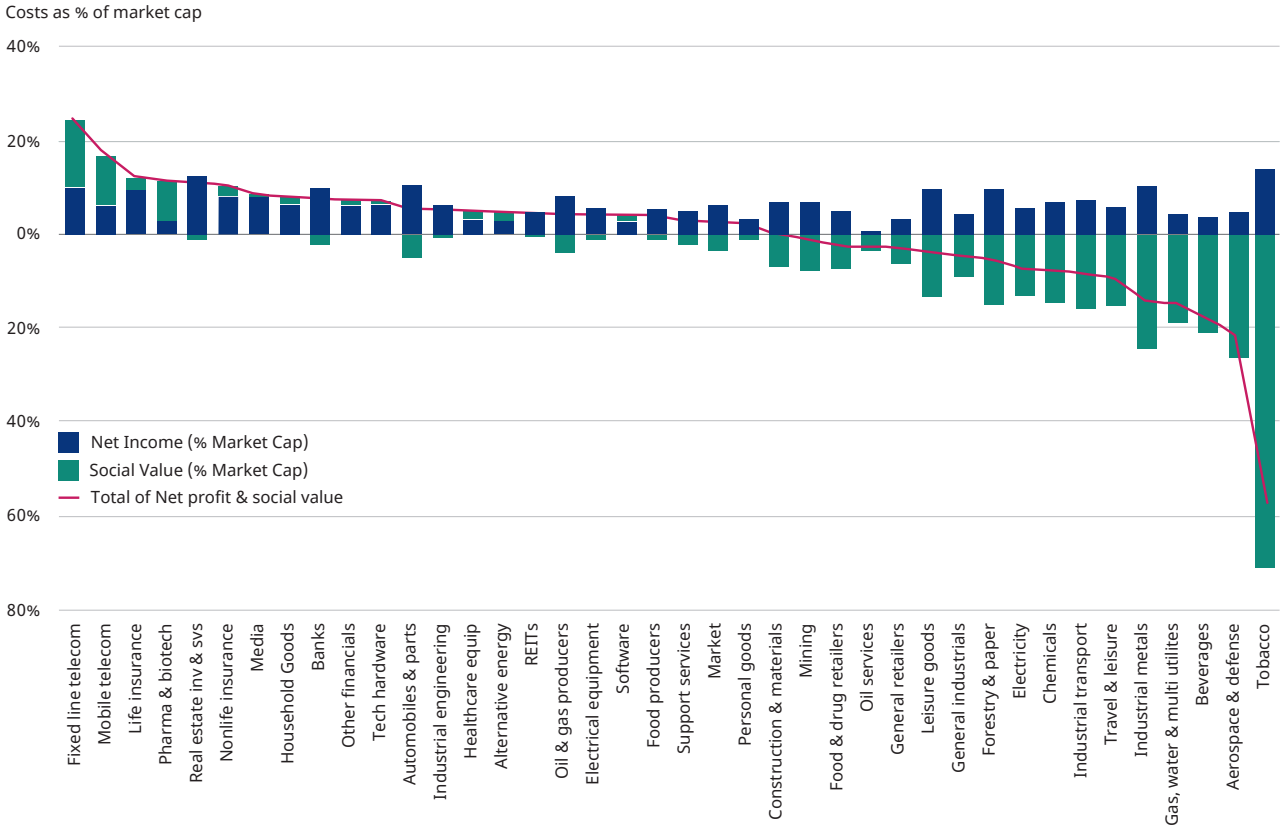
In total, the earnings listed companies generate for shareholders currently total US$4.1 trillion, which would fall by 55% to US$1.9 trillion if those social and environmental impacts crystallised as financial costs. One third of companies would become loss-making. The risk to profit pools and competitive positions is clear.

Assessing and managing investment risk

SustainEx helps investors to identify sources of risk to stocks, sectors or portfolios, on which they should focus analysis of companies' strategies to manage those risks.

Companies that have relied on pushing costs from their own financial statements to governments or societies will come under growing pressure as regulation intensifies. The scale of the externalities companies impose has grown so large that in many industries, those costs exceed their total earnings.

Figure 21: Social value and net profit, both as percentage of market value



Source: Schroders.

How companies manage those risks is a different question and requires different analysis. We have developed a number of tools to help our analysts and fund managers gauge companies' readiness to adapt to the changing pressures they face; detailed company conclusions cannot be reached through formulae alone and benefit from our global industry expertise and fundamental investment heritage. SustainEx provides a valuable guide to help inform the areas on which they should focus.

Portfolio construction

SustainEx is one tool among many we have developed for our analysts and fund managers. It can also provide a standalone measure to use in specific investment strategies. It provides a forward-looking measure of earnings risk, which can be used as a factor alongside more conventional measures, if applied to a large universe in a portfolio comprising a large number of companies which do not rely on stock-specific judgement.

We have worked with our multi-factor investment team to develop the Sustainable Multi-Factor Equity strategy which integrates SustainEx analysis alongside more conventional factors. We noted above that some of the 47 measures described here are built on web data or other unconventional sources, which are likely to prove less stable than those based on data from conventional data providers. As a result, the measures used in that investment strategy and other client solutions will exclude measures that do not reach the level of robustness and stability we require for those uses.

Like any approach to sustainability analysis, SustainEx has most value alongside other investment drivers. Growth and valuation drive share prices; sustainability analysis provides insight into future profitability but is not an investment driver in isolation.

APPENDIX: Impact measurement detail

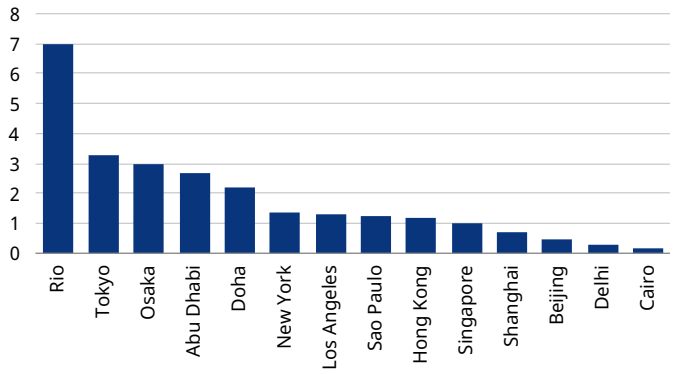
The below is an example of one of the 47 areas of social and environmental impact we identified and used as the basis of the SustainEx framework. We have summarised the reasons for including this measure in our analysis, the approach taken, the social and environmental costs or benefits (in 2018 US dollars) implied by those studies and the sources we have used.

Some of the impacts we use are measurable using widely disclosed and accepted measures. Others rely on unconventional data which may be more variable over time and even unavailable in the future. We note that not all can be included in analysis used in investment products.

Access to water

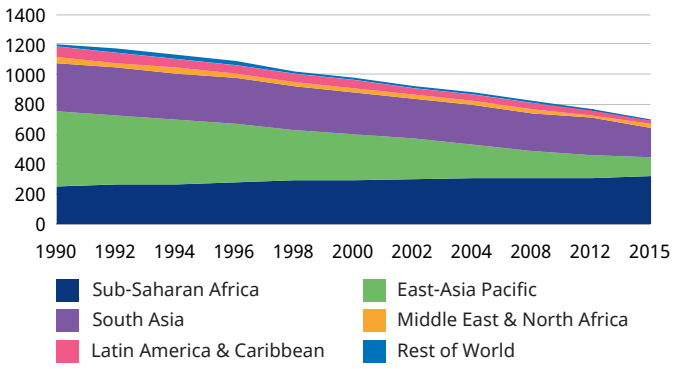
Access to clean drinking water is a cornerstone of human health. Infrastructure to provide clean water results in healthcare benefits, time savings and productivity gains to local populations. Water utilities generate an economic return, but are almost always legally required to charge prices far lower than the value water provides to their customers. According to the Statement of the Committee on the Right to Sanitation, every dollar invested in water yields a $9 economic benefit over the long term. 90% of the world's population now has access to improved water supplies but a significant proportion of emerging market populations remain unserved.

Figure 22: Price of water in selected cities across the world (USD per cubic metre) in 2015



Source: Municipal water utilities, Oxford Analytica, 2015, Schroders, 2018.

Figure 23: Number of people without access to an improved drinking source (millions)

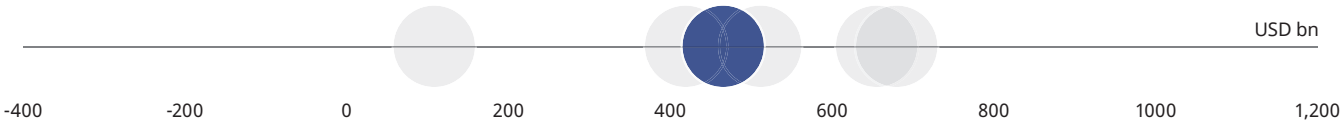


Source: Our World In Data, Schroders, 2018.

Calculating impacts

Whereas most studies focus on the costs to those without access to clean water, we take the opposite approach, estimating the benefits accruing to those who do have access. Extrapolating the costs imposed on people without water access to the rest of the world's population implies a global social value of water access of $418 billion. We assume one-eighth (13%) of this benefit is attributable to publically-listed companies and distribute this impact in proportion to each company's share of global water supply services.

Figure 24: Range of cost estimates: social benefits from Access to Water estimated by each study included in our analysis



Analysis based on the academic sources listed below. Source: Schroders, 2018.

Sources:

Companies' market shares are estimated using data from Bloomberg.
The estimated value of clean water provision is based on a range of estimates from academic and industry research: Benefits of investing in water and sanitation: An OECD perspective; Human Development Report 2006: Beyond Scarcity: Power, Poverty and the Global Water Crisis; Meeting the Challenge of Financing Water and Sanitation: Tools and Approaches; Sanitation Markets Using economics to improve the delivery of services along the sanitation value chain; The Economic and Social Benefits and the Barriers of Providing People with Disabilities Accessible Clean Water and Sanitation; United Nations Statement of the Committee on the Right to Sanitation.

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