



How KPMG True Value helped build the case for electric buses

Cities worldwide must keep a growing number of people on the move while providing a safe, secure and healthy environment.

Fully electric buses have great potential because they are exhaust-free, almost noiseless and can shorten travel time, helping to create cleaner, quieter and more efficient cities. The buses can even operate indoors which offers new opportunities for innovation in city planning and transport routing.

So electric buses might seem to be the obvious choice. However, electric buses face challenges in terms of gaining share in the city transport market space. Municipalities and transport authorities must base their investment decisions on the best available data which usually

focuses solely on direct financial costs. Costs related to environmental and social impacts are rarely factored in because relevant data is not easily available.

That is why Volvo Group decided to show leadership in the transport sector and the global sustainable development movement by quantifying the environmental and social value created by electric buses. In order to do so, Volvo Group chose to partner with finance and sustainability professionals from KPMG member firms and to use KPMG's True Value quantification methodology.

The results transformed conventional approaches to comparing different transport solutions.

"The results of this analysis have the potential to change perceptions, influence decision makers and ultimately to transform urban environments worldwide."



Niklas Gustavsson,
Chief Sustainability Officer,
Volvo Group

The ElectriCity project: a platform for open innovation and assessing the performance of electric buses



About the Volvo Group

The Volvo Group has a vision to become the world leader in sustainable transport solutions. It is one of the world's leading manufacturers of trucks and buses and also provides solutions for financing and service. The group, with its headquarters in Gothenburg, Sweden, employs about 100,000 people, has production facilities in 19 countries and sells its products in more than 190 markets.

In 2014 the Volvo Group's net sales amounted to around US\$33.5 billion.



The KPMG True Value analysis was based on data from many different sources including Sweden's ElectriCity project¹. ElectriCity, based in the city of Gothenburg, is a cooperative venture that brings together industry, academia and society to develop and test solutions for next-generation sustainable public transport. Volvo Group – a key partner in the ElectriCity project – provides fully electric buses, powered by electricity from renewable sources, for testing on a new pilot bus-route in Volvo Group's home town of Gothenburg, Sweden.

Fully electric buses: the transport solution for more sustainable cities

Momentum is building worldwide behind a technological shift towards fully electric city buses. The C40 Cities Climate Leadership Group is committed to rapidly accelerate the implementation of ultra-low emission bus technologies and 23 members have signed the Clean Bus Declaration calling on the finance and transport sectors to support them through technology innovation and financing mechanisms.

The global electric bus market is expected to grow at a compound annual growth rate of 28 per cent between 2014 and 2020, and to reach an estimated annual sales volume approaching 35,000 units by 2020².

¹ www.goteborgelectricity.se/en Retrieved 15 September 2015

² Persistence Market Research. 2015. Global Market Study on Electric Bus.

The approach: building societal costs into the cost of ownership

The objective of the analysis was to understand how the total cost of electric buses compares with that of diesel and biogas buses when social and environmental impacts are taken into account.

In order to do so, Volvo Group, with support from KPMG finance, sustainability and tax professionals, developed an approach called *True* Total Cost of Ownership (*True*TCO).

*True*TCO is based on the established Total Cost of Ownership (TCO) management accounting process that estimates the total cost of acquiring and operating an asset across the entire period of ownership. In the case of a bus, the TCO typically includes the cost of the vehicle lease, fuel, driver costs, garaging and maintenance.

*True*TCO, however, provides a broader picture because it uses quantification



techniques to bring the socio-economic and environmental costs and benefits to society into the analysis.

For example, the *True*TCO of buses also includes the negative effects of noise and pollution on public health, the environmental impacts of manufacturing fuel, contributions to climate change and the time that passengers spend in travelling.

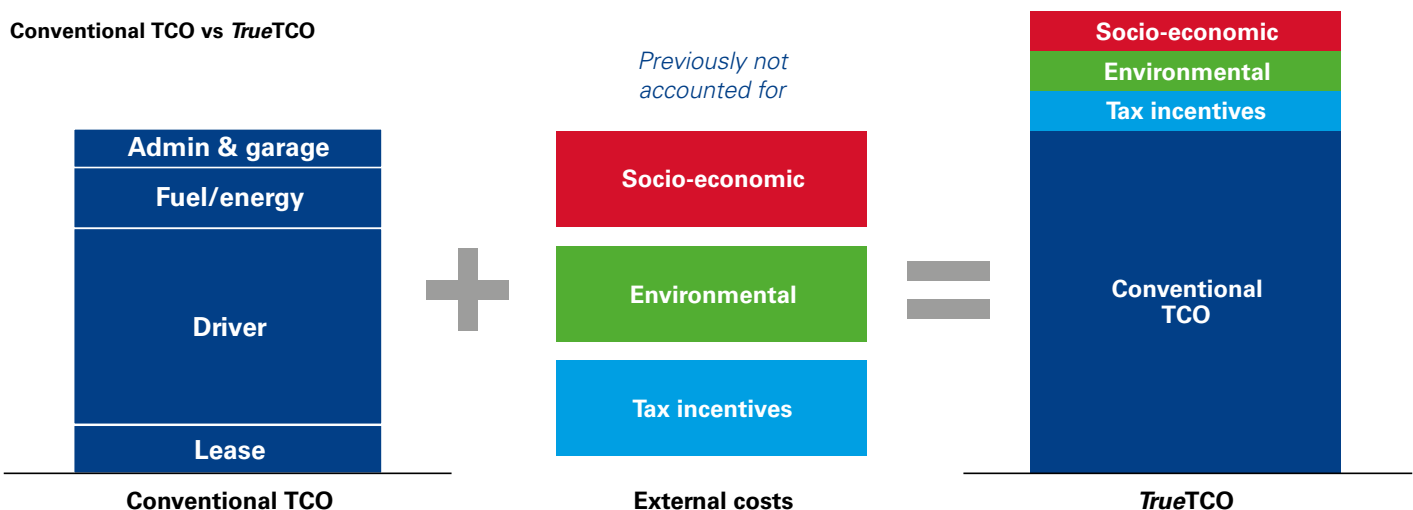
The approach uses valuation techniques from KPMG's True Value methodology which quantifies social and environmental value creation in financial terms (see page 7).

The *True*TCO approach also adjusts costs to assume a level playing field for all technologies in terms of tax incentives and subsidies, thereby enabling like-for-like comparison between electric, diesel and biogas buses.

Volvo Group and KPMG carried out a comprehensive stakeholder dialogue and materiality analysis which identified the following socio-economic and environmental impacts to be quantified in financial terms in Volvo Group's *True*TCO analysis:

INDICATOR	
 ENVIRONMENTAL IMPACTS	Greenhouse gases
	Resource use
	Energy use (non-renewable)
	Local pollution
 SOCIO-ECONOMIC IMPACTS	Conflict mineral use
	Noise
	Safety
	Travel time
	Tax incentives

Conventional TCO vs *True*TCO



The challenge: how do we apply financial values to environmental and socio-economic impacts?

KPMG's True Value methodology monetizes the environmental and socio-economic impacts of an organization and/or its products and services, i.e. quantifies them in financial terms.

A central challenge in every project is to identify robust and credible data which can be used to monetize what are traditionally perceived as non-financial impacts.

Monetization is gaining momentum as an approach to help companies understand, measure and manage the value they create and reduce for society. There is an increasing number of data sources available. Although much of this data is not yet as reliable as that used for financial reporting, monetization does offer a useful means to draw comparisons of scale between social and environmental impacts and to identify those that are most material both to the business and to society.

Volvo Group's *TrueTCO* analysis was carried out in Sweden and was based on production and operating data from Volvo electric, diesel and biogas buses operating in Swedish cities. It was therefore appropriate to look first at monetization data available from Swedish sources.

Much of the data used in the analysis was sourced from ASEK, a Swedish working group on Cost Benefit Analysis in the transport sector. ASEK's data³ is also widely used by the Swedish Transport Administration.

Examples of monetization data used in the analysis

IMPACT	COST US\$*	NOTE
Greenhouse gases	US\$134 (SEK 1,120) per ton of CO ₂	The ASEK carbon price is based on Sweden's politically set cost for carbon (i.e. the Swedish carbon tax) which reflects the estimated required carbon price to reduce emissions according to Swedish government targets.
Local pollution	Various according to type of pollution e.g. SO ₂ , NOx, VOCs	Data was sourced from Volvo Group's LCA database and values derived from ASEK.
Noise	Various according to the level of noise indoors and outdoors. e.g. a noise level of 75 decibels is calculated as having a cost of approximately US\$3,600 (SEK 30,000) per person per year	Traffic noise affects people and has been linked to health issues such as heart conditions and stress. The data published by ASEK was originally produced by the Swedish National Road and Transport Institute.
Energy use	Various according to type and amount of fossil fuel used	Fossil fuel extraction and the resulting depletion of fossil fuel sources increases the level of scarcity and energy security risks. Source: ReCiPe methodology for Life Cycle Assessment ⁴
Travel time	A value of time of approximately US\$6.5 (SEK 55) per hour per passenger was used based on data sourced from ASEK	A higher cost per passenger per hour was used to calculate time spent waiting rather than travelling. This reflects the customer experience better. The cost of waiting time was derived from various academic and government studies.

*Currency conversion rate: 1 Swedish Krona = US\$0.12

3 www.trafikverket.se/contentassets/13c6f625c3324bc4b34a59c9f4594703/20_english_summary_a52.pdf
Retrieved 10 September 2015

4 www.lcia-recipe.net Retrieved 24 September 2015

The results: what did we learn?



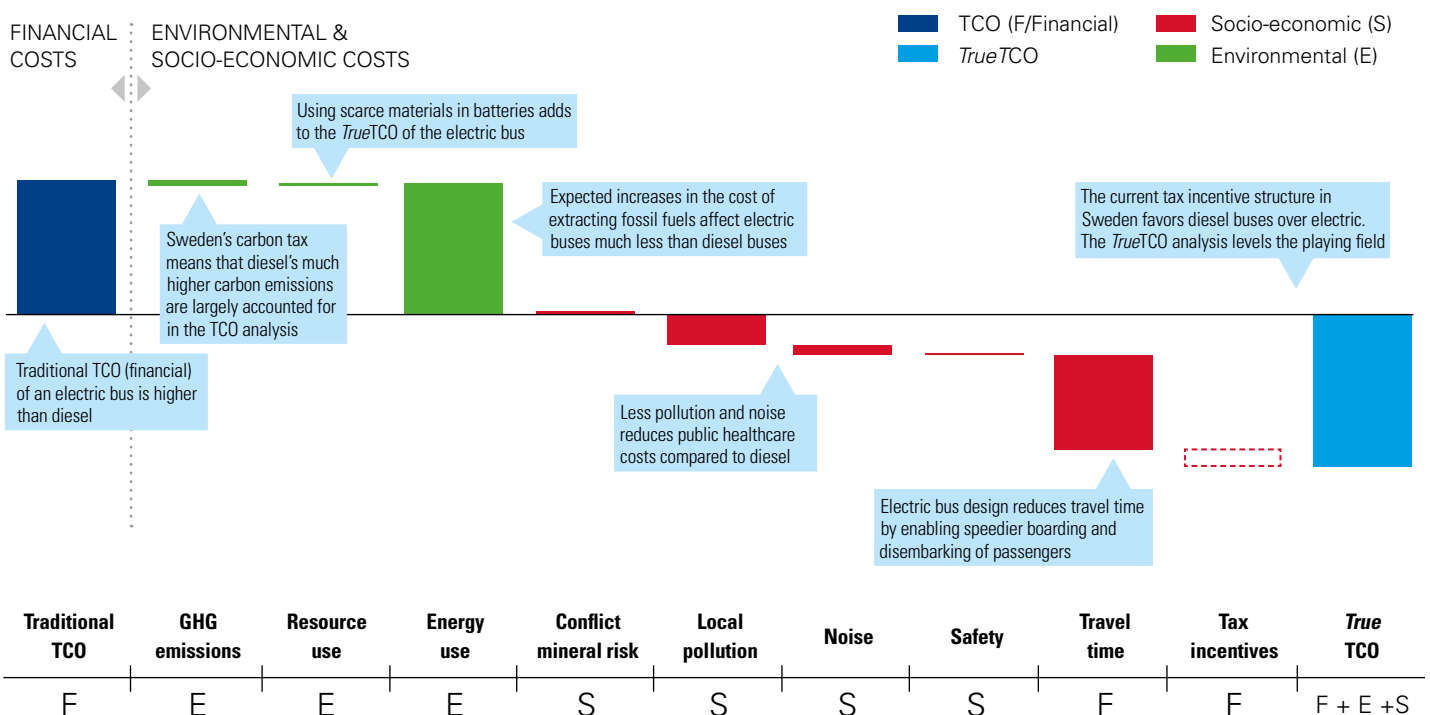
The *True*TCO of an electric bus is lower than that of a diesel bus

The value bridge below demonstrates how the *True*TCO analysis changes the conventional view of costs. The bars represent the difference in costs between an electric bus and a diesel bus.

The bar on the far left shows that the *True*TCO of an electric bus is higher than that of a diesel bus when only direct financial costs are taken into account. The bar on the far right shows that the *True*TCO of an electric bus is lower than that of a diesel bus when the costs of environmental and socio-economic impacts are taken into account.

KPMG True Value Analysis Comparison of *True*Total Cost of Ownership of electric bus vs diesel bus

*True*TCO per bus per year



TrueTotal Cost of Ownership transforms the business case for electric buses

Whereas the traditional TCO management accounting technique suggests that electric buses are more expensive than both biogas and diesel buses, the situation is reversed when the *TrueTCO* approach is applied.

The analysis showed that the *TrueTCO* of electric buses - i.e. when the costs of environmental and socio-economic impacts are taken into account - is lower than that of both biogas and diesel.

Furthermore, electric is the only technology to see a reduction in ownership costs when the *TrueTCO* lens is applied: both biogas and diesel see an increase in costs when environmental and social factors are considered.

N.B *TrueTCO* calculations were made assuming 100% renewables-derived electricity. If the electric buses ran on 100% coal generated electricity, the *TrueTCO* would increase but it would still be significantly lower than that of biogas or diesel buses.

Electric buses could deliver significant environmental and social benefits if implemented nationally

The analysis suggests that if all city buses in Sweden were electric, it could save Swedish society approximately US\$225 million (€199 million) per year of which US\$45 million (€40 million) could be savings in public healthcare costs.

Passengers could save 14 million hours of travel time per year and Sweden's carbon emissions could be reduced by 84,000 tons per year (approximately equivalent to the annual per capita emissions of 15,000 Swedish citizens).

The current tax system has unintended consequences

The analysis demonstrated that the current tax system in Sweden, despite placing a high cost on carbon, creates an uneven playing field for technologies. This could reduce the incentives for the adoption of electric bus technology and its benefits for society.

What next? How will Volvo Group use the analysis?

The analysis helps to increase awareness of the environmental and socio-economic impacts of city transport. It also helps city municipalities and transport authorities worldwide to make decisions on city planning and the future development of their transport systems.

It is a strong example of how business can drive sustainable innovation and change by quantifying external social and environmental impacts that, until now, have usually been unpriced.

Volvo Group is sharing the results widely to show how the transportation sector can play a key role in developing the sustainable cities of the future.

The analysis supports Volvo Group's vision to be the world leader in sustainable transport solutions. It contributes to a number of the UN Global Goals for Sustainable Development⁵, launched in September 2015, and is also aligned with the WWF Climate Savers program⁶.

UN GLOBAL GOALS

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

11 SUSTAINABLE CITIES AND COMMUNITIES



Make cities and human settlements inclusive, safe, resilient and sustainable

12 RESPONSIBLE CONSUMPTION AND PRODUCTION



Ensure sustainable consumption and production patterns

13 CLIMATE ACTION



Take urgent action to combat climate change and its impacts

⁵ www.globalgoals.org Retrieved 10 September 2015

⁶ www.climatesavers.org Retrieved 10 September 2015

WHAT IS KPMG TRUE VALUE?

KPMG True Value is a tool to understand how the value a business creates and reduces for society is likely to affect the value it creates for shareholders. This knowledge provides a new lens for decision-making to improve performance, inform strategy and increase influence. KPMG True Value is a 3-step process that can be applied across sectors and geographies. It is scalable and can be applied to a whole company, a division or a specific project. For more on KPMG True Value please visit kpmg.com/truevalue

- STEP 1:** Identify the value a company creates and reduces for society through its externalities and express this in financial terms
- STEP 2:** Assess how the internalization of externalities is likely to affect future earnings (through regulation, stakeholder action and market dynamics)
- STEP 3:** Develop business cases that build and protect future value for shareholders by increasing the value created for society

Where has KPMG True Value been applied?



Cement: **Holcim/Ambuja Cement** (India)

Holcim subsidiary Ambuja Cement used KPMG's True Value methodology to quantify risks to its future profitability. As a result, Ambuja has identified projects that will benefit society and boost future profitability. Holcim has also applied the KPMG True Value methodology at other subsidiaries and at corporate level.



Retail: **Kingfisher** (Europe and Asia)

Kingfisher is a leading home improvement retailer with 1176 stores in 11 countries. KPMG member firms have provided assurance on Kingfisher's reporting of its Net Positive initiative which aims to make a positive contribution to people and the environment, while growing a stronger, more profitable business.



Finance: **private equity** (Europe)

KPMG True Value has been used at the private equity arm of a global financial institution to quantify social and environmental risks and opportunities at a number of portfolio companies. The analysis has helped the firm identify strategies to reduce risk and build long-term value within its portfolio.



Food production and retailing: **major food retailer**

KPMG member firms worked with an international food retailer to quantify the societal value the company creates and reduces through its food products. This analysis has helped the company to develop its corporate responsibility strategy.

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