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Sustainable Investment Spotlight

Sustainable Investment Research, Bank J. Safra Sarasin

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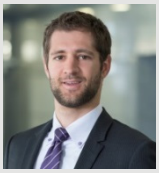
Authors



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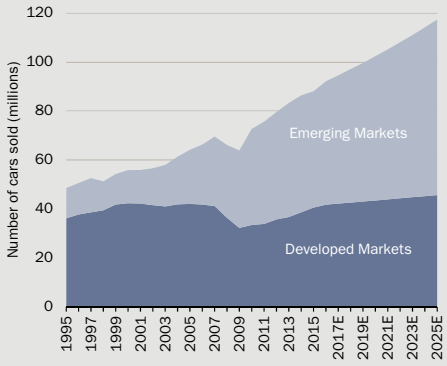
The Mobility (r)EVolution is coming

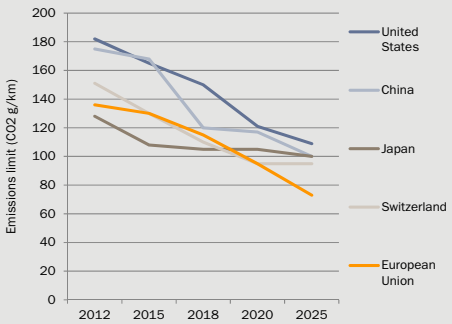
- **The combination of new technologies and environmental and regulatory pressure has paved the way for a mobility (r)EVolution.**
- **Solutions exist at the crossroads between the electric vehicle, car sharing and autonomous driving trends with a promise of cleaner, safer, cheaper and easier mobility.**
- **More technological, political, societal and regulatory challenges need to be tackled in order to fulfill this promise, which will reshape individual and mass mobility.**
- **Our integrated sustainable investment approach identifies the critical risks and opportunities along the mobility value chain while fueling the (r)EVolution.**

Chart 1: Continued car market shares to emerging markets



Sources: ICCT, Bank J. Safra Sarasin, 2017

Chart 2: Tightening vehicle emissions standards



Sources: UBS, Bank J. Safra Sarasin, 2017

Strong drivers for a (r)EVolution

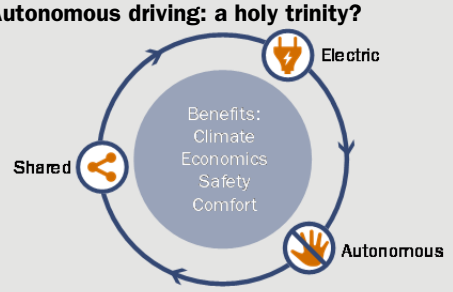
Mobility is essential for society and the economy, but creates unsustainable environmental and social challenges. Indeed, road transportation is a major contributor (around 15%) to global CO2 emissions, while the growth of the automobile market, mainly driven by emerging countries (chart 1), continues to push this number up.

CO2 emissions from road transportation are therefore a key target of global climate action, notably through vehicle emission standards (chart 2). At the same time – and as outlined in our 2015 publication *New Drives Needed* – the "dieselgate" affair made clear that such standards are impossible to meet in the long term with conventional internal combustion engine (ICE) technologies.

Furthermore, the current ownership and utilisation model – 1.2 passengers per car on average in the US – is more than just a cost burden to society. Riding solo generates congestion which represents 6.2 days lost in traffic jam for an average London driver every year, not mentioning fuel waste and related emissions. In parallel, in the US, a third of urban land is dedicated to parking spaces, with cars staying idle 95% of the time. Besides this, road accidents cause 1.2 million deaths globally every year.

Three reinforcing trends in mobility: electric vehicles (EV), car sharing and autonomous driving have the potential to bring about the (r)EVolution needed to address these challenges.

Chart 3: Electric vehicles, Car sharing and Autonomous driving: a holy trinity?



Source: Bank J. Safra Sarasin, 2017

From an environmental perspective, electric vehicles could indeed reduce CO2 emissions drastically if coupled with a clean

electricity supply and a sustainable management of a vehicle's life cycle.
Ride sharing further holds the potential to significantly reduce the number of vehicles on the road and consequently congestion, emissions and the need for parking space – thus also unlocking land for new usage.

Shared Mobility

Shared Mobility has existed for decades, mainly in the form of taxis. The business model is fast becoming disruptive with the growth of private car hire (e.g. Uber, Lyft), car clubs (e.g. ZipCar) and car-pooling (e.g. BlaBlaCar). Urbanisation, demographics and asset efficiency point to a continued fast growth in car-on-demand. Autonomous driving will meaningfully support this trend, as exemplified by the Swiss Mobility Car Sharing company, now testing its first co-developed autonomous driving vehicle. Longer term, shared mobility is probably the biggest threat to future new car sales.

Furthermore, higher usage rate of vehicles as a result of ride sharing can make electric technology more economical.
As a complement to this, autonomous driving can improve both road safety and mobility access by making sharing practices easier and cheaper.

Autonomous Driving

Regulators and automotive associations have set up a common roadmap that defines autonomous driving levels from 1 to 5. Although Tesla and other companies have already tested self-driving cars, it seems unlikely that completely autonomous vehicles will hit the road before the middle of next decade. The advanced driver-assistance systems built into cars today are indeed considered only level 1 or 2. Reaching levels 4 or 5 requires overcoming significant regulatory and technological hurdles, such as integrating artificial intelligence that can make decisions on any possible condition and real-time high-precision 3D mapping.

These three trends operate in a reinforcing dynamic (chart 3) and hold the promise of a cleaner, safer, easier and cheaper mobility.

Is the time ripe?

Major technological, political and societal challenges need to be tackled in order to fulfil this promise. As history suggests (chart 4), and despite a renewed momentum in the development of electric vehicles since the late 2000s, the road to the (r)EVolution therefore remains rocky.

Chart 4: Brief EV history and a look into the future

1884

Thomas Parker, an English engineer, builds (one of) the first electric car.

1899

Ferdinand Porsche presents his electric P1 to an international automobile exhibition in Berlin where 20% of manufacturers were showcasing electric vehicles.

30%

1900

Electric cars account for 30% of all vehicles on the road in the US.
New York City has a fleet of 60+ electric (but not autonomous) taxis.

1912

The (disruptive) Ford T is launched, opening the way to a long domination of ICE technology.

1996

General Motors launches the EV1 model but soon gives up on it on profitability grounds.

1997

The development of hybrid and electric vehicles technology restarts with the launch of the emblematic Toyota Prius.

1%

2015

The auto industry is at the center of attention after the dieselgate. The electric and hybrid offering has become significantly broader (30+ models) but its global market share remains very low.

20%

2030

15 car makers plan to launch more than 50 new EV models by 2030 with high sales ambitions. Given current challenges to mass adoption we however expect only a very gradual penetration of EVs in new car sales.

Source: Bank J. Safra Sarasin, 2017

Developing and mass-producing electric vehicles indeed implies profound changes in the value chain. The manufacturing of batteries, for example, requires large quantities of metals such as lithium, cobalt and graphite which are often found in sensitive regions – notably the Democratic Republic of Congo. Technological change is thus exposing the car industry to typical mining issues from water stress to corruption risks through to biodiversity impact.
Further down in the life cycle of vehicles, going electric essentially means transferring emission challenges from car usage to electricity generation. By the same token, the disposal and recycling of used batteries is critical if electric technology is to deliver its green promise. Exemplary business practices are therefore required to enable the sustainable development of electric technologies.
The development of autonomous driving and car sharing will also disrupt many business models with consequences for employment in the transportation industry, encompassing taxi and truck drivers as well as all related services. Fear of social consequences must not be overdone, as history shows that technological (r)evolutions do not happen overnight and tend to create more new jobs than they destroy at a global level. Potential consequences for individuals must however not be ignored.
From a technological and economic perspective, and although efforts in e-mobility have intensified, we think that significant contributions to car makers' sales and earnings are unlikely before the middle of the next decade. Evolutions of drive range, cost of ownership as well as infrastructure (chart 5) and customer adaptation will allow only a gradual shift to electric vehicles. Companies will therefore experience a period of double-spending on rival technologies: internal combustion engines and electric powertrains.

Chart 5: Competing Technologies

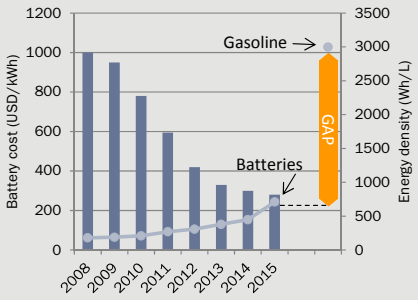
	Hybrid Electric Vehicle (HEV)	Plug-in Hybrid Electric Vehicle (PHEV)	Battery Electric Vehicle (BEV)	Fuel Cell Electric Vehicle (FCEV)
Greenness	+-	+	++ *Potentially**	+ *Potentially**
Drive Range	++	++	+- *progressing*	+
Infrastructure	++	+	+- *progressing*	- -
Total Costs	low *growing*	high *diminishing*	high *diminishing*	high
Principles	Runs on gasoline/ diesel → engine charges the battery → vehicle runs on battery or gasoline/ diesel depending on the situation	Same as HEV but larger battery capacity that can be charged from external electricity sources	Fully electric (no Internal Combustion Engine) → vehicle runs on battery	Runs on hydrogen → Fuel Cell charges the battery → vehicle runs on battery
*Energy Source(s)	Oil	Oil Coal Renewables Nuclear	Coal Renewables Nuclear	Coal Natural Gas Biomass

Source: Bank J. Safra Sarasin, 2017

Among these challenges, the key issue remains battery technology with a need for significant progress in energy density, costs

and life cycle management to catch up with conventional motors (chart 6). Indeed, the battery currently represents about 40% of an electric car's cost, while energy density – expressed in Wh/L both for batteries and fuels – which is a key parameter in the vehicle's driving range, is 6 times lower for batteries compared to gasoline.

Chart 6: Sinking battery costs but high energy density gap vs. conventional powertrain technology



Sources: IEA, Bank J. Safra Sarasin, 2017

Currently, most investments are made in two technologies – PHEV and BEV – but breakthroughs could emerge from alternatives such as fuel cells. The Japanese government and car makers are betting on it. This also highlights the role of politics in providing an enabling environment for a new mobility paradigm.

Regulations boosting the mobility (r)EVolution

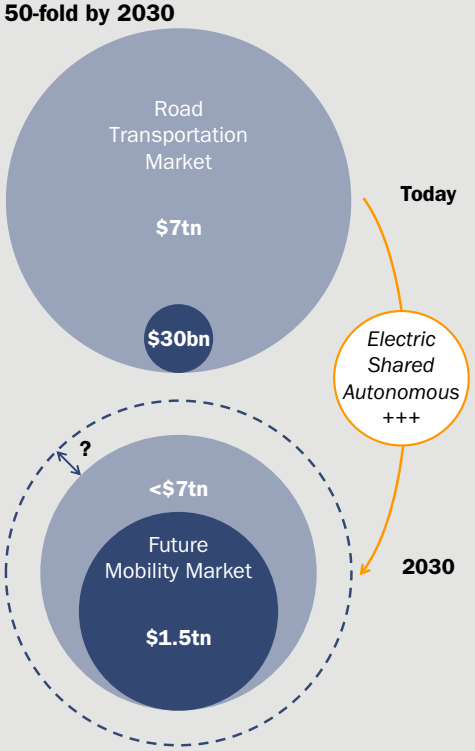
On the back of global climate action, governments are taking initiatives to promote the adoption of electric vehicles and foster ride sharing and autonomous driving. Beyond emissions standards, various forms of initiatives are indeed being tested around the world. These entail fiscal incentives at purchase, circulation advantages such as toll roads and parking fee exemption in Norway, or requirements for car makers like China's 12% target setting for EV penetration by 2020. As a key enabling factor, the current lack of infrastructure is also actively being addressed by some governments, as seen in the EU with a requirement for new buildings to include recharging facilities. Removing legal obstacles completes the picture, as the state of California, for example, is updating local regulations in order to allow driverless cars on the road by the end of 2017.

Winners and losers

The evolution of mobility has the potential to cause large shifts in people's mobility behaviour. This will disrupt many of today's business models while offering opportunities for outside technology rivals.

Electric vehicle, car sharing and autonomous trends should indeed lead to a much higher utilisation rate of vehicles and therefore result in a smaller overall road transportation market characterised by lower demand for new vehicles and reduced volumes and prices for maintenance, insurance and other related services.

Chart 7: Future Mobility market growing 50-fold by 2030

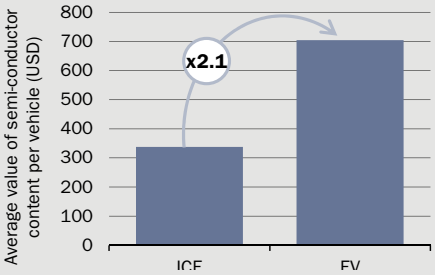


Sources: McKinsey, Rocky Mountain Institute, Roland Berger, BoAML, Bank J. Safra Sarasin, 2017

At the same time, opportunities in the future mobility market will explode from $ 30 billion today to $ 1.5 trillion in 2030. New entrants benefiting from this boom are emerging primarily in the chemical and IT sectors with the development of batteries and the increase of IT components in cars (chart 8), driven both by electric and autonomous trends. This development is accompanied by cooperation models, as exemplified by BMW and Intel/Mobileye, in the field of autonomous driving. Traditional players can thus embrace the new mobility paradigm and survive in what is otherwise a losing game for global incumbents.

On a secondary level, the development of charging infrastructure and additional demand for (green) power – implying 8 to 30% growth in grid capacity by 2050 depending on the pace of EV penetration – also expands the field for industrial and utilities companies.

Chart 8: EV technology doubles the semiconductor content of vehicles



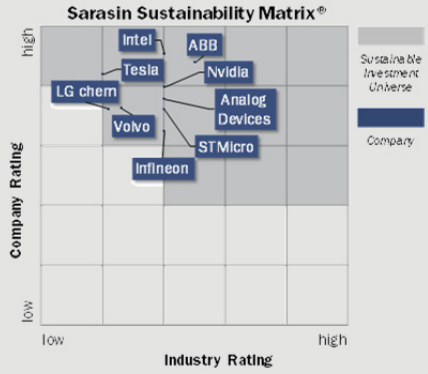
Sources: Bernstein Research, Bank J. Safra Sarasin, 2017

How to invest in the (r)EVolution

A thematic cross-sector approach is key to benefiting from the mobility (r)EVolution.

The sustainable investment research approach enables us to assess companies' preparedness for mid- and long-term challenges as outlined in the previous sections. We also analyse the companies' positioning with respect to their mobility product and services strategic positioning across many industries, e.g. automobiles, transport, software, semiconductors. Generally we favour technology challengers rather than traditional automotive manufacturers, due to the economics and future-orientation of their business models (chart 9).

Chart 9: Selection of (r)EVolution-fit companies



Source: Bank J. Safra Sarasin, 2017

Only by combining financial and sustainability analysis can investors assess companies' fitness for such profound change. As a result of our integrated sustainable investment approach, we are able to identify companies that are best prepared to harness the (r)EVolution, to the benefit of our clients and the future of mobility.

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The environmental, social and governance (ESG) analysis of companies is based on a proprietary assessment methodology developed by the Sustainable Investment Research Department of BJSS. All ratings are conducted by in-house sustainability analysts. The sustainability rating incorporates two dimensions which are combined in the Sarasin Sustainability-Matrix® :

- Sector Rating: Comparative assessment of industries based upon their impacts on environment and society.
- Company Rating: Comparative assessment of companies within their industry based upon their performance to manage their environmental, social and governance risks and opportunities.

Investment Universe: Only companies with a sufficiently high Company Rating (shaded area) qualify for Bank J. Safra Sarasin sustainability funds.

Key issues

When doing a sustainability rating, the analysts in the Sustainable Investment Research Department assess how well companies manage their main stakeholders' expectations (e.g. employees, suppliers, customers) and how well they manage related general and industry-specific environmental, social and governance risks and opportunities. The company's management quality with respect to ESG risks and opportunities is compared with its industry peers.

Controversial activities (exclusions)

Certain business activities which are not deemed to be compatible with sustainable development (e.g. armaments, nuclear power, tobacco, pornography) can lead to the exclusion of companies from the Bank J. Safra Sarasin sustainable investment universe.

Data sources

The Sustainable Investment Research Department uses a variety of data sources which are publicly available (e.g. company reports, press, internet search) and data/information provided by service providers which are collecting financial, environmental, social, governance and reputational risk data on behalf of the Sustainable Investment Research Department.

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