Batteries
At the Centre of E-Mobility
A review of social and environmental aspects
# Table of contents

Summary 3  
   Key findings 4  
   Where action is required 4  

1. **Introduction: The demand for raw materials – an Achilles’ heel** 5  
   1.1 Abuses in the raw materials mining sector 5  
   1.2 Increasing demand for raw materials 7  
   1.3 China’s domination of the battery manufacturing industry 7  

2. **Goal: Assessment of companies’ due diligence policies** 9  

3. **Methodology: Basing our findings on corporate publications** 10  

4. **Outcome: Strategy good but implementation lacking** 11  
   Summary of the results 11  
   4.1 Human rights: implementation found wanting 12  
   4.2 Some raw materials missing from the spotlight 12  
   4.3 Environmental measures not on track 13  

5. **Recommendations: Promoting recycling and alternative forms of transport** 14  
   5.1 Due diligence 14  
   5.2 Recycling 15  
   5.3 Reducing the number of individual cars on the road 16  

6. **Individual evaluations** 17  
   ABB 17  
   BYD 17  
   CATL 18  
   LG Chem 18  
   Panasonic 19  
   Samsung SDI 20  
   SK Innovation 20  

7. **Abbreviations** 22  

8. **Endnotes** 23  

## PUBLISHER’S IMPRINT

Publisher: Bread for all, Swiss Catholic Lenten Fund, ATE Swiss Association for transport and environment  
Authors: Karin Mader, Nicolas Schärneli  
Editing: Gabriela Neuhaus  
Translation: Intertext, Berlin  
Full report: [www.sehen-und-handeln.ch/battery](http://www.sehen-und-handeln.ch/battery), [www.verkehrscub.ch/battery](http://www.verkehrscub.ch/battery)  
Summary: [www.sehen-und-handeln.ch/battery-factsheet](http://www.sehen-und-handeln.ch/battery-factsheet), [www.verkehrscub.ch/battery](http://www.verkehrscub.ch/battery)  
Layout: Jonny Wüthrich, Vorlagenbauer  
Graphics: Karin Hutter  

Berne, Lucerne, Lausanne, August 2020
A move away from the use of fossil fuels and towards more climate friendly forms of transportation will only be possible if the e-mobility sector is substantially expanded. This is relevant to Switzerland, one of the countries in which the sale of electric vehicles is accelerating. At the core of these vehicles lies their Electric Vehicle Battery (EV), which stores energy for the electric motor. However, manufacturing these batteries not only consumes a substantial amount of energy, but is also responsible for various forms of ecological and social damage. The growing demand for the raw materials required in their production is especially problematic.

The charities Brot für alle (Bread for all), Fastenopfer (Swiss Catholic Lenten Fund), and the ATE Swiss Association for transport and environment have shed light on the corporate policies of the six leading international battery manufacturers and a large Swiss technology company to gain insight into how environmental and human rights concerns are dealt with in this industry. The companies’ own data from their sustainability and Corporate Social Responsibility (CSR) reports were analysed in order to examine the following questions:

- Are they complying with internationally agreed guidelines?
- Do they ensure that their subcontractors and their business partners along the supply chain also protect the environment and respect human rights?

Corporate policies regarding human rights, raw materials and the environment were examined on the basis of a total of 39 criteria. The companies in question were then sent their results and invited to supply feedback. Four of the seven companies responded, and their follow-up information was taken into account when preparing the final evaluation.
Key findings

Global market leader brings up the rear
The three South Korean manufacturers Samsung SDI, LG Chem, and SK Innovation as well as the Swiss company ABB fared better in the overall evaluation than the Japanese producer Panasonic and the two Chinese manufacturers BYD and CATL. The results for CATL, the global leader for car batteries which is currently expanding strongly in the Western market, gave particular cause for concern.

Strategy good but implementation lacking
The majority of the companies under scrutiny have developed strategies and policies indicating how they would like their suppliers to behave. However, their own publications provide little detail about whether or not these policies are implemented. Progress tracking by defining specific objectives and target figures is even less convincing.

Problems in the supply chains
Internal corporate structures and processes allow abuses in the supply chain to be identified, although they are only rarely followed up or rectified. Stakeholders from civil society are seldom brought on board to help define joint solutions. Complaint mechanisms along the entire supply chain are the exception rather than the rule. Making restitution for harmful effects which arise further down the supply chain is not addressed. None of the companies under review provides detailed information about their suppliers.

Problematic mining of raw materials
A large proportion of the raw materials used in batteries are mined in countries with high poverty rates and poor administrative and governance structures. Globally, it is the raw materials sector which accounts for the highest number of complaints about human rights violations.

The companies under examination focus their duty of care on the mineral cobalt, which is associated with child labour, as well as on four so-called ‘conflict minerals’ (tin, tantalum, tungsten and gold). But other important raw materials used in the manufacture of batteries, such as lithium and nickel, whose extraction can also be extremely harmful, are largely disregarded. The companies under review delegate most of their responsibility for monitoring the conditions under which the raw materials are mined to the Responsible Minerals Initiative (RMI) of which they are members. Yet the RMI also focuses on the classic conflict minerals and cobalt, and monitors conditions only as far back as the smelting plants rather than the mines right at the start of the supply chain.

Greenhouse gas emissions off track
Most of the companies under examination have their own energy and environmental policies in place as well as an environmental management system. But only a few require their suppliers to restrict their consumption of toxins, energy, and water and to improve waste water and waste disposal, or provide suitable support when their suppliers attempt to do so. Progress tracking by setting tangible objectives and target figures is inadequate, except in the case of CO₂ values. Four of the seven companies publish statistics on their greenhouse gas emissions, including those of their most important suppliers. However, only three are pursuing the emission targets set out in the Paris Agreement.

Where action is required
- In order for battery and vehicle manufacturers to honour their duty of care, they must take appropriate measures to ensure compliance with internationally recognised human rights and environmental standards.
- Investors should not automatically categorise e-mobility as a ‘green’ or sustainable investment. Social and ecological due diligence is required throughout the supply chain, especially in terms of the extraction of raw materials.
- When buying electric vehicles, the purchasing power of public procurers and vehicle users provides them with the leverage to demand sustainability and responsible manufacturing practices from electric vehicle makers. At the same time, suitable purchasing criteria can help bring about the necessary transparency in the supply chains.
- Politicians and lawmakers should promote technical innovations and create state incentives and regulation so that the life of batteries can be maximised and as many raw materials used in their manufacture as possible can be recycled. Greater durability, giving batteries a second life, and recycling all reduce the need for raw materials to continue to be mined.
- The most efficient solution for reducing greenhouse gas emissions and the other problems associated with vehicle and battery manufacture is to downsize the number of vehicles on our roads altogether. Public transport, car-sharing, car-pooling and cycling are all possible alternatives to driving individual cars.
1. Introduction: The demand for raw materials – an Achilles’ heel

Over 311,000 cars were sold in Switzerland in 2019, which is about 12,000 more than in the previous year. Whilst the sale of conventional petrol and diesel cars is in decline, sales of cars which use an alternative power source are booming. Indeed, the market share of electric cars in Switzerland more than doubled in 2019. The necessary shift from fossil fuels is leading to an increased interest in renewable energies, including in the mobility and transport sector. Electric-powered cars, as well as bikes, scooters, buses, trains, ships, drones and in the future possibly even aeroplanes, will make an important contribution globally to solving the climate emergency.

The environmental footprint of electric vehicles has less impact than that of conventionally powered modes of transport. This is especially true if renewable energies are used both to generate the electricity that powers the vehicle and to manufacture the vehicle in the first place. Batteries, also known as Electric Vehicle Batteries (EVBs), are the core element of electric vehicles, as they store the energy. Most are equipped with Lithium-ion batteries. According to the World Bank, this technology will continue to lead the field in the e-mobility sector over the next ten years.

Yet battery production continues to depend to a large extent on the use of fossil fuels, because it is concentrated in China, where 80% of energy is coal-generated. The green credentials of lithium-ion batteries are tarnished even further when considering the still largely unresolved problems of recycling and waste disposal. Overall, almost a quarter of the environmental ‘tyre print’ of electric vehicles is generated by the manufacture of the battery.

The individual stages in the production of batteries are largely automated, and most are performed by robots. The serious problems related to environmental and employment conditions are for the most part found at the very beginning of the battery’s supply chain, namely in association with the extraction of the raw materials.

The main raw ingredients used in the manufacture of batteries for electric vehicles include cobalt, copper, nickel, lithium, manganese, and graphite.

1.1 Abuses in the raw materials mining sector

A large proportion of the raw materials used in batteries are mined in countries with high poverty rates and poor administrative and governance structures. Although local elites profit financially from the mining of raw materials, the indigenous population benefits only to a very limited degree. Mine workers frequently face atrocious and dangerous working conditions, while the inhabitants of neighbouring towns and villages suffer environmental and other consequent damage. According to the Business and Human Rights Resource Centre, an independent international non-profit organisation, most of the complaints about violations of human rights around the world relate to the raw materials sector. The most striking of these include relocating entire villages following the awarding of a mining concession, destroying agricultural land which is under cultivation, polluting waterways, and the impact of mining activity on the security and health of the population.

“The rainwater washes the excavated earth from the mine down the steep slopes. The sludge contains toxic metallic residues and contaminates our land and our fish farms”, complains Cecilia Cruz’, who works for an NGO in the Philippines, where nickel is mined and where local anticipation of new jobs went unfulfilled. “First, people were relocated from the villages to make room for the new nickel mine. And now, they’re not even getting the jobs they were promised. The company prefers to employ day labourers from the nearby town.”
Halfway around the globe, in the Atacama Highlands of Chile, the growth of the lithium mining industry is exacerbating the problem of drought in the fragile desert ecosystem, and making it harder for indigenous communities to survive there.

The so-called Lithium Triangle in Chile, Argentina and Bolivia contains more than 60% of the known global reserves of this ‘white gold’. Lithium from the salt flats of Latin America is comparatively cheap, because there the raw material can be obtained through natural evaporation. The light metal is found in a saline solution below the crusts of the highland lakes, and co-exists in a fragile equilibrium with fresh water reserves. When this solution is pumped to the surface, the groundwater table drops, to the detriment of the entire ecosystem. Raw materials companies regularly disregard the rights of the local populations when conducting construction projects and mining activities. Inadequate compensation for the ceding of land and water rights, which can sometimes be distributed unevenly, can also lead to conflicts between the local communities themselves.

Another key raw material in the manufacture of batteries is cobalt, which is to be found almost exclusively in the Democratic Republic of the Congo (DRC). The largest reserves of this sought-after mineral are found in the southeast of the country. They are mined and sold for the most part by relatively small raw materials companies from countries such as China, Lebanon, India and the DRC, as well as by large groups such as the Swiss mining multinational Glencore. Many concessions are awarded under somewhat questionable circumstances. The local population suffers from displacement and relocation, with insufficient compensation to make a fresh start elsewhere. This has resulted in violence and lethal conflict between the security forces and local villagers.

In the past, Glencore has faced mounting criticism from local populations. Complaints have ranged from the contamination of rivers to the desertification of fields, gardens and crops caused by toxic materials from the mines.

Some 20% of the cobalt extracted in the DRC comes from small-scale mining operations. Hardly any safety measures are taken around the hand-dug wells, and serious accidents are the order of the day. Small-scale cobalt mining is also notorious for its use of child labour, which is widespread.

“My parents had a large herd of llamas. Today there is barely enough water to drink, or to cultivate sufficient fodder crops to see the animals through the winter.”

Hugo Díaz, Farmer in the highlands of Chile

Source: www.jisea.org
“Respiratory diseases are common, especially during the dry season. There is too much dust in the streets, thrown up by the lorries. And when it rains, everything is covered in mud.”

Véronique Kakoma Mwika, Nurse

1.2 Increasing demand for raw materials

Between 2010 and 2018, the demand for batteries rose by 30 percent per annum. The Global Battery Alliance attributes this to the electrification of transport and the growing demand for energy storage systems for power grids.10

The World Bank expects demand for the raw materials used in batteries, such as lithium, graphite and cobalt, to rise four or five-fold between 2018 and 2050.11

In addition to mining raw materials on land, deep-sea mining is expected to play an increasingly important role in the future. Hardy any research has been carried out or estimations made about the associated impact on marine ecology, the health effects for island and coastal dwellers, or territorial ownership claims and conflicts.

Because Cobalt is the only mineral relevant to the manufacture of batteries that is extracted primarily in a single country, it represents a particular procurement risk for battery manufacturers. To ensure they will have a reliable source of raw materials in the future, individual battery and vehicle manufacturers are therefore keen to sign contracts directly with mining groups. For instance, the South Korean battery maker SK Innovation concluded a contract with the Swiss group Glencore in 2019. This guarantees SK Innovation access to the much sought-after raw material until 2025, thus providing it with enough resources to manufacture batteries for up to three million electric vehicles.12

The battery and vehicle manufacturer Tesla is aiming to develop cobalt-free technology in the future.13 Nonetheless, in 2020 the company signed a contract with Glencore to secure access to cobalt for its gigafactory in Shanghai and its plant scheduled to be built in Berlin. Tesla stresses the importance of being able to control the entire supply chain in raw materials from the DRC to China through its contract with Glencore.

1.3 China’s domination of the battery manufacturing industry

China is not only the largest market for batteries, but also dominates large sections of global battery supply chains, in particular the processing of raw materials and the production of cells. The two companies CATL and BYD are leaders in this field. The Chinese group BYD produces batteries for the global market, as well as its own cars, buses and other electric vehicles for the domestic market.

The German car industry is keen to step up its collaboration with European suppliers in the future with a view to producing electric vehicle batteries and reducing its reliance on China. This should have the added benefit of cutting air and sea miles. Thus the German manufacturer Volkswagen is planning to join forces with the Swedish battery group Northvolt to build a megafactory for battery cells at the VW plant in Salzgitter, which is scheduled to be put into operation in 2024.14

“By 2030, passenger cars will account for the largest share (60%) of global battery demand, followed by the commercial vehicle segment with 23%. Geographically, China is the biggest market with 43%.”

Global Battery Alliance15
The world's No. 1 – CATL

The Chinese group Contemporary Amperex Technology Ltd. (CATL) has dominated one third of the world market for lithium-ion batteries since 2019 and is considered the global leader in car batteries.\textsuperscript{16} The company specialises in EVBs for electric vehicles and owes some of its success to Beijing’s subsidy programme ‘Made in China 2025’, which promotes the country’s e-mobility and battery industries. In 2018, CATL got off to a brilliant start on the stock exchange, and was able to increase production many times over with this new, available capital. While it undercut its competitors on the domestic market with its cheaper batteries, the company was also able to impress international buyers with the quality of its products. BMW, Daimler, Volkswagen and PSA are just some of the customers of this industry giant. CATL also benefits from its position as a ‘pure player’ in the battery market, whereas the Chinese No. 2, BYD – which also makes its own cars – is viewed with suspicion by western manufacturers.\textsuperscript{17}

CATL is currently building a gigafactory in Thuringia, Germany, for the manufacture of lithium-ion battery cells for electric cars. It is expected to enter production in 2022. A sales contract with BMW has already been signed.

CATL and Tesla are conducting research into new battery technology which should dispense with the need for cobalt altogether in the years ahead.\textsuperscript{18} Meanwhile, the company is procuring sufficient raw material for the immediate future from the Chinese battery recycling and materials company GEM Co. Ltd., which in turn sources its cobalt from the Swiss mining group Glencore.\textsuperscript{19}
2. Goal: Assessment of companies’ due diligence policies

According to the UN Guiding Principles on Human Rights and Business\textsuperscript{10} and the OECD Guidelines for Multinational Enterprises\textsuperscript{11}, a business’s duty of care extends to all parts of its global supply chain. This means that battery and vehicle manufacturers share responsibility not only for the conditions of the final assembly of their cells, but also for all of the preceding stages of production. They must take measures to ensure that their subcontractors and business partners protect the environment and respect human rights. If they are to be successful in this, there needs to be close and transparent cooperation between vehicle manufacturers, battery producers and their suppliers.

This report considers the question of whether the manufacturers of batteries for e-mobility comply with internationally agreed guidelines and ensure that their subcontractors and business partners respect human rights and protect the environment at all stages in the value chain.

“Ethical conduct is a subject which is really very close to our hearts. (...) There must be a dozen intermediaries between the mine and Renault, and it is difficult to establish the precise details of how the minerals are extracted. We are working side by side with LG Chem, our battery cell supplier, on this issue.”

Eric Feunteun, Electric Vehicle Programme Director with Renault\textsuperscript{12}

---

Value chain of lithium-ion batteries

![Value chain diagram](image)

Source: www3.weforum.org

---

Whose batteries are installed in which electric cars?

Individual battery manufacturers supply several vehicle makers simultaneously. The market is very fast-moving, which is why the table below represents only a snapshot and does not claim to be comprehensive.

<table>
<thead>
<tr>
<th>Selected vehicle manufacturers</th>
<th>Battery manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daimler, Ford, General Motors, Hyundai/Kia, Jaguar, Renault, Tesla, Volkswagen, Volvo</td>
<td>LG Chem</td>
</tr>
<tr>
<td>Daimler, Ferrari, Hyundai/Kia, Jaguar, Land Rover, Volkswagen</td>
<td>SK Innovation</td>
</tr>
<tr>
<td>BMW, Fiat, Volkswagen, Volvo</td>
<td>Samsung SDI</td>
</tr>
<tr>
<td>BMW, Daimler, Honda, Hyundai, Jaguar, Land Rover, Tesla, Toyota, Volkswagen, Volvo</td>
<td>CATL</td>
</tr>
<tr>
<td>Toyota, BYD</td>
<td>BYD</td>
</tr>
<tr>
<td>Ford, Honda, Tesla, Toyota</td>
<td>Panasonic</td>
</tr>
<tr>
<td>Hess (buses)</td>
<td>ABB</td>
</tr>
</tbody>
</table>
3. Methodology:
Basing our findings on corporate publications

The report analyses the environmental and human rights policies of the leading international battery producers for electric vehicles and the measures they take to implement these corporate guidelines.

Vehicle batteries are also manufactured in Switzerland, and imported cells are connected to make battery modules there. Specialised applications apart, the Swiss battery maker Leclanché plans to expand capacity in the future. ABB is already supplying drive and storage systems for electric buses made by the Swiss manufacturer Carosserie Hess AG. For this reason ABB has been included in the study.

The companies under review include:
- LG Chem, SK Innovation and Samsung SDI (South Korea)
- BYD and CATL (China)
- Panasonic (Japan)
- ABB (Switzerland)

For reasons of objective comparability, only the facts and figures published by the companies themselves were used for the analysis. The most important sources of information on their environmental and human rights policies were their sustainability and CSR (Corporate Social Responsibility) reports. It was not within our remit to examine the extent to which the policies represented in these publications were actually implemented at the companies and by their subcontractors.

We reviewed only reports and information which are available in English. The CSR and sustainability reports we consulted generally refer to the entire product range of the manufacturer, i.e. not only – or not specifically – to battery production.

The questions are derived from the UN Guiding Principles on Human Rights and Business and the OECD Guidelines for Multinational Enterprises. The questions on greenhouse gas emissions are based on the Paris Climate Agreement.

The study examines information supplied by the companies themselves in relation to:
- human and employment rights
- raw materials extraction
- the environment (greenhouse gas emissions, energy consumption, water, waste, toxins, environmental footprint)

Each of these categories was considered from the following perspectives:
- strategy / policies
- implementation
- monitoring of progress
- transparency
- complaints procedures and redress in the event of human rights violations

The list of 39 questions relates to the actual businesses under review as well as to their subsidiaries and subcontractors.

Based on data analysis, the answers to each question were evaluated and assigned to one of the following categories:

- On the right path
- Adequate
- Poor
- Inadequate / no information

The businesses were given an opportunity to provide feedback on the results of their individual evaluations prior to publication. Of the seven companies involved, four (ABB, BYD, Samsung SDI and SK Innovation) responded. Where satisfactory evidence and documentation were supplied, their evaluations were adjusted accordingly. LG Chem, Panasonic and CATL provided no feedback.
4. **Outcome:** Strategy good but implementation lacking

The three Korean manufacturers (Samsung SDI, LG Chem and SK Innovation) and the Swiss company ABB rated higher than the Japanese manufacturer Panasonic and the two Chinese firms (BYD and CATL).

While Samsung SDI occupied first place in the overall rankings, CATL – the Chinese global market leader – came last. This was due not least to a lack of transparency on the part of the company: we could find no published data to help us answer the majority of the questions we were posing. Given that CATL has risen to become the leading producer of car batteries in the world and is currently expanding rapidly in the Western market, this result gives particular cause for concern.

With the exception of CATL, all of the respective companies publish information on most of the areas under review. Although their reports always centre on their own company, the majority also have strategies and policies relating to the desired conduct of their suppliers. The implementation of these strategies and policies scores less well, however. All companies lack the concrete objectives and target figures needed to verify the conduct of all concerned.
4.1 Human rights: implementation found wanting

Respecting employment and human rights: The strategies and policies of most of the companies under scrutiny invoke internationally agreed guidelines such as the International Human Rights Charter and the International Covenant on Civil and Political Rights (Parts I and II), or the core concerns of the International Labour Organization (ILO). Most of the companies have internal corporate structures such as a CSR department as well as a management system, and provide courses on human rights issues. Although some deficiencies are identified in the supply chain, the information available in the corporate reports suggests that they are only followed up in an incomplete and inadequate way.

Documents relating to problems which have been identified are seldom made accessible to the local people who are impacted by them. Furthermore, stakeholders from civil society are very rarely consulted by the respective companies with a view to arriving at mutually beneficial solutions. In general, there are very few opportunities anywhere in the supply chain to raise concerns, and in most cases: restitution for any damage caused is rarely up for discussion. Detailed information about suppliers, such as their names and head offices, is omitted from the reports prepared by the companies under scrutiny. When asked for the information in question, some made reference to business confidentiality.

4.2 Some raw materials missing from the spotlight

Taking care in the use of raw materials: All of the businesses under review have their own specific rules which govern the procurement of so-called conflict minerals. These are raw materials whose extraction and marketing contributes to the funding of local conflicts. Depending on their place of origin, tin, tantalum and tungsten, but also gold, can fall into this category.

A few companies also have special regulations governing their procurement of cobalt from the Democratic Republic of the Congo. In some cases this is based on their membership of the Responsible Cobalt Initiative, which was the brainchild of the Chinese Chamber of Commerce for Metals, Minerals and Chemicals.

All of the companies under scrutiny – with the exception of BYD and CATL from China - are members of the
Responsible Minerals Initiative (RMI). This group was founded by the Responsible Business Alliance, the world’s largest industry coalition for the electronics industry, and the Global e-Sustainability Initiative, a consortium of leading telecom firms. The RMI concerns itself not only with the classic conflict minerals, but also with cobalt. But none of the companies under scrutiny takes account of every raw material used in batteries when exercising its supply chain responsibility. Only Samsung SDI indicated in the original Korean version of its CSR report – although not in the English-language version – that supply chain responsibility extended to all raw materials.

While some of the companies we examined do provide detailed information about the names and locations of smelting plants and refineries for individual raw materials, no concrete information is provided about the mines from which these materials are sourced and the conditions under which they are extracted. Instead, they make reference to the RMI, which guarantees its members transparent traceability up to as far as the plants in which the raw materials are smelted. This initiative means that the smelting plants are, for their part, responsible for procuring raw materials from mines which operate responsibly.

The RMI will attempt to extend transparency as far as the mines in the future through the use of blockchain technology, in particular where conflict minerals are concerned. This shall apply not only to industrial extraction by raw materials groups, but also to small-scale mining operations.

None of the companies under scrutiny is a member of an initiative which gives stakeholders from civil society a major say or which emanates directly from civil society, such as the Initiative for Responsible Mining Assurance.

### 4.3 Environmental measures not on track

**The environment:** All of the companies under scrutiny have policies on environmental responsibility, which apply equally to their supply chains. The majority also have a CSR department or a comparable structural unit, as well as an environmental management system. In most cases, their effectiveness is reviewed externally, at least in part. The two Chinese companies BYD and CATL are the only ones for which the relevant data are not available.

Most of the companies actively endeavour to reduce their greenhouse gas emissions and energy consumption, and to increase their use of renewable energies. Most also have responsible policies in terms of water consumption, waste water and waste disposal, and the use of toxins.

However, when it comes to honouring their responsibilities further down the supply chain, the picture is different. Very few of the companies under scrutiny require their suppliers to restrict their use of toxins, energy or water consumption, nor to improve their waste water and waste disposal practices. They also do not provide their subcontractors with support in this respect.

<table>
<thead>
<tr>
<th>Strategy/policies</th>
<th>Structure and management</th>
<th>Companies*</th>
<th>Suppliers*</th>
<th>Follow-up/monitoring</th>
<th>Transparency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Samsung SDI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ABB</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Panasonic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LG Chem</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SK Innovation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BYD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CATL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*CO₂, energy, water, waste, toxins

The use of concrete facts and figures to verify the implementation of environmental objectives are lacking, with the exception of CO₂ values: four of the seven companies publish hard-and-fast statistics on the greenhouse gas emissions they themselves generate, as well as those released by their suppliers (Scope 3). Three of them – ABB, Panasonic and Samsung SDI – are pursuing emissions targets in line with the Paris Climate Agreement. With the exception of BYD and CATL, all of the companies studied state they calculate their environmental footprint, taking into account the impact of their batteries over their entire life cycle in terms of the environmental harm they cause and their impact in terms of energy. However, most either publish no figures at all, or if they do, only incomplete ones.
5. **Recommendations:**

**Promoting recycling and alternative forms of transport**

5.1 **Due diligence**

International directives state that battery producers and downstream electric vehicle manufacturers must ensure that steps are taken to prevent social and ecological problems from arising in their supply chains and to eradicate them if they do. The results of this study show that the major players in this sector have thus far met their obligations only to a limited degree. In addition, a majority of the companies studied are not even on course to implement the provisions of the Paris Climate Agreement.

Adherence to the international guidelines of the UN and the OECD is dependent upon voluntary action being taken by businesses. Since evidence shows that in most cases this does not suffice, policymakers and regulators in a number of countries are demanding the imposition of binding regulations. The European Union too has announced consultations on a law aimed at achieving this end.

Investors can have a decisive influence on corporate behaviour by imposing conditions on the funding they supply. It is important to note that e-mobility is not, per se, a green and sustainable investment category. Sustainability criteria must take into account social and environmental due diligence along the entire value chain. This means paying particular attention to the damage caused or exacerbated by raw materials extraction for the e-mobility industry and other new technologies.

The purchasing power of public procurers, transport companies and vehicle users not only allows them to make cost benefits, but also provides them with the leverage to demand sustainability and responsible manufacturing practices from electric vehicle makers. At the same time, suitable purchasing criteria can help bring about the necessary transparency in the supply chains.

---

The Global Battery Alliance

The Global Battery Alliance (GBA) is an industry initiative with around 70 members. These include raw materials and energy groups, battery, IT and vehicle manufacturers, UN institutions, (development) banks, as well as some stakeholders from civil society.

The GBA was founded in 2017 at the World Economic Forum in Davos, and its declared objective is to create a sustainable value chain for battery manufacture. The development of a ‘fairly manufactured battery’ label is expected by 2022.

The Alliance’s ambitious plans are underpinned by a comprehensive analysis of the problems and potential for improving battery manufacture. According to the GBA, the most serious challenges include substantial social and environmental risks in the raw materials sector, and high greenhouse gas emissions from battery production.

Based on the UN Guiding Principles on Business and Human Rights and the OECD Due Diligence Guidance for Responsible Supply Chains, the GBA calls for a “responsible and just battery value chain” in its ‘Vision for a Sustainable Battery Value Chain in 2030’.

The GBA stresses the growing importance of the circular economy. In terms of the environmental footprint of battery manufacture, it advocates the disclosure of emissions targets and figures, and recommends the drafting of regulations which take into account the entire value chain and/or the entire life cycle of the battery.26
5.2 Recycling

Raw materials should be recycled more. This would enable us to largely bypass the social and ecological problems associated with mining raw materials. Extending battery life and reusing exhausted vehicle batteries as stationary energy storage units (‘second life’), for instance for use in photovoltaics, would also help reduce the constant demand for new raw materials.

Lawmakers and authorities should also be promoting durability, a second life, and battery recycling. Raw materials recovered from batteries could be integrated in the circular economy, which is only going to increase in importance in the future. Because mining raw materials for batteries is often cheaper than recycling, appropriate countermeasures need to be taken. There is also a need for investment in innovations, so that in future batteries from recycled materials can be just as efficient and durable as those made from ‘fresh’ raw materials.

“Because the economy is attracted to the cheapest price point, we need more incentives and state regulation to support recycling and technical innovation.”

Marcel Gauch, EMPA27

In principle all minerals can be recycled, although this involves varying degrees of time and expense. Following mechanical reduction and sorting of the individual parts of the battery, cobalt and nickel can be recovered almost in their entirety by smelting (i.e. by employing pyrometallurgical processes). On the other hand, to recover lithium, other chemical (hydrometallurgical) processes are required, and the techniques currently available mean that the required purity of the recycled lithium is not always sufficient for it to be reused in vehicle batteries.

To date, only China has relatively large capacity for the recycling of lithium-ion cells – one example being GEM Co. Ltd. in Shenzhen, which produces raw materials for batteries. In Europe, only a few such plants are in operation, such as the Belgian materials technology and recycling group Umicore and the German company Duesenfeld GmbH, which has specialised in the recycling of lithium-ion EVBs. While Umicore mainly recovers cobalt and nickel, Duesenfeld can also recycle lithium, manganese and graphite. In Switzerland, lithium-ion batteries are collected and delivered to the recycling company Batrec in Wimmis. However, the number of exhausted EVBs recovered from electric vehicles has been low thus far. This is why Batrec has outsourced the extraction of the individual recyclable materials to France.28

While energy consumption and greenhouse gas emissions are reduced by recycling in the case of individual raw materials such as aluminium, the recovery of other raw materials requires more energy and water than mining does.29 But here too technical innovations should be able to help level the playing field. For instance, Duesenfeld uses residual energy from the recycled batteries in the recovery process.

In future, batteries should be assembled in such a way that they can be dismantled efficiently, to allow their raw materials to be used again. This is not currently the case. Recycling is also made more difficult because there is poor access to energy status and other battery management data, not least for safety reasons. For instance, individual elements of a battery represent a fire hazard. The solution is for battery manufacturers to implement a second life and the recycling of individual elements at the design stage, and to make the records of their battery systems freely available. This requires appropriate regulations and measurement standards to be introduced. As part of its circular economy action plan, the EU is trying to introduce minimum requirements for the durability of vehicle batteries. Conditions are also to be created so that vehicle batteries can be made available for a second life or recycling.30

“The batteries now being installed in electric cars last for about 10 to 20 years. By 2030, large quantities of used batteries will be piling up. By then at the latest, the capacity must be in place to recycle the batteries and as much of the raw materials as possible.”

Marcel Gauch, EMPA31
Switzerland has for many years had an ‘advance recycling charge’, which was introduced to promote efficient recycling and the safe disposal of electrical and electronic devices. This charge is paid by manufacturers and importers and forms an integral element of the sales price whereby paying up front for waste disposal and recycling by the specialist Swiss company Swico. A similar system also exists for household batteries and EVBs, for instance for those belonging to drones and electric bikes. This is being implemented by the company Atag Wirtschaftsorganisationen AG under the brand name Inobat Batterierecycling Schweiz. However, up to now batteries from electric cars have been excluded from the advance waste disposal and recycling payment scheme.\textsuperscript{32}\footnote{Given the growing number of exhausted car batteries which will soon be piling up, their inclusion would appear to be essential.}

5.3 Reducing the number of individual cars on the road

In principle, the best way of circumventing these minuses is to drastically reduce the number of vehicles on the road. However, this will require changing mobility behaviour and turning away from individual motorised transportation.

Cars account for around three quarters of the motor vehicles on our roads. There is enormous potential to make their use more efficient, because they spend most of their time stationary, and on average transport only 1.5 people per trip.\footnote{Simulations show that we could reduce the volume of cars by about 90 percent if we made consistent use of car sharing.}

The number of vehicles could also be reduced by permitting them to travel only along routes where there is no alternative, and only to destinations which cannot be reached by more efficient forms of transit, such as public transport or bicycles.
6. Individual evaluations

ABB

Head office: Zürich, Switzerland  
Founded: 1883  
Turnover (2019): CHF 26.5 billion  
2000: Business focus shifts to renewable energies  
2010: Moves into EV charging systems  
2018: Enters FIA Formula E  
Membership of a multi-stakeholder initiative: None

Human rights

ABB has a human rights policy which identifies the most serious problems and deals with them at board level. Training in human rights is given to employees and management, but not to the affected communities. ABB publishes the names of all of its direct, and the most important indirect suppliers; however, transparency across the entire supply chain remains incomplete. For instance, no impact assessment was found. A complaints mechanism exists for ABB and its suppliers which also operates via an external company. ABB has introduced regulations on complaint resolution and dealing with abuses. Although these specify the consequences of violating the regulations, there is no information about its restitution policy. This is of relevance not only to employees in the supply chain, but also with respect to the affected communities.

Raw materials

In terms of conflict minerals, ABB has a comprehensive policy, but this excludes other minerals. The company is a member of the Responsible Minerals Initiative (RMI), which certifies smelting plants and refineries for cobalt and conflict minerals. ABB publishes the names of smelting plants and refineries within its supply chain in its conflict minerals report. Those for other minerals are not published. However, when it comes to mines no public information is available for scrutiny.

Environment

ABB sets itself ambitious targets in the area of the environment, which are also dealt with at board level. The management system concerning sustainability has resulted in satisfactory measures being taken at its own production sites in all of the environmental areas under examination. Its reports publish both the company’s figures and CO₂ emissions across the entire supply chain (Scopes 1-3). ABB’s evaluation of its environmental footprint thus far (‘Life Cycle Assessment’, LCA) refers to complete electric buses equipped with ABB battery systems. Plans have been announced to evaluate battery systems separately in the future. The external audit relates mainly to ABB’s own company figures; i.e. it omits supply chain data.

BYD

Head office: Shenzhen, China  
Founded: 1995  
Listed on the stock exchange: 2002 Hong Kong Stock Exchange, 2011 Shenzhen Stock Exchange  
Turnover (2019): CHF 16.6 billion  
2008: First hybrid vehicle  
2010: Partnership with Daimler  
2015: Opening of an EV factory in Brazil  
2020: Enters the European market  
Membership of a multi-stakeholder initiative: None

Human rights

BYD conducts annual self-evaluations to check for potential human rights violations by its own and its partner companies. The results are not published, nor are they verified by a third party. The company has a department to address human rights violations, and important matters are discussed at the executive level. No basic or advanced training in this area is provided within the company. Important data on human rights are omitted from the annual report. Nor is a list of suppliers published or an impact assessment conducted. In response to our enquiries, BYD mentioned a participatory ‘transparent procurement’ process, it is unclear whether the regulations on processing and rectifying human rights violations in the supply chain
also apply to the affected communities and ordinary workers, or whether it is only the management of partner companies which may lodge complaints.

**Raw materials**
BYD is not a member of the RMI, although it bases its regulations for suppliers of conflict minerals on those of the latter. The company is not a member of any initiative and publishes no data about its suppliers.

**Environment**
BYD implements various sustainability measures within its own company through its environmental management system and requires its suppliers to do likewise. Satisfactory measures are in place for some areas, such as water management, but not for others. There were no targets were found which BYD aspired to meet. Matters relating to the environment and sustainability are dealt with at the executive level. Only its own statistics are published in the CSR report, figures for total consumption are not given. We found no evidence of a Life Cycle Assessment or any third-party verification of the published figures.

**CATL**

**Head office:** Ningde, China  
**Founded:** 2011  
**Listed on the stock exchange:** 2018 Shenzhen Stock Exchange  
**Turnover (2019):** CHF 6.1 billion  
**2014: Partnership with BMW**  
**2019: Company with the largest volume of lithium-ion battery production**  
**2020: Partnership with Tesla**  
**Membership of a multi-stakeholder initiative:** None

**Human rights**
Although CATL has a human rights policy, this is not based on the key principles of the ILO, the UNGP, or OECD guidelines. Nonetheless, the company complies with certain international standards and requires the same of its suppliers. It is not clear whether or at what level CATL addresses human rights issues. No report is published on related activities, facts and figures, or the systems in use. Transparency is extremely poor in the case of CATL. As well as the gaps in its policy, only a small amount of information is available about the human rights performance of the company.

**Raw materials**
CATL is a member of the Responsible Cobalt Initiative of the Chinese Chamber of Commerce. Aside from cobalt, no other minerals are considered, nor is there any information available about smelting, refining or mining along the supply chain of CATL.

**Environment**
The company’s environmental policies are incomplete. Nonetheless, certain international standards are observed, and compliance is also required of its suppliers. Since we could locate no CSR report in English among CATL’s publications. However, it was not possible to learn more about other areas such as corporate structure, the system for dealing with environmental issues, any sustainability measures taken, or the company’s performance in this respect. No emission reduction targets were found, nor was there a life cycle assessment or an external audit. Overall, transparency in the areas we are investigating at CATL were insufficient.

**LG Chem**

**Head office:** Seoul, South Korea  
**Founded:** 1947  
**Listed on the stock exchange:** 2001 South Korean Stock Exchange  
**Turnover (2019):** CHF 24 billion  
2009: The first lithium-ion HEV battery for hybrid vehicles in the world (for the Hyundai Sonata)  
2010: The first PHEV (plug-in hybrid vehicle) battery in the world (for the Volvo XC60)  
2010: The first EV battery (1st gen) for the Audi e-Tron  
2016: 2nd gen battery (improved performance/efficiency) for the Audi e-Tron  
2019: 2nd gen PHEV battery (for the Volvo XC60)  
2020: 3rd gen battery (improved performance/efficiency) for the Audi e-Tron  
**Membership of a multi-stakeholder initiative:** None

**Human rights**
LG Chem requires companies along the supply chain to evaluate their own performance, and in some cases commissions external bodies to verify their findings. Decisions regarding human rights are made at the executive level and implemented by the department set up for this purpose. We found no evidence of training courses for workers on their human rights. Important indicators were missing from the CSR report and no impact assessment was
found. It is unclear whether the complaints mechanisms of LG Chem apply only to its employees or to the entire supply chain, or how restitution is made for violations of human rights.

**Raw materials**

LG Chem bases its Supplier Management System on the requirements of the UN and the OECD, but the focus is solely on conflict minerals – others are not addressed. LG Chem advocates for a high level of transparency in the case of cobalt in particular, and is a member of several initiatives in this area. Its membership of the RMI ensures that the smelting and refining of conflict minerals and cobalt are certified. There is no public list available of its subcontractors or mines.

**Environment**

CO₂ neutrality is a declared goal of LG Chem. By 2030, it aims to reduce the level of greenhouse gas emissions by 50 percent in comparison with 2017. In order to achieve this, the company has established a Greenhouse Gas and Energy Management System (GEMS), which allows it to trade in emission credits. However, no concrete measures were found which would directly reduce emissions. LG Chem implements environmental improvement measures at all of its own production sites, but does not require the same of its suppliers. It has its own department for environmental issues and the most important of these are discussed at the executive level. The company’s own figures are published in its reports, as well as those for CO₂ emissions along the entire supply chain (Scopes 1-3). In other areas however, there is a lack of overall statistics. The company also publishes a Life Cycle Assessment, although this can only be accessed on request. The audits which are carried out are restricted to the company’s own consumption figures.

**Panasonic**

**Head office: Osaka, Japan**

**Founded: 1918**

**Listed on the stock exchange: 1949 Tokyo Stock Exchange**

**Turnover (2019): CHF 71.5 billion**

1923: First battery launched (for lamps)

1937: First car battery (lead-acid)

1971: First lithium battery (graphite-fluoride)

1994: First lithium-ion battery

**Membership of a multi-stakeholder initiative: None**

**Human rights**

Panasonic’s suppliers operate a self-evaluation system across the entire supply chain, which is sometimes monitored by the company itself. Panasonic discusses human rights matters and a fair supply chain at the executive level. There are also designated departments for these issues. Although the company publishes an annual CSR report, it lacks some important data as well as a list of subcontractors. For instance, no impact assessment has been enacted. Panasonic also lacks a complaints mechanism which would enable workers from the company, its subcontractors, or any affected communities to report and respond to human rights violations at any point in the supply chain.

**Raw materials**

Panasonic bases its ‘Procurement Guidelines’ on the OECD’s ‘Due Diligence Guidelines’. This prohibits the use of conflict minerals, although there is no policy governing the use of other minerals. Panasonic is a member of the RMI, which certifies smelting plants and refineries for cobalt and conflict minerals. Panasonic also monitors its raw materials suppliers itself; 80 percent of the 322 smelting plants and refineries in the company’s supply chain were duly certified in 2019. Although Panasonic publishes a list of conflict mineral and cobalt smelting plants, no information is provided about mines or the origins of other minerals.

**Environment**

Panasonic is endeavouring to improve its performance on environmental issues. The company is hoping to achieve CO₂-neutral production by 2050. Since the environment is of great interest to the public, environmental matters are discussed not only at the executive level, but also by the Board of Directors. The company is implementing environmental improvement measures at its production sites.
around the world, and also publishes an annual report on the subject. However, the documentation does not relate to suppliers, and no improvement in their conduct is required or supported in the area of environmental matters. As a result, the reports provide information on the overall consumption of CO₂ alone (Scopes 1-3). The information concerning the environmental footprint of battery production is incomplete. Audits conducted by third parties also relate only to Panasonic’s own consumption.

**Samsung SDI**

**Head office:** Seoul, South Korea  
**Founded:** 1970  
**Listed on the stock exchange:** 1996 South Korean Stock Exchange, 2005 Stuttgart Stock Exchange  
**Turnover (2019):** CHF 8.3 billion  
**1999:** First lithium-ion battery  
**Battery factories for electric vehicles open in:** 2011/12: Ulsan, South Korea  
2015: Xi’an, China  
2018 and 2020: Göd, Hungary  
**Membership of a multi-stakeholder initiative:** None

**Human rights**

Samsung SDI conducts annual self-evaluations to check for potential human rights violations in its own companies and those of its partners. However, the results are not published, and there is no evidence of verification by a third party. The company has a department which handles human rights violations and also conducts employee training in this area. Important matters pertaining to human rights are discussed at the executive level. More detailed information about human rights is lacking from the annual report, and no list of suppliers is published. No impact assessment has been conducted. Samsung SDI’s ‘Partner Sinnungo’ programme can be accessed on its website; its purpose is to handle human rights violations in the supply chain and make restitution. However, it is unclear whether this is restricted to the management of partner companies or whether affected communities or ordinary workers are also able to file complaints.

**Raw materials**

Samsung SDI responded to criticism that the company’s policies regarding a responsible supply chain focused solely on conflict minerals, and provided an assurance that other raw materials were included in the Korean version of its publication. It now intends to make a correction to this effect in the English version. In order to ensure that the OECD’s ‘Due Diligence Guidelines’ are observed, Samsung SDI set up the S-Partner System, which arranges for a third party to inspect the suppliers of critical minerals every two years. Samsung SDI is a member of the Responsible Cobalt Initiative of the Chinese Chamber of Commerce and of the RMI, which mainly certifies smelting plants and refineries for conflict minerals. Samsung SDI publishes the origin and names of the cobalt smelting plants and refineries; however, those for other minerals are not communicated.

**Environment**

Samsung SDI set up the S-Partner System to improve and monitor its own as well as external production sites. It is the only one of the companies under review to use both internal and external monitoring to pursue sustainability measures in all of the areas we examined. Moreover, the company is keen to reduce the volume of toxins used not only at its own sites, but also at those of its suppliers. Important problems are discussed at the executive level at this company too. In addition, a Life Cycle Assessment has been carried out for its batteries, although this is not accessible to the public. In its CSR report, Samsung SDI only publishes the statistics for its own consumption, with the exception of CO₂, where the figures for total consumption (Scopes 1-3) are published. The external audit also restricts itself to considering the company’s own consumption figures.

**SK Innovation**

**Head office:** Seoul, South Korea  
**Founded:** 1962  
**Listed on the stock exchange:** 2007 South Korean Stock Exchange  
**Turnover (2019):** CHF 42.1 billion  
**2006:** Enters the EV market  
**2010:** Partnership with Hyundai and Kia Motors  
**2011:** Partnership with Mercedes Benz  
**2016:** Lithium-ion battery supply contract with Mercedes Benz and Daimler  
**Membership of a multi-stakeholder initiative:** Global Battery Alliance

**Human rights**

SK Innovation’s suppliers all along its supply chain are subject to a self-evaluation system, albeit one where external monitoring is almost completely absent. Although there is staff training on human rights, it is unclear how many people attend. Matters relating to human rights are discussed at the
executive level at SK Innovation with the responsible department. The company publishes an annual CSR report and identifies the most blatant human rights violations, but there is a lack of important data on the evaluation of its subcontractors or indeed a list of their names. Nor can the company’s impact assessment be accessed by the public. There is little detailed information about the complaints mechanism which is implemented, only a summary is published. It is also unclear whether the system is applicable to the entire supply chain, or only to the company’s own employees.

**Raw materials**

SK Innovation has a Code of Conduct for its raw materials suppliers, which is based on the UNGPs. The use of conflict minerals is consequently prohibited. However, there is no policy governing other minerals. The company has joined a number of initiatives on the fair mining of raw materials, and is the only one of the companies under review to be part of a multi-stakeholder initiative (the Global Battery Alliance), which also gives an important voice to stakeholders from civil society. The company delegates the certification and auditing of smelting plants and refineries for conflict materials to the RMI. The names and locations of suppliers and mines are not publicised.

**Environment**

In order to reduce its CO₂ emissions, SK Innovation has set up a system to trade in emission credits. However, no concrete measures were found which would directly reduce emissions. The company is implementing a number of environmental improvement measures at its own production sites, but does not require the same of its suppliers. It has its own department for environmental problems, and the most important matters are discussed at the executive level. SK Innovation conducted a Life Cycle Assessment which can be inspected by the public, and which shows the cost of its batteries in terms of resources. In its CSR report the company publishes only the figures for its own consumption, with the exception of CO₂, where total consumption (Scopes 1-3) is given. The external audits also restrict themselves to the company’s own consumption.
### 7. Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSR</td>
<td>Corporate Social Responsibility</td>
</tr>
<tr>
<td>DRC</td>
<td>Democratic Republic of the Congo</td>
</tr>
<tr>
<td>EMPA</td>
<td>Swiss Federal Laboratories for Materials Science and Technology</td>
</tr>
<tr>
<td>EVB</td>
<td>Electric Vehicle Battery</td>
</tr>
<tr>
<td>GBA</td>
<td>Global Battery Alliance</td>
</tr>
<tr>
<td>GRI</td>
<td>Global Reporting Initiative</td>
</tr>
<tr>
<td>ILO</td>
<td>International Labour Organization</td>
</tr>
<tr>
<td>INOBAT</td>
<td>Interest group for battery disposal</td>
</tr>
<tr>
<td>LCA</td>
<td>Life Cycle Assessment (also environmental footprint, energy audit)</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-governmental organisation</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>OECD Guidelines</td>
<td>OECD guidelines for multinational companies</td>
</tr>
<tr>
<td>RMI</td>
<td>Responsible Minerals Initiative</td>
</tr>
<tr>
<td>SWICO</td>
<td>Swiss Association of Suppliers for Information, Communications and Organisation Technology</td>
</tr>
</tbody>
</table>
8. Endnotes

Unless otherwise stated, the following websites were last accessed on 21 July 2020


7. Name changed for security reasons

8. Danwatch, Denmark, 2019: How much water is used to make the world’s batteries? A web report on lithium extraction in Chile. [https://danwatch.dk/en/undersoegelse/how-much-water-is-used-to-make-the-worlds-batteries](https://danwatch.dk/en/undersoegelse/how-much-water-is-used-to-make-the-worlds-batteries)


13. Neue Tesla-Batterie soll E-Autos günstiger machen, Kooperation mit CATL, Handelsblatt, 14.5.2020


18. Neue Tesla-Batterie soll E-Autos günstiger machen, Kooperation mit CATL, Handelsblatt, 14.5.2020


22 The inevitable electric transition – Dossier on e-mobility, rt: Swissquote, Finance and Technology Unpacked, September 2019

23 UN Guiding Principles on Human Rights and Business, United Nations, 2011 (German translation by Deutsches Global Compact Netzwerk, 2013)


25 The Paris Agreement, 2015
https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

http://www3.weforum.org/docs/WEF_A_Vision_for_a_Sustainable_Battery_Value_Chain_in_2030_Report.pdf

27 Marcel Gauch is the Sustainability Delegate of the Swiss Federal Laboratories for Materials Science and Technology (EMPA). Quote from: Verkehrs-Club der Schweiz VCS, 2020: Auto-Umweltliste, Der Ratgeber für den umweltbewussten Autokauf, p. 17

28 Irene Bättig, on behalf of INOBAT for Fokus online, 6.1.2020: Wenn dem Akku der Plüs ausgeht: https://fokus.swiss/2020/01/wenn-dem-akkus-der-plüs-ausgeht


30 The positive side of batteries, ECOS, May 2020:

31 Marcel Gauch is the Sustainability Delegate of the Swiss Federal Laboratories for Materials Science and Technology (EMPA). Quote from: Verkehrs-Club der Schweiz (VCS), 2020: List of cars and their environmental impact; a guide to making an informed purchase, p. 17

32 Irene Bättig, on behalf of INOBAT for Fokus online, 6.1.2020: Wenn dem Akku der Plüs ausgeht: https://fokus.swiss/2020/01/wenn-dem-akkus-der-plüs-ausgeht

33 Strassenfahrzeuge – Bestand, Motorisierungsgrad. Federal Office of Statistics, Switzerland

Bread for all – We encourage change

Bread for all is the Swiss Protestant churches’ development organisation. We promote new models of food production and economic exchange both in the global North and South on the basis of cooperation between people and the respect for natural resources. We empower people to partake in this change through awareness-raising and promising alternatives.

Bread for all
Bürenstrasse 12, 3007 Bern
Tel. +41 31 380 65 65; bfa@bfa-ppp.ch; www.brotfueralle.ch
Postal account: 40 984-9

Swiss Catholic Lenten Fund

Daring to Change – Strengthening Justice

The Swiss Catholic Lenten Fund is the charity for Catholics in Switzerland. We are dedicated to working alongside disadvantaged peoples for a fairer world, a world without hunger and without poverty. We promote change on the social, cultural, economic and individual levels in order to encourage the dynamics of change towards a sustainable way of life. We cooperate with local organizations in 14 countries in Africa, Asia and Latin America and we are also active in Switzerland and internationally.

Swiss Catholic Lenten Fund
Alpenquai 4, Postfach 2856, 6002 Lucerne
Tel. +41 41 227 59 59; mail@fastenopfer.ch; www.fastenopfer.ch/english
Postal account: 60 19191-7

ATE Swiss Association for transport and environment

With 100,000 members, VCS is the largest transport association in Switzerland committed to sustainable mobility and a high quality of life. Whether by car, tram or bicycle, on foot or by train and bus - the mobility of the future must intelligently combine all means of transport.

ATE Swiss Association for transport and environment
Aarbergergasse 61, Postfach, 3001 Bern
Tel. +41 31 329 59 59; vcs@verkehrclub.ch; www.verkehrclub.ch
IBAN CH48 0900 0000 4900 1651 0