Sustainable supply and value chains of electric vehicle batteries

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Batteries are playing a key role in advancing electromobility. Successful transformation toward electrified transportation depends on the battery technology as well as secure materials supply chain for battery manufacturing (Crabtree, 2019). The increasing adoption of electric vehicles (EVs) results in a significant demand for raw materials for battery manufacturing. There are also some other challenges in the upwards the supply chain of EV batteries, e.g. social risks and hazards, intensive mining, possible interruption in the material supply chain as well as some economic risks due to price increment or political instabilities in some countries within the supply chain (Mann et al., 2019).

Projections also show that increased EV deployment can lead to a huge amount of EV batteries at their end-of-life (EoL) (i.e. 80% of their original state of health) by the end of this decade. Therefore, finding the right pathways required to ensure the sustainable management of EoL EV batteries is of critical importance for sustainable electromobility (Harper et al., 2019). Repurposing EV battery packs in less demanding applications or so called ‘second life’ is a way that can extend the EV battery use phase and has the potential to create environmental benefits and economic value. However, uncertainties around the remaining lifetime, cost of repurposing, and lack of required standards on installation and performance of repurposed EV batteries create barriers to the second life battery applications.

Recycling could play a significant role in securing the material supply for EV batteries (Crabtree,
2019), diverting EoL batteries and valuable materials from landfills, and also avoiding the energy use and environmental emissions from the cradle-to-gate EV battery life cycle. While lead-acid battery recycling is currently in operation, recycling for lithium-ion batteries (LIBs) and other emerging battery chemistries is still in its infancy and the associated economic, environmental, and social impacts need to be addressed. Moreover, considering the future transition of battery chemistries toward less cobalt inclusion in the LIBs, the recycling industry needs to find innovative and optimized solutions for EV battery recycling to exhibit low cost, energy consumption, and environmental impacts. There is also a need for primary data on different recycling processes of EoL EV batteries in order to help clarify the environmental impacts and economic costs of EV battery recycling.

In a wider aspect, the ever-increasing use of EVs requires appropriate policy frameworks and regulations on EoL safety and recycling (Wu, et al., 2020). Collecting EoL EV batteries also needs more in-depth research to uncover responsibilities, pricing, and required management regimes to help policymakers set the right strategies. Overall, the lack of understanding of the upcoming waste management and reverse supply chain networks for EoL EV batteries can cause significant challenges but could also create great opportunities (Ghadimi et al., 2019).

All these issues around the evolving context of electromobility provide rich research grounds and do call for additional investigation into the challenges and opportunities created by expected growth of EV adoption and EoL EV batteries. Thus, we welcome and encourage submission of high-quality manuscripts on the broad area of **sustainable supply and value chains of electric vehicle batteries** focusing on the following, but not limited to, topics:

- Environmental, economic, or social impacts of EV batteries over their entire life cycle
- Resources and energy flows in the supply and value chains of EV batteries
- Dynamic modelling of the material supply chain of EV batteries
- Novel theories and solutions for EoL EV batteries such as collection, sorting, reverse logistics, and recovery
- Sustainability assessment of second life EV batteries for different applications
- Novel recycling techniques for EoL EV batteries
- Innovative management practices, business models, or policy frameworks for second life and recycling of EoL EV batteries
- Regulatory framework and legislation for managing EoL EV batteries
**Manuscript Preparation and Submission**

A Virtual Special Issue (VSI) is an online-only grouping of Special Issue articles traditionally assigned to a single Special Issue. The articles in a VSI will be assigned a unique identifier and published in a regular journal issue. The unique identifier allows to simultaneously adding the article to a VSI in ScienceDirect.com. Articles grouped together in a VSI retain their original citation details. A VSI speeds up the publication of individual articles as, unlike the publication process for conventional Special Issue articles, a VSI does not need to wait for the final article to be ready before publication. All submitted papers should address issues related to the theme of the VSI and be within the scope of the journal.

A detailed submission guideline is available as “Guide for Authors” at http://www.journals.elsevier.com/resources-conservation-and-recycling. All manuscripts and any supplementary material should be submitted through Elsevier Editorial System () and select “VSI: EV battery” when asked to indicate the “Article Type”.

**Important Dates**

- Full paper submission deadline: October 30, 2020
- Final decision notification: February 28, 2021
- Publication: As soon as accepted (VSI)

**References**


