



IB-1: A Comprehensive Life Cycle Assessment on EVs' Lithium-ion Battery in China

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Introduction : Background

1. Many countries started to develop Next-Generation Vehicles (NGV) to reduce CO2 emission and fossil fuel consumption from the transportation sector. Among all the NGV, Electric Vehicle (EV) received the most attention in these years.
2. In 2015, China surpassed America and becomes the largest EV market in the world.
3. Along with EVs' popularization, Lithium-ion Batteries (LiB) market is also developing fast. LiB makers are continually upgrading LiBs since they are the only power resource for EVs.
4. There will be a massive number of waste LiB in China need to be recycled properly, yet, the environmental impact of doing so is still unclear.

Research methodology

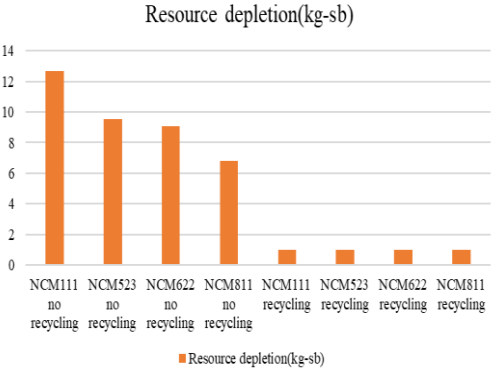
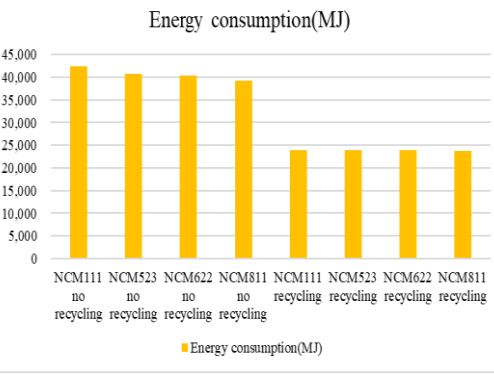
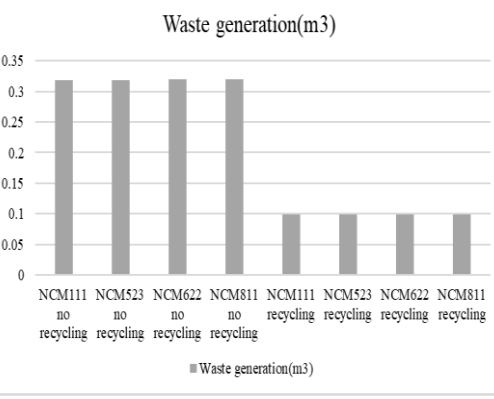
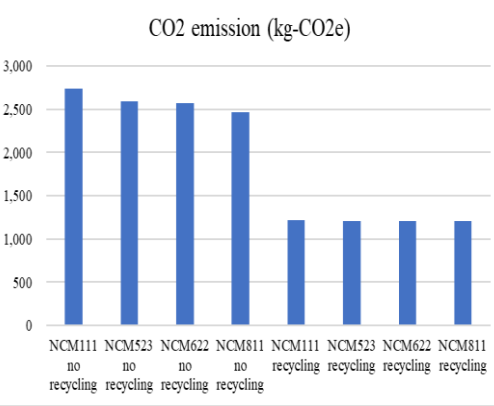
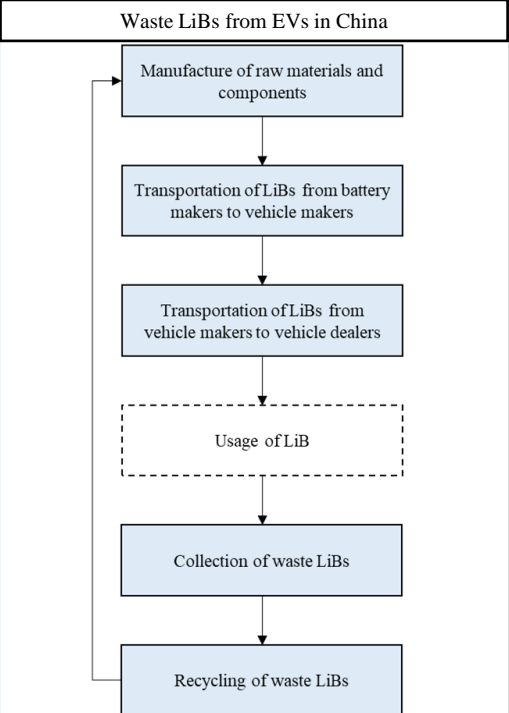
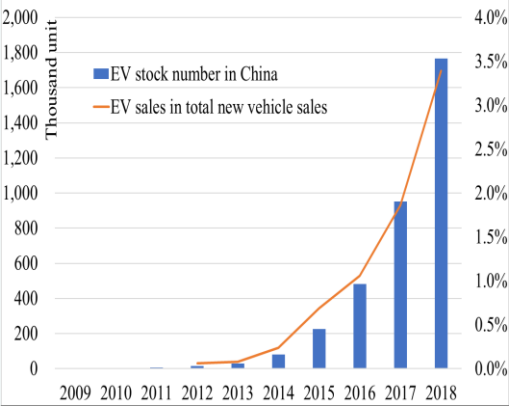
1. Life-Cycle Assessment (LCA) method have been widely used to quantitatively analysis the environmental impact of a studied product.
2. In this research, we analyzed the environmental impact of a LiB generated from its manufacturing, assembling, transportation, collection and recycling processes. And will demonstrate how exactly will waste LiB recycling process affects the environmental impact of a LiB.
3. A sensitive analysis focusing on the change in the type of LiBs is performed.

Environmental impact of LiBs

1. The environmental impact of LiBs is decreasing due to the change in LiBs' composition.
2. Under the "non-recycling" scenario, 2,500 kg~2,700 kg of CO2 emission, 7 kg ~13 kg of substance depletion, 0.3 m3 of landfill volume, and 39,000 MJ~42,000 MJ of energy consumption will be required through LiBs' life cycle.
3. If waste LiBs' could be appropriately recycled, their life cycle CO2 emission can be cut to 1,200 kg, resource depletion will be around 1 kg, landfill occupation volume will be around 0.1 m3, and energy consumption will be 23,000 MJ only.

Conclusion

1. The environmental impact of LiBs is decreasing along with the technology innovation, and the change in LiBs' composition.
2. The most fundamental and instant way to decrease LiBs' life cycle environmental impact is to recycle them when they became waste batteries.
3. To establish a sustainable and efficient waste LiB recycling system, the Chinese government and stakeholders in the recycling industry should try to improve the collection rate of waste LIBs in the future.



Research scope of this study | Environmental impact of LiBs under each scenario