Sustainable Lithium-Ion
Batteries for E-Mobility

LOOP

On behalf of

Federal Ministry
for Economic Cooperation
and Development

Implemented by

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

TUMI
Transformative Urban Mobility Initiative

Sustainable Lithium-Ion Batteries

for e-mobility

1 raw material extraction

Work towards a mining sector that respects social and ecological factors and our climate.

RECOMMENDATIONS

- Mining should take place under good governance (transparency, accountability, prevention of corruption, rule of law, participation)
- Protect human rights, rights of vulnerable groups, promote gender equality, and ensure occupational safety
- Reduce CO2 emissions, avoid pollution of soil, air and water and implement plans for ecological restoration and mine closure

https://rue.bmz.de/resource/blob/100120/3fc11581e7fbb1545a907121483 2bcc0/GIZ_BGR_RawMaterials_for_E-Mobility_EN.pdf

2 transport

Use sustainable transport modes to transport all battery materials along the life cycle.

RECOMMENDATIONS

- Avoid transport where possible (source & process locally)
- Shift to the most efficient means of transport (especially rail, inland waterways, etc.)
- Electrify transport routes and use renewable energy
- Consider transport externalities in and between all following process steps

https://www.transformative-mobility.org/assets/publications/ASI_TUMI_SUTP_iNUA_No-9_April-2019.pdf

3 raw material processing

Ensure fair and transparent processes throughout the entire supply chain.

RECOMMENDATIONS

- Reduce CO2 emissions trough sustainable production methods and technologies e.g. the use of renewable energies in production
- Increase supply chain transparency
- Ensure fair working conditions
- Increase local value chain through processing locally

https://rue.bmz.de/resource/blob/100106/832bb23a3f541bb96393555cf2bf3f1c/GIZ-FactSheet-LPRM-English.pdf

4 battery design & production

Design for durability and circularity.

RECOMMENDATIONS

- Design batteries for the circular economy, with durability, efficient raw material use, modularity, re-use and recyclability in mind.
- Maximise uptake of secondary raw material content from recycling
- Development of new battery types and compositions to use resources more efficiently and economically (e.g. without critical resources or less cobalt use)
- Reduce CO2 emissions, energy and water consumption in the production of batteries

https://static1.squarespace.com/static/5b52037e4611a0606973bc79/t/6077e44e9edfc90ec441f2ef/1618469978857/TB_Kurzfassung+EN

5 battery use in e-mobility

Charge Li-Ion Batteries of EVs with renewable electricity for all transport modes to bring down emissions.

RECOMMENDATIONS

- Select vehicle technology based on external conditions (topography, climate) and operating hours
- Size the vehicle battery right based on the usage profile
- Aim for maximum utilisation of vehicles by using, batteries with priority for public transport, shared or autonomous vehicles
- Follow careful charging/discharging regime of batteries to reduce ageing of battery cells
- Adopt efficient driving behaviour (less stop-and-go, smooth acceleration processes) to reduce energy consumption and battery degradation.
- Increase battery utilisation (during parking) by feeding battery power to the electricity grid via vehicle to grid (V2G) integration

https://www.sum4all.org/data/files/buildingblocksandpolicyrecommendations_english.pdf

6 further use / second life

Extend the lifetime of batteries.

RECOMMENDATIONS

- Enable second life for vehicle batteries when 80% or less battery capacity is left
- Repurpose batteries for stationary energy storage or other applications where performance demands are lower, extending the life of batteries
- Identify (business) opportunities for making lithium-ion batteries usable again
- Develop and apply standards that ensure minimum quality, performance and safety requirements are met

https://www.sciencedirect.com/science/article/pii/S0301479718313124

7 recycling

Set-up take-back systems for recycling financed through extended producer responsibility.

RECOMMENDATIONS

- Support establishment of formal recycling infrastructure according to international standards
- Collect and send to formal recycling facilities
- If no local recycling infrastructure available, enable safe transport (e.g. in drums with sand) to appropriate facilities (around 30 companies in E-Asia, Europe, N-America)
- Establish financing options for the collection and recycling of Li-ion batteries, as recycling costs often exceed material value (e.g. Extended Producer Responsibility (EPR))

https://accurec.de/wp-content/uploads/2021/04/Accurec-Comparative-study.pdf

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Authors

GIZ Sector Project Sustainable Mobility

GIZ Extractives and Development Sector Programme

GIZ Sector Project on Concepts for Sustainable Waste Management and Circular Economy

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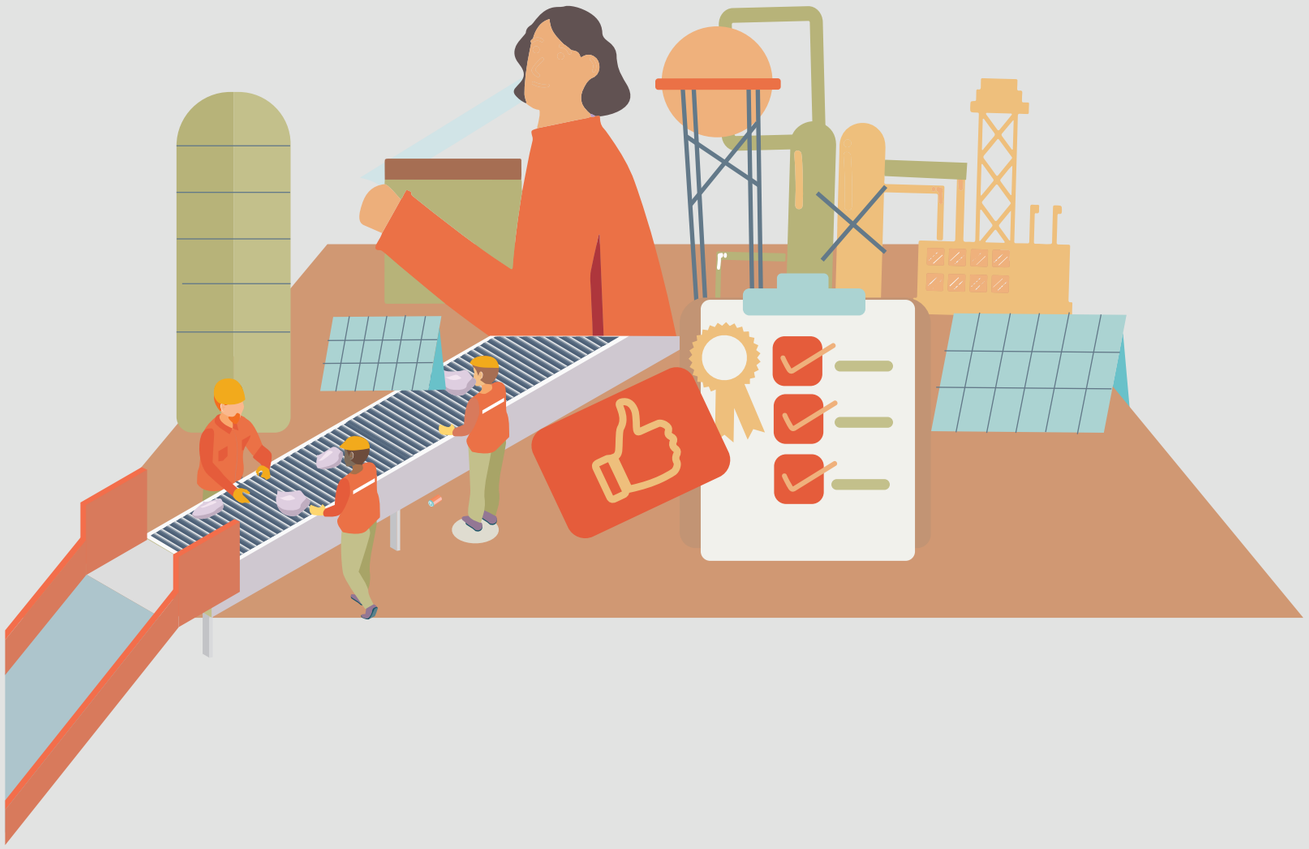

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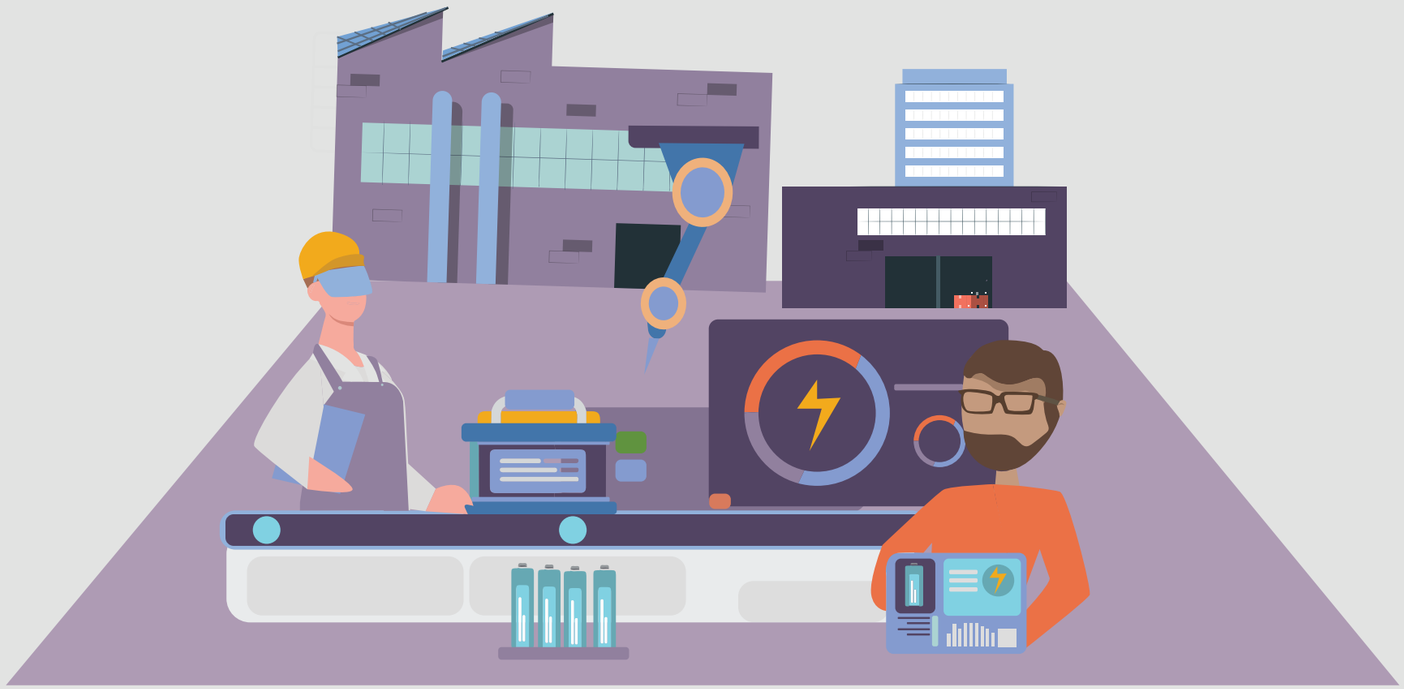

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