# Lithium Batteries

# The Global Increase In Demand

# &

# Developing Regulation For Transportation For New, Damaged, Recalled or Recycled Product

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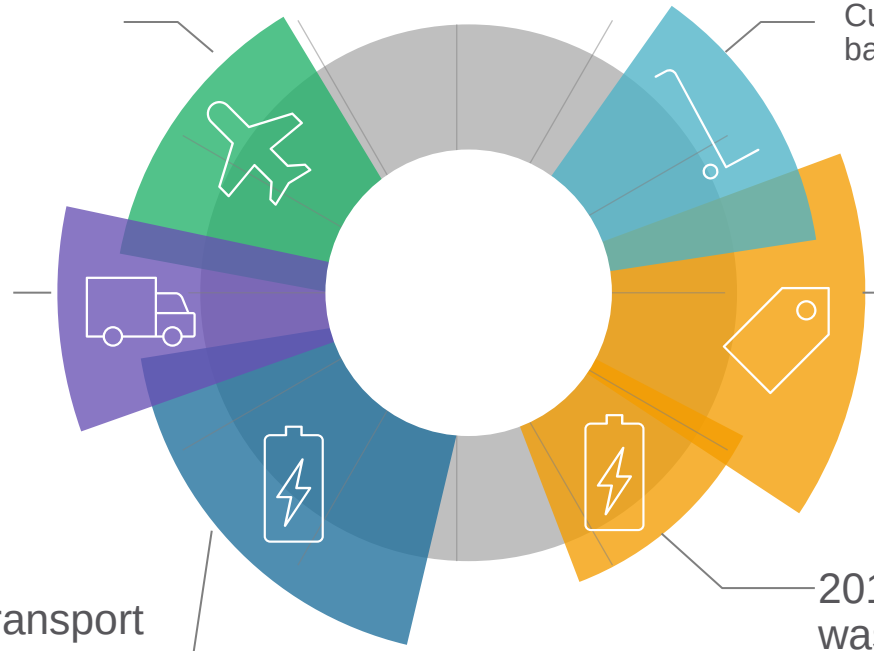
# Lithium Batteries - Increased Global Demand

Transport regulations becoming increasingly stringent & ever changing for new, replacement & recalled battery units

Lithium is ‘’The New Gasoline’’ Values soaring for virgin & battery grade recycled material.

Current estimate that only 5% of Lithium batteries recycled correctly



Demand for higher power means that batteries over 100 Whr are becoming more commonplace & these present increased logistic issues & costs

Why the increase demand?
Lithium has 50% to 80% more energy than lead acid battery chemistry
Lithium is very light
Long lifetime 3000 cycles
Fast charging capability
No battery memory issues

Cells and batteries for transport must be protected from rupture, overcharge, short circuit, heating & over discharge – packaging, optimum storage conditions, handling & qualified personnel & training can reduce non compliance, risk & fines

2016 global battery production was 27.9 GWhr
Forecast for 2020 production is 173.5 GWhr

Driven by EV’s, Powerwall storage, Cordless consumer goods

# Rechargable Lithium Batteries: Developing Regulation

Lithium batteries & cells have unique UN identification numbers for transport, if capacity is greater than 100Wh it becomes more tricky.
UN3090, UN3091 Lithium Metal
UN3480, UN3481 Lithium Ion
UN3171 Lithium powered vehicles

Specialist UN certified packaging of new batteries & cells they must be less than 30% state of charge (SOC)
Class D fire-extinguisher. Halon & water extinguishers will create toxic gasses

All cells & batteries must meet UN standards for transport of dangerous goods and can only be transported if they have past testing to UN38.3 requirements

Labelling, packaging & weight limits for Class 9 Dangerous Goods. Special conditions allow for transport of defective, damaged, recalled or for disposal & recycling
New labelling from 1st Jan 2019.

Cells & batteries must be manufactured under a quality management programme otherwise they can not be transported at all. Some dispensation for prototypes & small runs of <100 items
IATA DGR 3.9.2.6

Proliferation of Lithium batteries at any one time 500 million in use Worldwide
Transportation with regulations
Cargo Aircraft – IATA
Passenger Aircraft - Forbidden
Road/Rail - ADR/RID
Sea - IMDG
*A small passenger aircraft with 100 passengers could have up to 500 lithium batteries within hand luggage!

# New Lithium Battery Hazard Label – legal requirement from January 2019

# Lithium Battery Transportation For Recalls/Damaged/Recycled

Tight Controls & can only be moved in accordance with Transport Regulations with Special Provisions
ADR – Dangerous Goods by Road or RID – Dangerous Goods by Rail

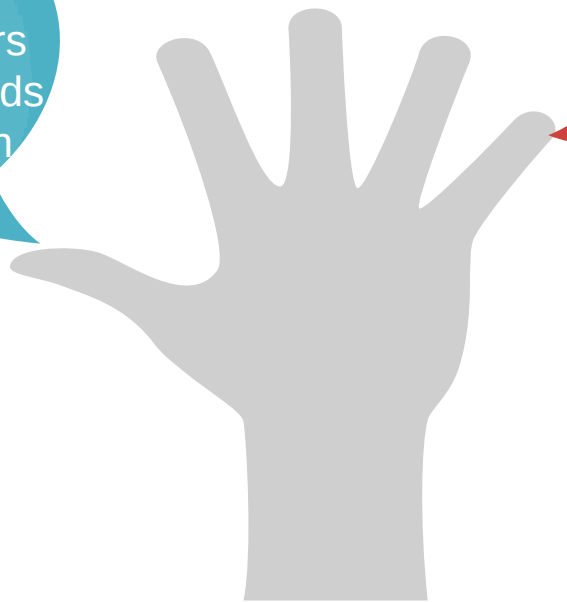
Packages must be marked Damaged /Defective Lithium-ion or Lithium Metal batteries

Packages must be marked Lithium batteries for disposal or Lithium batteries for recycling

Must be packaged as singles to UN packaging nstruction P908 or LP904

Can only be transported by Specialist providers as dangerous goods Special Provision 376 & 377

In Drums, boxes, jerricans no movement inner & outer non-conbustable thermal packing

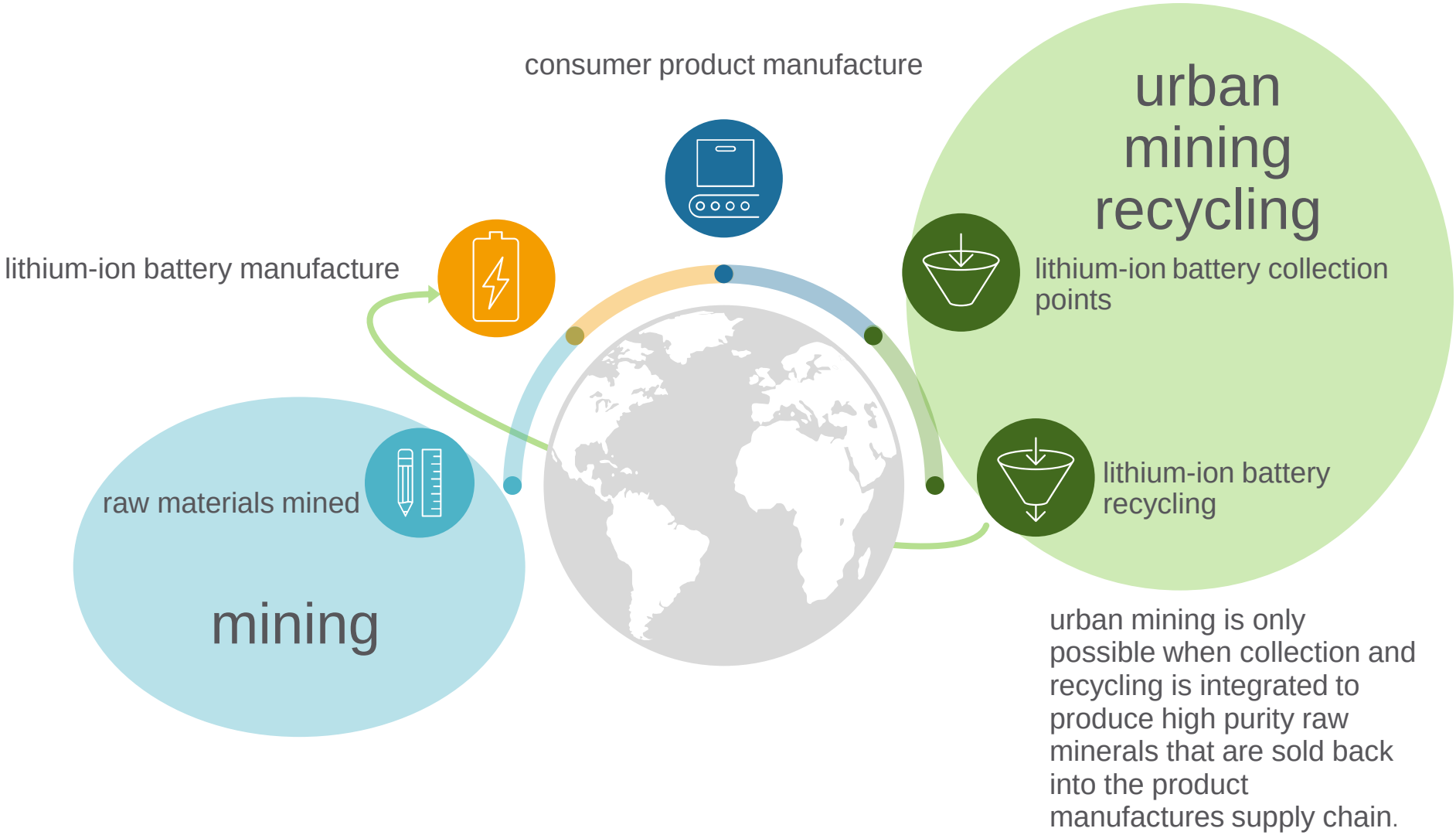


You must declare if transporting defective Batteries- work with an organisation that is au fait with regulations

You must minimize vibration, shocks, movement, you may need to design specialised packaging

Cells can leak you must absorb with inert material & if possible cells should be discharged

# New Global Opportunities for Recycling Safely & Correctly - Supporting Brands & Consumers




urban mining is only possible when collection and recycling is integrated to produce high purity raw minerals that are sold back into the product manufactures supply chain.