

Critical Minerals

A Royal Academy of Engineering and Indian National Academy of Engineering Forum

Sustainable and Traceable Critical Minerals Supply Chains for the Energy Transition

BEWARE THE 'RESOURCE CURSE'
IT ALL STARTS IN THE GROUND
BOTH LARGE & SMALL SCALE
WE WANT THE GOOD OF MINING
NOT THE BAD...
A HOUSEHOLD MINES
INNOVATION NEEDED IN TRACKING

SUPPLY CHAIN CHOICE IS ESSENTIAL
TECH INTEGRATION MUST BE FROM STEP 1 TO REDUCE WASTE
EXPERT MATERIALS
RECYCLING NEEDS TO HAVE UPDATED RULES

LOCALS NEED WIN/WIN SUPPLY CHAINS, TAKING OUT OF THE GROUND MUST RETURN BENEFITS TO COMMUNITIES

Designing for Resource Efficiency and Circularity in Energy Technologies

THE SOLUTION TO EMISSIONS IS THE GLOBAL ENERGY TRANSITION
CRITICAL METALS & MINERALS ARE ESSENTIAL FOR THIS PROCESS
MORE EFFICIENCY CAN HELP US TO REDUCE OUR RISK
LONGER LIFE CYCLE

HUGE OPPORTUNITIES TO BE GRASPED IN RECYCLING WITH SCRAP METAL TO REDUCE EMISSIONS
MOVING TOWARDS A CIRCULAR ECONOMY

WE HAVE TO LOOK AHEAD TO A WORLD LESS RELIANT ON LITHIUM & COBALT
ADVANCED SIMULATION TO DETERMINE MORE PRECISE DEMAND AND THEREFORE IMPROVE EFFICIENCY
A NEED TO BALANCE THE ECONOMIES WITH A WHOLE LIFE CYCLES APPROACH
EXPANDING ON ALTERNATIVE SOLUTIONS

PROCESSES & PRODUCTS MUST BE DESIGNED WITH CIRCULARITY IN MIND
THE CIRCULAR ECONOMY GOES BEYOND JUST RECYCLING
REUSE
RECYCLE
RECOVER
RECOVERY

Re-use, Recovery, Recycling

60% GLOBAL PGM COMES FROM SOUTH AFRICA
2/3 OF THE POPULATION ASSOCIATED WITH THE MINES
MINING HAS A PEOPLE IMPACT
A PLANET IMPACT
PROFIT
PGMs INVOLVED IN MANY MANY AREAS

HYDROGEN ECONOMY GROWS - THE DEMAND ALSO GROWS
THE RESOURCES ARE SCARCE - RECYCLING IS ESSENTIAL
HYDREFINE
LESS WATER
LOWER ENERGY
LESS WASTE
PRODUCE MAGNETS FROM RECYCLED ELEMENTS THAT ARE EQUAL TO ONES FROM PRIMARY MATERIALS
DESIGN PRODUCTS TO BE RECYCLED...
ADVANCED ANALYSIS TO OPTIMISE THE RECOVERY
UTILISE EMERGING TECHNOLOGY, SUCH AS AI, TO SORT WASTE AND IMPROVE EFFICIENCY
EXPERTISE & KNOWLEDGE NEEDS TO BE EXTRACTED TOO!

WE NEED FURTHER COLLABORATION TO LAUNCH INNOVATIVE IDEAS

Reducing Dependency on Scarce Materials

THE HOLY GRAIL...
SPACE TO DIVERSIFY IN AREAS SUCH AS SODIUM & SULPHUR
THERE ARE LIMITATIONS AND SOME, SUCH AS K-ION WILL ONLY HAVE SPECIFIC APPLICATIONS
HOLISTIC VIEW OF PRODUCTION
MANUFACTURING BATTERIES: EVERYTHING IS IMPORTED
RISK
RISK
EXTRACTED
REFINED
USED

WAYS TO MITIGATE
CIRCULAR ECONOMY + RECYCLING
SUPPLY CHAIN MANAGEMENT
MATERIAL SUBSTITUTION
ADVANCED RECOVERY TECH
MANY AREAS TO EXPLORE FOR EXTRACTION
LAND AND SEA MINING OPPORTUNITIES COME WITH CHALLENGES
LARGE INVESTMENT IN R&D IN MINING (4% CENTRES OF EXCELLENCE)

SELF-DRIVING LAB

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UK x India Critical Minerals Supply Chain Observatory Discussion

ALL THE PIECES WERE THERE, MINDS, IDEAS & SOLUTIONS – WE JUST HAVE TO CONNECT THEM!

GLOBAL SUPPLY CHAIN IS A CONSTANT CRASH RISK

90% IS NOT VISIBLE

I CAN'T SEE A THING...

CREATED A HUGE DATA SET ABOUT GLOBAL CRITICAL MINERALS

REPAIR DATA SOURCES

TRIANGULATING DATA TO ENSURE ACCURACY

4 AGENTIC LAYERS TO CHECK DATA

LAYERS UPON LAYERS OF INFORMATION

A PLATFORM TO MAP THE SUPPLY CHAIN

GOAL IS FOR A CHATBOT TO EXTRACT THE DATA

YOU CAN DIRECTLY TRACK WHAT MINERALS ARE COMING IN AND OUT OF YOUR COUNTRY

FROM MINES TO EV/PV...

DATA CHALLENGE TO TRACK DATA ON MATERIALS BEYOND THIS

HOW MANY CRITICAL MINERALS ARE IN YOUR DRAWER

UK x India Technology Security Initiative Discussion

BUILT ON KEY PILLARS

A PRIMARY GOAL BUILD RELATIONSHIPS

SHIPS

AI

TELECOMS

CRITICAL MINERALS

SEMICONDUCTORS

QUANTUM TECHNOLOGIES

BIO-TECH & HEALTH TECH

ADVANCED MATERIALS

HERE'S SOME SEED FUNDING

VISITS MUST BE BACKED BY TANGIBLE OUTCOMES & FUNDING

CONNECTIONS MUST BE MADE BETWEEN

INDUSTRY

ACADEMIA

NOW IS THE MOMENT TO PUSH FOR FUNDING!

JOINT FUNDING AND GETTING FUNDING VIA UKRI

POLICY IS GREAT, BUT WE ALSO NEED MECHANISMS

Discussion: Ongoing Collaboration & Next Steps

BETTER UNDERSTANDING OF RESOURCES

IMPROVED SCHOLARSHIP AND EXCHANGE PROGRAM

OPTIMISE EXTRACTION OF GALLIUM

CHALLENGE BASED WORKSHOPS

LEVERAGE INDUSTRY GUILDS

SCALABLE ECONOMIC MODEL

ACADEMIA

INDUSTRY

BETTER GEOLOGICAL DATA

INDIA HAS THE VOLUME

UK HAS EXPERTISE

SKILLS

GAP

UPSKILLING IS REQUIRED TO COMPETE EFFECTIVELY GLOBALLY

MAKE ACHIEVEMENTS OF INDIA CENTRES OF EXCELLENCE VISIBLE IN THE UK!

CLEAR LINK TO MARKET

AI TO AID IN DECISION MAKING

FLEXIBLE PROJECT FUNDING

PROTECTED ACADEMIC PROGRAM