AfricaMaVal

Coordination and Support Action (CSA)

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or he European Health and Digital Executive Agency (HADEA). Neither the European Union nor the granting authority can be held responsible for them.

Start date : 2022-06-01 Duration : 42 Months

Strategy Outline - Stage 1

Authors : Mrs. Andre UFER (EIT RM), André Ufer (EIT-Raw Materials), Shahrzad Manoochehri and Robin Gilli (WRFA), with contributions from Philip Schütte and Konstantin Kühne (BGR), Andor Lips, Eloise Nederveen and Bryce Albery (HCF) Carol Zammit (BRGM)

AfricaMaVal - Contract Number: 101057832

Project officer: Victoria Leroy

Document title	Strategy Outline - Stage 1
Author(s)	Mrs. Andre UFER, André Ufer (EIT-Raw Materials), Shahrzad Manoochehri and Robin Gilli (WRFA), with contributions from Philip Schütte and Konstantin Kühne (BGR), Andor Lips, Eloise Nederveen and Bryce Albery (HCF) Carol Zammit (BRGM)
Number of pages	59
Document type	Deliverable
Work Package	WP6
Document number	D6.2
Issued by	EIT RM
Date of completion	2023-08-07 09:24:07
Dissemination level	Public

Summary

This deliverable will synthesize input from task 6.1. and other WPs to compile a succinct state of play that acts as the basis for a gap analysis and the further successive strategy development. Stage 1 will deliver a strategy outline with clearly defined challenges, opportunities, targets and goals to be further developed in the successive stages.

Approval

Date	By
2023-08-07 09:25:18	Mrs. Andre UFER (EIT RM)
2023-08-07 09:36:03	Mrs. Carol ZAMMIT (BRGM)

Horizon Europe Framework Programme (HORIZON)

D6.2 – Strategy Outline Stage 1

WP6 - Task 6.2

July 31, 2023

André Ufer[1], Shahrzad Manoochehri[2], Robin Gilli[2], with contributions from Philip Schütte[3], Konstantin Kühne[3], Andor Lips[4], Eloise Nederveen[4], Bryce Albery[4], Carol Zammit[5]

[1]*EIT-Raw Materials*
[2]*World Resources Forum Association (WRFA)*
[3]*Bundesanstalt für Geowissenschaften und Rohstoffe (BGR)*
[4]*HCF*
[5] *Bureau de Recherches Géologiques et Minières (BRGM)*

Funded by
the European Union

Disclaimer

The content of this deliverable reflects only the author's view. The European Commission is not responsible for any use that may be made of the information it contains.

Document information

Grant Agreement / Proposal ID	101057832
Project Title	EU-**Africa** Partnership on Raw **Ma**terial **Val**ue chains
Project Acronym	AfricaMaVal
Project Coordinator	Guillaneau Jean-Claude (jc.guillaneau@brgm.fr) - BRGM
Project starting date (duration)	1st June 2022 (42 months)
Related Work Package	WP 6 Developing a strategy for integration for EU and Africa value chains for the energy and digital transition activities
Related Task(s)	6.2 Conceptualize and synthesize the input from the mapping exercises
Lead Organisation	EIT Raw Materials
Contributing Partner(s)	BRGM, LNEG, BGR, MADI, HCF, WRF, LGI, AWIMA, DMT
Due Date	July 30, 2023
Submission Date	June 23, 2023
Dissemination level	

History

Date	Version	Submitted by	Reviewed by	Comments
June 26, 2023	1	André Ufer	Shahrzad Manoochehri	
July 21, 2023			Carol ZAMMIT	

Table of Contents

Funded by
the European Union

List of Figures

List of Tables

Funded by
the European Union

Abbreviations and Acronyms

Acronym	Description
3DP	3-dimensional printing
3T	Tin, tungsten, tantalum
3TG	Tin, tungsten, tantalum and gold
AMV	African Mining Vision
AMDC	African Minerals Development Center
ARM	Alliance for Responsible Mining
ASM	Artisanal- and small scale mining
AU	African Union
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe (Federal Agency for Geosciences and Natural Resources)
CPI	Corruption Perception Index
CRM	Critical Raw Material
CSO	Civil Society Organization
CTC	Certified Trading Chains
DRC	Democratic Republic of Congo
EBRD	European Bank for Reconstruction and Development
EC	European Commission

EEAS	European External Action Service
EIB	European Investment Bank
ELV	End-of-live Vehicle
EU	European Union
ESG	Environment, Social, Governance
EV	Electric Vehicle
FDI	Foreign Direct Investment
FS	Feasibility Study
GHG	Greenhouse Gas
GRI	Global Reporting Initiative
HREE	Heavy Rare Earth Elements
ICMM	International Council on Metals and Minerals
ICT	Information and Communication Technology
IFC	International Finance Corporation
ILO	International Labour Organization
IRMA	International Responsible Mining Assurance
ITSCI	International Tin Supply Chain Initiative
JRC	Joint Research Committee
JV	Joint-Ventures
KfW	Kreditanstalt für Wiederaufbau
Li	Lithium
LME	London Metal Exchange
LREE	Light Rare Earth Elements

LSM	Large-Scale Mining
NFB	Neodymium-iron-borate
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
PFS	Pre-Feasibility Study
PGM	Platinum group metals
PPP	Public Private Partnership
PV	Photovoltaic
REE	Rare Earth Elements
RMI	Raw Materials Initiative
RMIS	Raw Materials Information System
SDG	Sustainable Development Goals
SM	Strategic Minerals
TVET	Technical and vocational education and training
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
US	United States
WEEE	Waste Electrical & Electronic Equipment
WP	Work Package

Funded by
the European Union

Executive Summary

This report constitutes a first outline of the AfricaMaVal strategy. It provides a general overview of the critical raw materials demand for the twin transition and will then describe the role of the AfricaMaVal project in achieving the goals and targets of such a transition. The document highlights the strategic opportunities and strengths of the project and analyses the existing gaps and shortcomings that need to be overcome to ensure sustainable and responsible supply of materials for the transition. Furthermore, this draft strategy provides recommendations for European responsible sourcing from Africa. and presents the enabling conditions that can be achieved under the AfricaMaVal.

,

Keywords

ECRM, Sourcing, Transition, Renewables, Value-Chains, ESG, Supply Risks, Demand Patterns, Batteries, Magnets, PV, Wind Turbines, Resource Nationalism, Preferential Access to Resources, Partnerships, Risk Awareness, Strategic Investments, Joint Ventures, Offtake Agreements, Africa Mining Vision

Background: The AfricaMaVal Project

In light of the increasing material demand of modern economies in general, and the material requirements under the energy and transport transition framework in particular (see subsequent chapter), the EU understands that this demand can not be met through mining of critical raw materials (CRM) within the borders of the EU alone, but that an increasing portion will have to be sourced from countries in other jurisdictions.

While the European Commission (EC) is building closer ties with a number of countries for improving access of European industry to CRM (so called raw material partnerships), additional activities with regard to the responsible sourcing of mineral and metals have to be undertaken to ensure reliable supply for Europe.

The AfricaMaVal project is one such activity, aiming to develop EU-Africa partnerships to ensure responsible sourcing of minerals for the European industry while promoting economic development opportunities for instance through fostering local content, infrastructure promotion and training & education for Africa.

Core activities of the AfricaMaVal project include a thorough analysis and assessment about the geological potential of CRM (WP 1), assessing the current level of activities with regard to mining (including exploration) and refining as well as mapping of relevant infrastructure (WP 2), an analysis of required financing tools, including mapping of private and public funding opportunities (WP 3) and ESG requirements (WP 4). Outputs of the project are a digital matchmaking platform supported by B2B events and investment pitching platforms (WP 5 and 6), and the provision of investment opportunities from large-scale mining (LSM), mid-tier and small scale mining (ASM), and infrastructure by way of making available to investors and offtakers pre-screened investment opportunities.

The strategy, which will be developed, adapted and refined throughout the lifetime of the project will ask how the material need for the twin transition will be met given identified project strengths and weaknesses, as well as under identified opportunities and gaps that are influencing the project. Out of this ‘governing framework’ a set of goals and actions will be developed. It is important to understand that many insights will become evident only when the project is being ‘rolled out’, i.e. when the matchmaking platform has been activated and the matchmaking process has been initiated both virtually and in real life through B2B meetings. For this reason, a total of three drafts will be developed, taking into account recent developments, experiences and lessons learned.

1 The Demand Side: Raw Material Requirements under the EU Twin Transition Framework

The term 'twin transition' concerns the goal towards increasing digitalization as well as the modification of the energy- and transport systems. The first part hence describes actions and policies to transform the EU economy from an analogous information processing system to one that is largely based on digital processes and big data, whereas the second part covers actions and policies to shift the EU from largely fossil-fuel based energy and transport system towards a predominantly renewable -based system.

As an EU Joint Research Committee (JRC) report (Muench, S. et al, 2022) points out, the two transitions are also interdependent and (should) reinforce each other: Digital data for instance can help to make renewable energy use more efficient by using electricity at times when renewable production is peaking - thus ensuring lower consumer prices. The report points out one example: 'Smart cities and communities are possible solutions to reduce these emissions and show how the twin transitions can take place in a holistic, systemic manner…. Information and Communication Technology-based solutions could reduce commuting by 15-20 % and cut greenhouse gas emissions by 10-15 %.' (p.9). On the other hand, increased digitalization will also result in higher electricity demand, which could be regarded as a negative interdependence.

While the digital transition will be an ongoing process, the 'green' transition (including the energy and transport system transition) is to be completed by 2050, as that is the date by which the EU aims to be climate neutral. Given the implications that these two lines of transition cast over basically any aspect of the economic and social life within the EU, they are poised to become central points of action for Europe's future.

Given that, what will then be the consequences from a raw materials perspective? For clarity purposes, it is necessary to define some terms as they are interpreted differently according to the prevailing context. Raw materials for instance could include any primary commodity, i.e. commodities that are grown, harvested or mined. Mined or extracted raw materials in turn may include energy (e.g. oil, coal) as well as non-energy minerals and metals. In the context of the studies of the AfricaMaVal project, raw materials however are defined as minerals and metals, including ferrous (e.g. iron ores) and non-ferrous minerals (e.g. copper). Furthermore, the term 'critical raw material' (or CRM) or 'extended critical raw materials' (ECRM)[1] is of specific importance. Given that the EU is a major hub of processing, manufacturing and energy production it has to be stated that from a general point of view, all raw materials, even when not classed as critical, are important for the EU economy. However, special attention is given to a specific set of raw materials that are deemed to be 'critical'. According to the Raw Material

[1] ECRM does cover CRM plus copper, nickel, tin and manganese.

Funded by
the European Union

Information System (RMIS), Critical Raw Materials are 'both of high economic importance for the EU and have a high risk of supply disruption'.

The material repercussions can in theory be assessed and calculated, resulting in an 'economic importance' quantification measurement. Of course, this assessment comes with the constraint that reactions of market forces with possible unintended results are not yet known. For instance, some of the solutions that are currently being thought of might not be accepted by the market or may turn out as impracticable or similar. This is also true of future abilities to substitute, replace and recycle. There might be technologies in place that could substantially boost these abilities, while some processes might turn out to not be of great efficiency. In short, while 'transition' is frequently depicted as a linear process, in reality it will most likely not be all that linear.

Independent of that, it is the obligation of policy makers to account for material requirements of the twin transition with the current state of technology. A major instrument for such an accounting process is the European Green Deal. The most relevant regulation stemming from the Green Deal has been the adoption of the European Climate Law to establish the legally binding target of reaching net zero greenhouse gas emissions in the European Union by 2050, with the logic implications this has for energy generation and the future maintenance and development of individual and public transportation systems.

1.1 The Role of Extended Critical Raw Materials (ECRM) and ECRM value chains

Interestingly, the progressing modernization of the industrialized economies has led to an increase in the demand of metals and minerals, which came to a surprise to some analysts, who rather figured the transition towards pure service economies, and hence a minor degree of raw materials use. In addition, technologies required under the twin transition regiment will demand more minerals and metals both in absolute and relative terms. Volker et al (2014) clearly point out a steep increase in metal use over the last two and a half centuries, stipulated by an increase in metal demand by epoch-typical industrial products such as the windmill, the steam engine, the car and technologies based on renewables (such as photovoltaics and wind energy generators). While the windmills basically relied upon a few selected raw material ingredients, this figure now includes at least 36 CRMs (40 for ECRM) for the case of photovoltaic and wind turbine production (ibid).

For the EU then, monitoring this shifting demand for CRM to allow the twin transition to be realized is of critical importance. Within the EU, CRMs are being assessed regularly, a result of the Raw Materials Initiative (RMI) which requires the Commission to undergo such assessments. The assessment, i.e. the level of criticality of certain raw materials serves also as a basis for EU and national policy measures in relation to (critical) raw materials. The latest Commission Communication regarding the criticality assessment was in 2023.

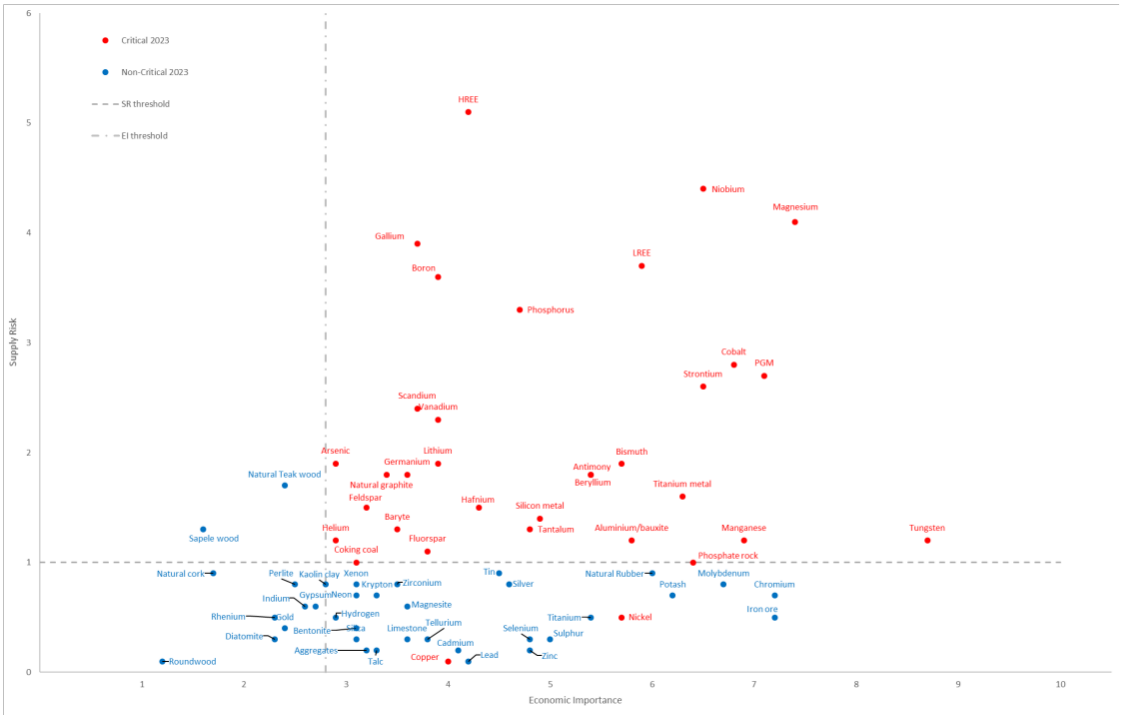


Figure 1: Interrelationship between scarcity and demand of the 2023 CRM; source: EC 2023

While Figure 1 provides a visible relationship between economic importance and supply risk, Table 2 below lists the individual minerals and metals that have been identified in the latest 2023 assessment of critical raw materials. In comparison to earlier assessments, the latest analysis also takes up the term of 'Strategic Minerals' (SM), which are derived from the proposed Critical Minerals Act Regulation (March 2023). Tables 2 and 3 below show the CRMs that have been recently (in 2023) included (as compared to the previous assessment, in italics), as well as the inclusion of strategic minerals. It is interesting to note that copper and nickel do not meet the CRM thresholds but are included as Strategic Raw Materials. Hence, this report, and the AfricaMaVal project in general will also look at 'strategic minerals', as the importance to secure additional access to those is equally critical for the EU. For this report then, the strategic minerals are not distinguished as a separate group but are included and studied in the group of CRMs.

Funded by
the European Union

Table 1: The 2023 critical raw materials list; new CRMs in italics; source: EU 2023

2023 Critical Raw Materials (*new CRMs in italics)*			
aluminium/bauxite	coking coal	lithium	phosphorus
antimony	*feldspar*	LREE	scandium
arsenic	fluorspar	magnesium	silicon metal
baryte	gallium	*manganese*	strontium
beryllium	germanium	natural graphite	tantalum
bismuth	hafnium	niobium	titanium metal
boron/borate	*helium*	PGM	tungsten
cobalt	HREE	phosphate rock	vanadium
		*copper**	*nickel**

Table 2: Strategic Raw Materials source: EU 2023

Strategic Raw Materials

1. Bismuth
2. Boron – metallurgy grade
3. Cobalt
4. Copper
5. Gallium
6. Germanium
7. Lithium – battery grade
8. Magnesium metal
9. Manganese – battery grade
10. Natural Graphite – battery grade
11. Nickel – battery grade
12. Platinum Group Metals
13. Rare Earth Elements for magnets (Nd, Pr, Tb, Dy, Gd, Sm and Ce)
14. Silicon metal
15. Titanium metal
16. Tungsten

For the purpose of this report, it is of course of interest to combine the above essence of the 2020 assessment and connect it with the insights as far as demand patterns are concerned stemming from the previously discussed twin transition needs. For this reason, the Joint Research

Center (JRC) of the European Commission (EC) has drafted a fairly insightful report in 2020 to connect the dots (see European Commission 2020b). While some of the findings will be discussed in more detail further below, the following overview is an essence of the study, highlighting the role of CRMs within a number of critical goods and supply chains that are at the nucleus of the twin transition.

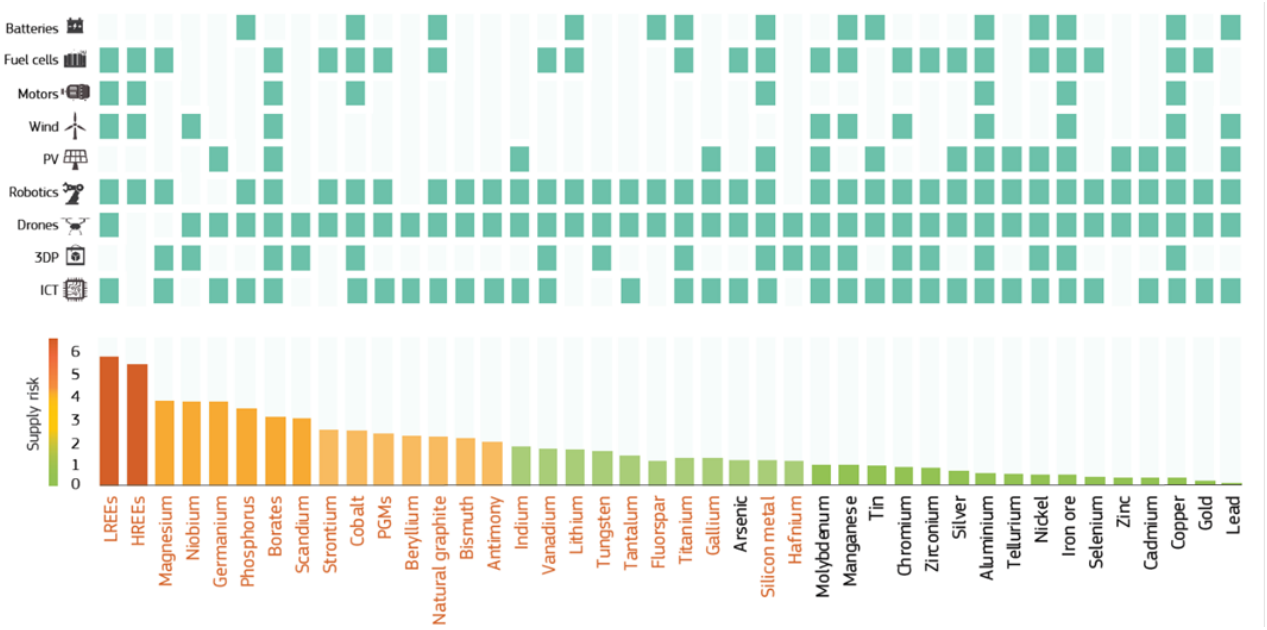


Figure 2: CRMs and their role in the twin transition process; source: EU 2020 (b)

1.2 Demand patterns

Out of the previous analyses, one can calculate the raise in demand of a number of minerals identified as CRM: For instance, lithium, a critical ingredient for the cathode of electric vehicles (EV) batteries will experience an 18-fold increase by 2030, and even 57-fold by 2050, while cobalt, which is also required in batteries will be needed five times more in 2030 than is the case today (EC 2020b). Demand increase for these two metals however is projected at a 60-times and 15-times increase respectively when the 2050 deadline is used as a mark (ibid). Tenfold increase in demand is projected for rare earth elements (REE), which are used for producing permanent magnets (in turn to be built into electric vehicles, robots or wind generators). Table 3 below is providing further insights on the critically of minerals and metals (i.e. supply risks) and their respective use, highlighting goods and their supply chains which are particularly vulnerable to these supply risks.

Table 3: Supply risks and usage for various CRM; source: Authors, after EC (2020b)

Supply Risk	CRM	Usage
Very high	LREE HREE	Permanent magnet motors for Wind turbines EV Permanent magnet motors for Robotics Drones Further use in ICT
High	Magnesium Niobium Germanium Phosphorus Borates Scandium	Fuel cells Wind turbines Traction Motors PV Robotics Drones 3DP and ICT
Moderate	Strontium Cobalt PGMs Beryllium ? Graphite (natural) Bismuth ? Antimony ?	Fuel cells Wind turbines Traction Motors PV Robotics Drones 3DP and ICT
Low	Indium Vanadium Lithium Tungsten Titanium Gallium Hafnium Silicon metal	Fuel cells Wind turbines Traction Motors PV Robotics Drones 3DP and ICT
Very Low	Manganese Nickel Copper	Fuel cells Wind turbines Traction Motors PV Robotics Drones 3DP and ICT

Funded by
the European Union

The table shows that most key goods that are relevant for the twin transition are subject to supply risks at least for some of their ingredients. Especially the renewable energy as well as the EV sectors are prone to such risks deriving from the critical supply situation for REE, magnesium, niobium and a few others.

While Table 2 above sheds light onto the current situation, all supply-related discussions around the twin transition have to take future demand patterns into account to enable policy makers to assess growing criticality now, and set-up relevant countermeasures. Due to the fact that the twin transition is based on a number of regulations that aim at specific goals until 2030 and 2050 (climate-neutrality) respectively, the 2020 foresight study of the European Commission was able to calculate demand patterns and thus growth in demand for a number of 2020 CRMs. To take up the key messages of this assessment, the following section looks at key manufacturing products applicable for the twin transitions and provides demand forecasts for the relevant CRMs. This is followed by a discussion on supply risks for the major value chains.

1.2.1 Batteries

This type of high-capacity batteries is becoming necessary for a growing number of applications, first and foremost for consumer electronic devices as well as for the automotive industry. While all types of lithium-Ion batteries will require a variety of CRM inputs, different battery technologies are currently being examined that each have different metal composition for their cathodes (and even for their anodes, to a lesser extent). Table 4 below lists the most common used CRMs across the different types of batteries in use.

Table 4: CRMs for batteries; source: EU 2020(b)[2]

CRM	COMMENT
Graphite	Anode ingredient for all types of Li-ion batteries
Silicon	Potentially to be used in anodes
Titanium	Potentially to be used in anodes
Niobium	Potentially to be used in anodes and cathodes
Lithium	Currently indispensable for all types of Li-ion batteries
Cobalt	Important cathode material; heat resistance, promotes safety of batteries

Supply bottlenecks are ubiquitous for a number of CRMs used for batteries. Geographical concentration of raw materials, as well as the weak position of the EU along the battery value chain are the most relevant constraints, as the EU produces only 1% of the required raw materials. China on the other hand is in a dominant position, as it produces 46% of refined cobalt, 45% of refined lithium derived from hard rock (source/citation??). In addition, when looking at the value chain, China produces 32% of the necessary CRMs (EU = 1%), 52% of processed materials (EU = 8%), 52% of components such as anodes and cathodes (EU = 9%), and a total of 66% of batteries as a whole. Nickel, which could become an important ingredient in certain types of li-ion batteries, also suffers from heavy geographical concentration (Indonesia, Philippines, New Caledonia), and mining and export has frequently become subject to moratoriums, leaving the supply situation shaky.

Securing reliable partnerships specifically for the supply of cobalt, lithium, natural graphite and (battery-quality or battery-grade) nickel is thus of critical importance. With regard to cobalt, it also has to be stated that as far as the African continent is concerned, partnerships with countries other than the DRC should be sought, as the latter already occupies a major market position due to its enormous production capacities and even higher share of global deposits.

[2] Please note: all subsequent tables under 1.2 are taken from the same source

1.2.2 Fuel cells

Fuel cells are supposed to become an important stepstone in the production of hydrogen-based energy in the near future, and thus a central component within the twin transition concept. In addition to providing heat and electricity, their usage in vehicles is also foreseen. For example, already today they are used in special vehicles like forklifts and buses. The key mechanism within fuel cells is the transformation of a fuel (ideally hydrogen) into electricity without combustion. Similar as for the lithium-ion batteries discussed above, it is important to point out that several different types of fuel cells with different technologies and CRM use operate today (see Table 5).

Table 5: CRMs for fuel cells

CRM	Comment
Cobalt	Could replace platinum
Palladium	Could replace platinum; but still expensive and rare
Platinum	Is currently in use with most cells today, in both the anode and the cathode
Graphite	/For bipolar plates and anode composition
Strontium	/
Titanium	/

Any discussion on the criticality of supplies also needs to consider storage devices for the hydrogen fuel as well, to make the fuel cell run effectively as a whole system. With that, magnesium, REE, borates, silicon, rhodium, ruthenium, lithium, and vanadium also join ranks with the CRM identified in the table above. Platinum group metals (PGMs) contribute a major share to criticality aspects for fuel cells. Not only are PGMs heavily concentrated in Southern Africa and Russia respectively (see map on p.34), but platinum prices contribute up to 50% of the total price level of a fuel cell . Cobalt and palladium, which could both replace platinum, though also face their own geographical concentration challenges.

On a more positive side, the EU is currently in a considerably stronger position along the value chain as far as processed materials and components are concerned. About 40% and 25% of processed materials and components are being produced in the EU. However, when looking at the final product, i.e., the manufacturing of a fuel cell, the EU drops back to 1%, as 99% of global fuel cells are being manufactured in the US and in non-China Asia.

1.2.3 Wind turbine generators

Wind turbine generators are poised to become one of the backbones of the energy-transition, in that they will have to produce sufficient quantities of energy to allow any sort of transition from fossil backed fuels. Wind generation in the EU takes place both off- and onshore, whereas offshore windparks and coastal onshore parks are the most efficient sites in terms of wind energy harvesting.. Their reliability in terms of energy supply on a large scale is not yet proven, nor are their costs, acceptance or regulation defined, including the transport from wind farms to consumers. This report will nevertheless discuss CRM demand based on a positive outcome of these open questions and a middle scenarioAs is true for li-ion batteries, there exists a number of different types of wind energy generators, with respective implications for raw materials demand.

Production of certain components of wind turbines such as the generators, drive trains, rotors and blades are specifically dependent on CRM, and this is certainly true for permanent magnet generators, that require relative high amounts of REEs[3](see Table 6).

Table 6: CRMs for wind turbines

CRM	Comment
REEs	neodymium, dysprosium, praseodymium are most commonly required in the production of wind generators. Most are used for the permanent magnet motors, while niobium is a micro alloy used to increase the stiffness of the tower structure.
Niobium	Microalloying element for towers of turbines
Boron	/Magnets

In a logic consequence to what has been stated above, REEs have the biggest influence on both prices of wind generator components and the turbines themselves. Also, the stark scarcity of REEs, in combination with their substantial degree of geographical concentration in China has the potential to actually put limits on the total supply of wind generators that can be built and put to

[3] Neodymium-iron-borate (NFB) is currently the most effective material composition for permanent magnets, although efforts are underway to substitute these motors with REE-free ingredients. See for instance the Passenger project for more information (https://passenger-project.eu/)

use. China already placed an export moratorium once on some rare earth elements (in 2011), a move which was globally felt in sensitive industries.

While it is true that there are numerous projects underway in the EU to limit and/or substitute the use of REE in permanent magnet motors, the commercialization and costs, reliability, market acceptance etc. are currently too far away to provide an easy solution to this problem. On a positive side it can be stated that the EU covers a relatively strong position at the downstream end of the supply chain, and with Germany and Denmark being leading producers of wind turbines, the EU actually produces 58% of all global turbines.

1.2.4 Traction motors / permanent magnet motors

Electric traction motors are a key component for consumer electronics, renewables and for electric mobility (EV). About eight billion of these motors, ranging from small sizes, as used in portable electronic devices, up to large motors to propel vehicles. The growing demand for EV-based mobility will considerably increase the quantities of larger size traction motors in the next 25 years. As with the magnet motors used for wind generators, most EV motors are based on the NFB technology (i.e., neodymium, iron, borates), as this technology provides the highest levels of performance (see Table 7). However, alternatives for permanent magnets are also being sought. Induction motors for instance do not require permanent magnetic materials, but rely on the induction of electrical currents into the motor's rotor conductor. As a consequence of this technological shift, more copper rather than REE is required. However, even though the NFB technology will most likely dominate EV propulsion in this decade, there are many efforts underway to at least minimize REE use and increase their efficiency. As the EC report on material use (EC 2020b) points out, '…a rise in material efficiency for neodymium and praseodymium of up to 30% from 2015 to 2030 in a PM of equal magnetic strength and cost is expected' (p.34), and similar efforts may be expected for dysprosium usage. For efforts to reduce and even substitute REE by alternative technologies such as aluminum nickel cobalt (AlNiCo), refer to the brief discussion in the section on wind generators and REEs in the same report (EC 2020,b).

Table 7: CRMs for magnetic motors

CRM	Comment
REE	Praseodymium, neodymium, dysprosium, praseodymium are the REE most commonly required in the production of traction motors. Dysprosium is used as an additive to improve the magnet coercivity at high temperatures.
Boron	Used in composition of neodymium–iron–boron (NdFeB) magnets
Silicon	Electronics grade silicon in semiconductors, control electronics; alloying element in Al-alloys and silicon steel

The assessment regarding criticality along the supply chain for traction motors is similar as in the section on wind turbine generators, because the above mentioned REEs constitute the most critical elements in the production of components. Hence, prices of these REE as well as their geographical concentration in China, whose power in influencing global supplies shall be monitored carefully. Regarding extraction of REE, borates and silicon and the processing of alloys, wires and casings (to be used for the components), the EU controls only 1% and 7% respectively, while it produces 8% of components. China, as it hosts the bulk of REE deposits, extracts the majority of REE globally, but also of other relevant raw materials (65%), and has similar dominance regarding the production of processed materials. Japan is however the largest producer of electric motors (62%).

1.2.5 Photovoltaics

Photovoltaic (PV) technology, which converts the energy of the sun into electricity is the second pillar of the energy transformation process. Photovoltaic technology can be used both at large scale (solar parks) as well as on smaller scales, supporting energy production for individual households.

While there are several different PV technologies available on the market with corresponding differences in terms of raw materials use, the European Commission (EC 2020b) points out that the crystalline silicon solar panels account for 95% of global installed PV capacity (p. 38).

Table 8: CRMs for PV

CRM	Comment
Germanium	Semi-conductor material
Gallium	Also used as semi-conductor material
Indium	Used as conductive layer
Boron	Used as dopant
Silicon	Key semi-conductor material

While there are major efforts underway by manufacturers to increase performance and thus efficiency of PV technology, and while it is estimated that there is indeed still some room to boost performance of solar panels, the political push to increase energy creation through PV will mean that the supply risk pressure for CRM such as silicon, indium, gallium and germanium will most likely increase considerably over time (Table 8). While the EU supplies 6% of raw materials currently required for PV production, and the geographical base of raw material production is generally broader and less concentrated than is the case for REE, China holds a dominant position in this segment as well, producing 53% of the required raw materials and 50% of processed materials, such as silicon metals, polysilicon and refined copper. China's dominance is increasing along the value chain, as it assembles 70% of the solar panels worldwide (EU 1%) (European Commission 2020, b).

1.3 Total material demand projections

Combining the previous discussion on lithium-ion batteries, fuel cells, permanent magnets and photovoltaics (PV), the following section takes a look at demand projections for the most relevant CRMs for these key products:

1.3.1 Li-ion batteries for EV

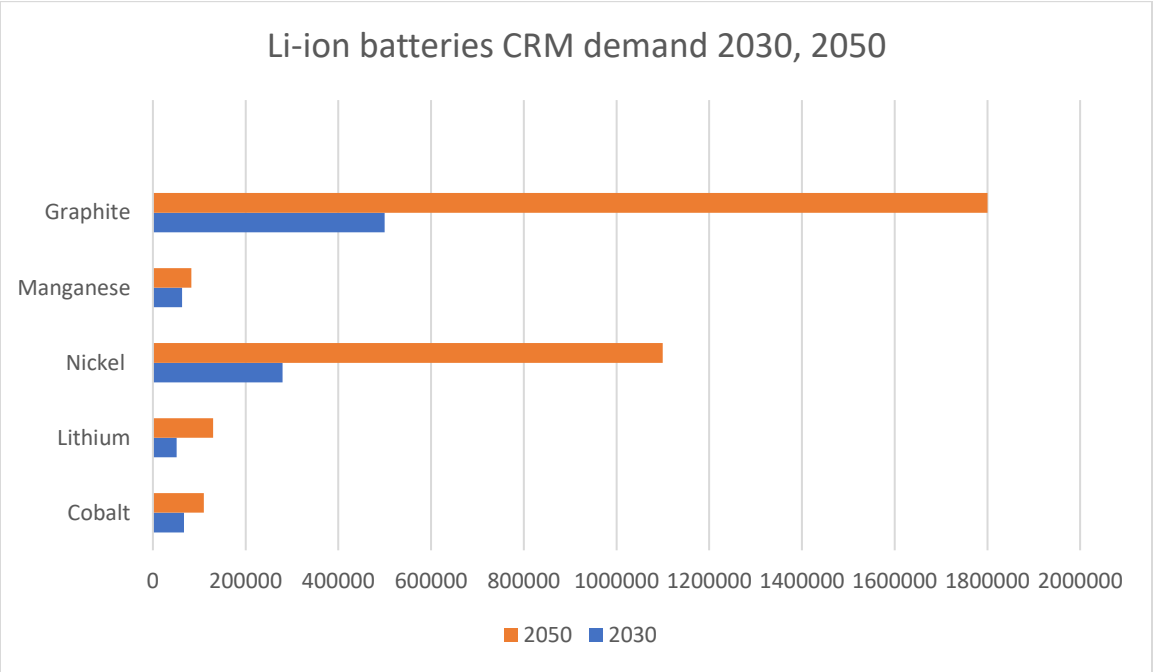


Figure 3: Demand projection for five key CRM contained in EV batteries, 2030 and 2050

1.3.2 Li-ion batteries for renewables

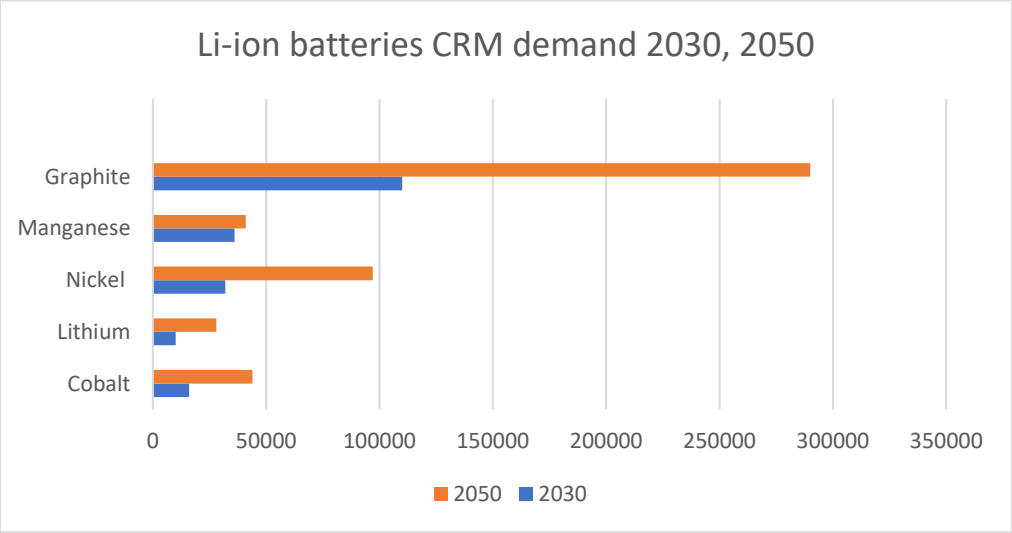


Figure 4: Demand projection for five key CRM contained in batteries for renewable energy

Funded by
the European Union

1.3.3 Fuel cells, for both EVs and renewables combined

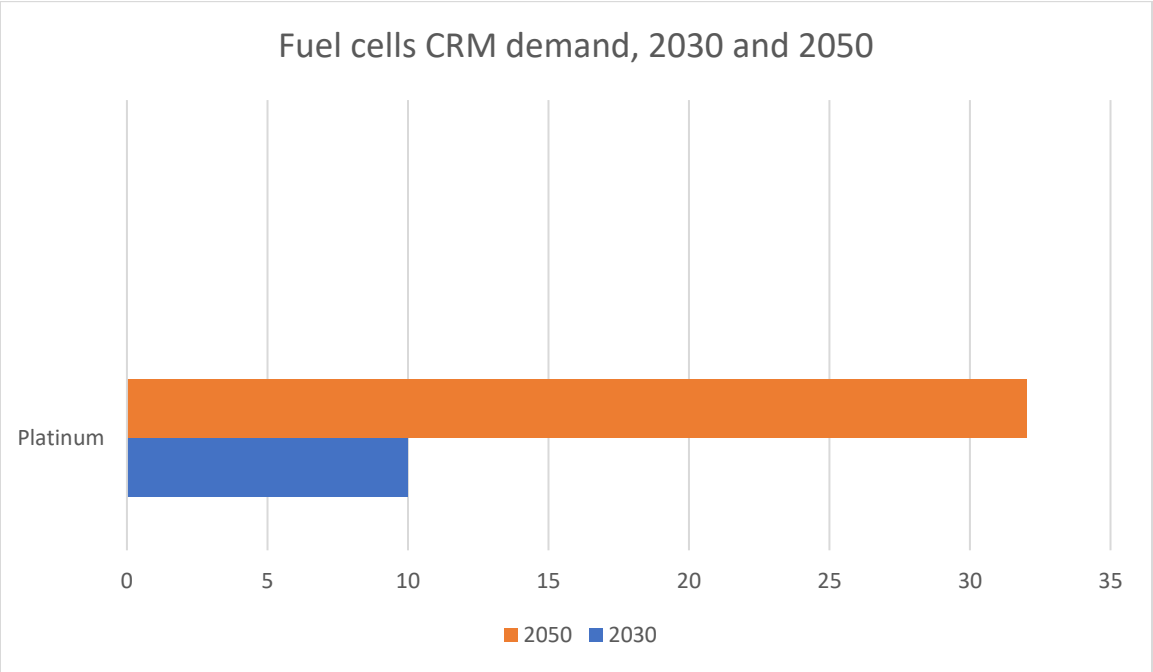


Figure 5: Demand projection for platinum contained in fuel cells, 2030 and 2050

1.3.4 Wind turbines

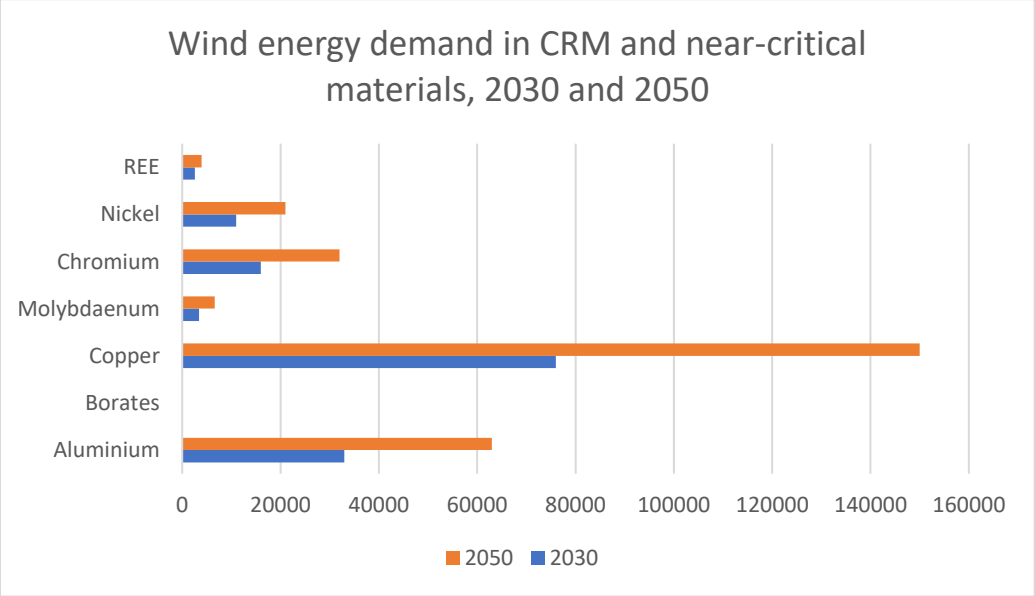


Figure 6: Demand projection for CRMs contained in wind energy turbines, 2030 and 2050

Funded by
the European Union

1.3.5 Permanent magnet motors for EVs

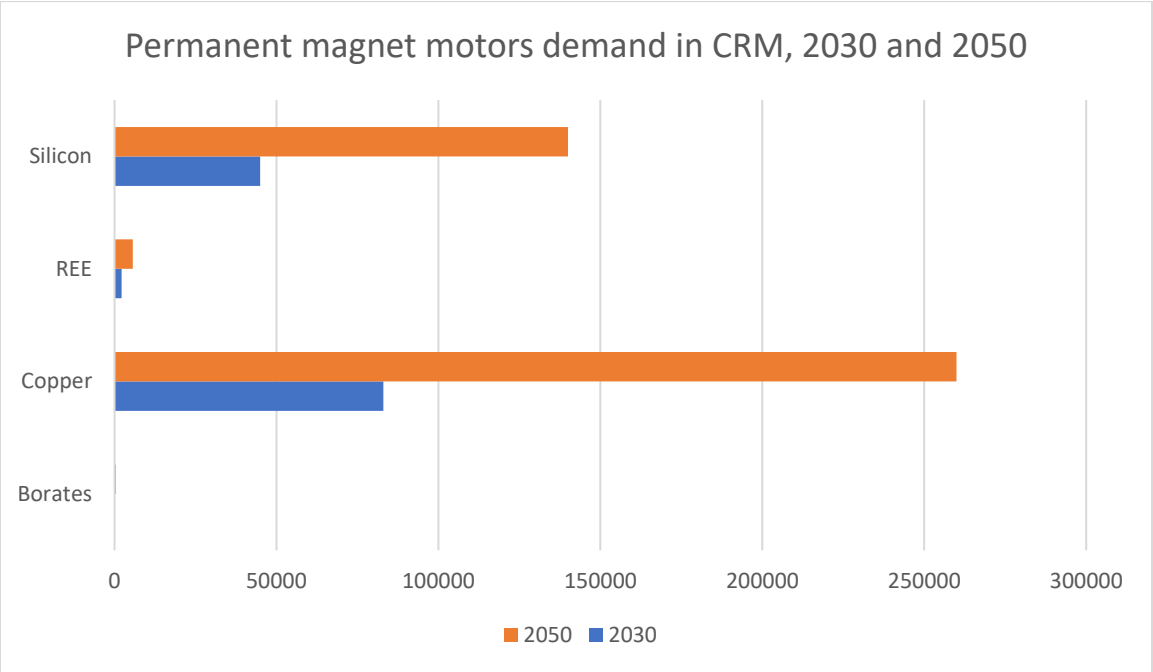


Figure 7: Demand projection for CRM contained in magnet motors, 2030 and 2050

1.3.6 Photovoltaics

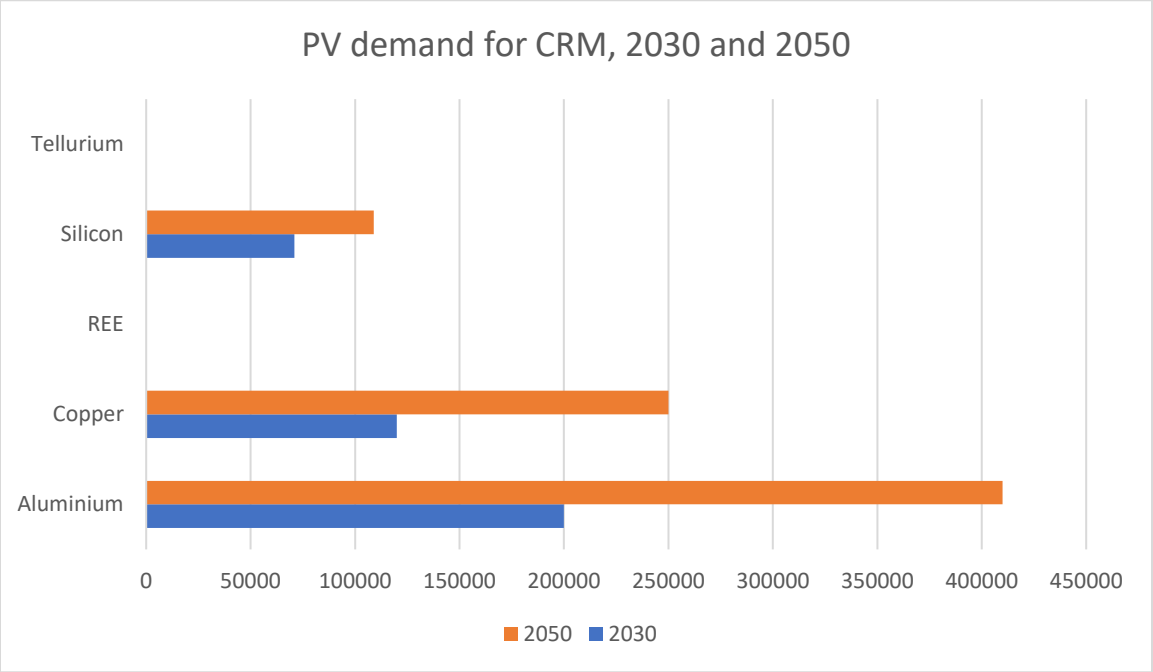


Figure 8: Demand projection for CRM contained in PV, 2030 and 2050

Funded by
the European Union

2. Enabling factors to meet the demand (Strengths and Opportunities)

Meeting the demands for the Twin Transition outlined in the first chapter is the *sine qua non* of the AfricaMaVal project. AfricaMaVal thus is footed on solid and growing market demand, enjoys political backing from both the EU and African governments, and is implemented through 17 consortium partners from academia, industry and civil society. The project identifies strategic projects, conducts field work on the ground in Africa, builds networks between the two continents and puts together data in order to deliver investment opportunities for European offtakers and global investors. As such, it is clear that the project enters the field with a particular set of strengths and opportunities which could help overcoming the various challenges. Whereas those challenges will be discussed in the next sub-chapter, the first section of chapter 2 will look at the general supply situation[4] for CRM in Africa, and will then highlight the opportunities and strengths that were identified in the first months of the roll-out of the project.

2.1 Political backing, 'strategic' projects and availability of public funding

The recently adopted Critical Raw Materials Act (CRMA) i emphasizes a focus on so-called strategic projects and the consequent options to promote such projects through different financial and non-financial measures to guarantee a reliable and quick implementation of such projects. In the parlance of the CRMA, strategic projects are those that meet certain criteria in terms of expected contribution, technical feasibility and sustainability, so that they can be considered as of "overriding public interest" and therefore benefit from streamlined permitting and facilitated access to finance. A strategic project will be eligible for, amongst others:

- Streamlined permitting processes;
- Facilitated access to financing opportunities through "coordination of finance"; and
- Facilitated conclusion of offtake agreements

This could allow for tailor-made action by the EU Commission to secure the outputs of these projects for the European industry. While the arsenal of potential tools the EC will mobilize is not yet fully clear, it is expected that this includes i) the release of and support of the project through funds from the strategic fund and ii) putting forward additional political/trade/development efforts vis-à-vis the country that hosts the project(s) in question.

In the context of Africa, streamlined permitting will not be applicable as this is of course subject to individual national jurisdictions. Rather a number of support measures should facilitate the

[4] In this first draft of the strategy, this analysis needs to be superficial, as the field work of WPs 1 and 2 is ongoing, with major deliveries to be expected around M18.

implementation of these projects. Hence, as the EC has pointed out, the CRM partnerships may look at individual projects and promote the same through such measures and actions. While at the time of writing it seems completely open as to what these measures could be, financing seems to be one specific area of instruments that could be applied. While here too, specifics would yet need to be detailed out, there seems to emerge at least three likely avenues:

Option 1 – Strategic participation: Under this option, the EU could use funds to secure minority shares of a project, raising the overall profile and visibility of it, and thus attracting more private capital. As an additional benefit, such participation (which could be embodied by the European Investments Bank (EIB) or the European Bank for Reconstruction and Development (EBRD) for instance) could act as a deterrent against expropriation or other policy related risks. Such a model has been frequently applied by the IFC to stimulate mining investments in jurisdictions which have otherwise not enjoyed easy FDI into the sector.

Option 2 – Risk guarantees: Alternatively, the EU could provide a guarantee against various political or commercial risks and ensure that the project company is thus able to honour its debt servicing obligations. The role model here could be the German untied guarantee (managed through Euler Hermes), whereby the German state guarantees banks the repayment of the credit in the case of defined commercial and political events affecting the borrower's ability to service its debts, thus acting as "enablers" for private capital into more challenging jurisdictions and for non-typical commodities.

Option 3 – Seed or promotional funding: Public funds would also serve a dedicated role, in principle to overcome market failure in light of asymmetric information (between the project owner and investors). A feasibility study (FS) or pre-feasibility study (PFS) on a project will provide a better, more comprehensive understanding of a project and give further comfort that the project will be able to service its debt, pay dividends and provide for the targeted returns. A FS/PFS is often key to unlocking the larger pockets of financing. A challenge faced by many junior developers is the cost of producing the FS/PFS. Hence, using public 'seed funds ' to cover at least a portion, if not all, of the required finances funding for FS could be key to 'unlocking' a project of crucial importance. This could be made applicable at least for those projects that have been identified as 'strategic' as per the CRMA.

The fact that a number of national and regional development banks are present in the EU should augment this potential advantage, as finance institution such as EIB, EBRD or KfW might be more familiar with structuring such credit schemes as a purely private bank.

2.2 Supporting African firms through partnerships with European industry

The promotion of partnerships between Europe and Africa is an envisioned impact of AfricaMaVal, and also one of the 'selling points' towards African countries. While part of the value-added within supply chains will remain concentrated in Europe the African continent

progressively recognizes the importance of building these value chains at home. It does fit into the wider picture that a number of African countries (Zimbabwe, DRC, Uganda and Namibia) have put down export moratoriums for unprocessed lithium as well as for other minerals. It is unlikely that it will be the only four countries to do so.

Promoting partnerships between European and African industry (including suppliers but also other actors that work on and along the mineral supply chain) in the form of joint ventures (JVs) might be an excellent opportunity to secure the supply of CRMs to Europe while expanding value added in Africa. JVs indeed have benefits for both partners: while the African partners will profit from increased value-added, taxation and income in the short term, the long term view promises increased knowledge sharing and mastering of technological and managerial processes. European firms on the other hand have the opportunity to become a key partner in the African mining industry and could benefit from numerous offers due to the growing demand for specialized technical and other services for the African mining sector, thus also generating income and employment within Europe.

For instance, as illustrated in Figure 9, there are several steps involved in processing lithium into two main chemical ingredients (lithium hydroxide and lithium carbonate) which are used in the component manufacturing process. It can be expected that joint ventures between European and African companies, start-ups included, could enable the production of these chemicals in Africa, securing additional value-added, skills, manufacturing capacity and other benefits for local economic development.

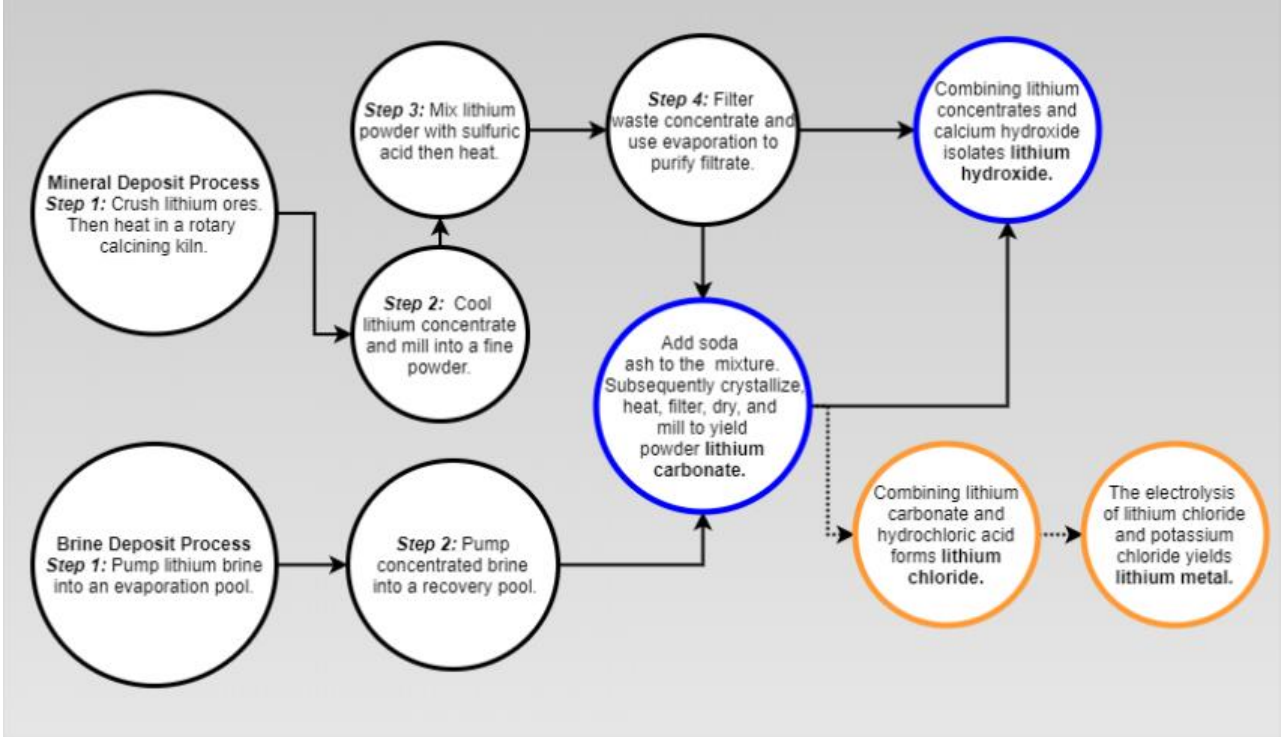


Figure 9: Converting unprocessed lithium minerals into processed lithium chemicals and refined compounds (Volker at al., 2014)

2.3 Finance: Capital Needs & Availability

Financing, specifically the overall availability and its conditions will be a crucial aspect in the sourcing endeavour in general. If (private) capital can not be mobilized, this will be especially detrimental for exploration projects, which normally face greater competition for resources. If European firms do not get a stronger hold on such projects, it is unlikely that CRM sourcing from Africa will be significantly increased within the next 5-10 years as then project owners will find financing sources from elsewhere.

While exploration is most risky, and hence requires the least risk aware capital, infrastructure is another risky and sensitive area. Most parts of Africa except South- and Southern Africa tend to suffer from insufficient infrastructure, be it on transport or energy. Hence, upgrading or even investing in new construction of such infrastructure will be crucial for the mining sector, to be able to increase output over time. While investment in infrastructure is less risky than investments into exploration, the financing needs for running such projects are huge. Hence, in most cases it will require consortia to bid. Another issue for the EU of course is that the useof infrastructure can not be limited to specific parties (in general), which means that it will not only be the EU industry (and African citizens) that will profit from it.

In any case, the EU will most likely be able to mobilize public financing sources as was discussed further above. Apart from this discussion, this sub-chapter can not add much more to the debate at this stage, as the results from WP3 are not yet complete. Hence, the next version of the strategy will have a greater focus on the financing aspects.

2.4 Meeting ESG Challenges

Despite the positive contribution of critical raw materials to the achievement of the global sustainability and development agendas, such as the United Nations Agenda 2030 and the Sustainable Development Goals (SDG), Paris Agreement and the European Green Deal, their extraction is often accompanied by a variety of environmental, social and governance (ESG) challenges specially in the source countries. These negative impacts are associated with various stages of the value chain from exploration, mining, processing, smelting and refining to mine closure and tailings management. In addition, the relevant infrastructure and activities that are needed to support mining operations (such as the roads and railways) can contribute to these negative impacts (IRP 2020).

Water stress and contamination are among the key **environmental issues**. Mining operations demand large amount of water and given that the majority of these operations are located in countries with low water resources, this can result in competition between the mining industry and other local activities such as agriculture or livelihood of communities. Furthermore, if not properly treated, toxic effluent waters from various stages of the mining operations, can contaminate groundwaters and surface waters and consequently affect ecosystems, biodiversity, marine environment, agricultural soil, food chains and human health. In addition to the negative impacts on water, majority of mining operations can cause other environmental challenges such as air pollution, emission of GHG, soil erosion and contamination, deforestation, degradation or loss of biodiversity and habitat loss, alteration and degradation (IRP 2020).

Mining operations are in many occasions embedded in or indirectly related to local communities, which can result to various negative **social impacts**. Human rights violations including child labour and gender inequality, health and safety risks of workers and communities, land ownership and land use conflicts as well as displacement and forced migration are among the most common social issues. Furthermore, the industry can be associated with specific **governance and financial issues** such as bribery and corruption, illicit financial flows, money laundering and tax evasions (IRP 2020).

The extent of environmental, social and governance impacts is strongly dependent on the type and scale of mining approaches, which can range from diversified multi-national companies or Large-Scale Mining companies (LSM), to mid-tier companies with focus on a specific commodity, state-owned companies, mid-size and small quarry companies to artisanal and small-scale miners (UNEP 2020).

Artisanal and small-scale mining (ASM) is known as formal or informal mining operations with simple forms of exploration, extraction, processing and transportation, which normally requires low capital and high labour technologies (OECD 2016). It is estimated that in Africa, around 9 million people are directly working in ASM sector and there are more than 50 million people whose livelihood depends on the sector (DELVE 2023 & Levin Sources, 2022). Due to their less formal (or even informal) character and lack of financial resources to follow sustainable mining methods and technologies, the ASM operations are often associated with severe ESG risks that are country, context or commodity specific. High level of environmental degradation and pollution, persisting human rights abuses such as gender-based violations (e.g. unequal access for women to key roles or being confined to low paying roles) and child labour, forced reallocation of communities, lack of access to sanitation and health care, lack of access to market or ability to sell their products are some of the key challenges associated with ASM operations (Levin Sources 2022).

Donor-driven programs, mostly stemming from European or North American official development assistance (ODA) often have a focus on the health and safety of the ASM workforce or on environmental issues, whereas other considerations such as access to finance, improving geological knowledge, strengthening efficiency of extraction, increasing the ratio of machinery vs manual labour, improving access to sales markets and knowledge on pricing, trading etc. are being overlooked. These issues were termed by the AWIMA team as 'real solutions', as opposed to solutions which do fit into ODA-programmes, but do not results in a tangible improvement of ASM livelihoods.

It will hence be crucial for the sourcing strategy to take these issues into account. Similar as the potential danger of a 'network fatigue' by European industry, a 'training fatigue' by ASM members must be avoided. In other words, if ASM is to be acknowledged as a 'responsible source', it must address and provide solutions to

- Access to finance
- Improving the efficiency of mining
- Support access to official trade networks.

While this may beg the question of how such components would address 'ESG proper', the answer may lie in that such support services will increase the proficiency of ASM, its integration into the formal economy and as such its overall visibility. This will allow both governments, buyers and other organizations to make a better assessment of prevailing ASM challenges, but also will allow for better trainings and solutions to address those challenges. But the above-mentioned set of 'real solutions' has to be the primary focus. Support programs as that of Trafigura in the DRC for instance could be of a role model character.

Furthermore, a level of realism also has to be applied in the general ESG discussion as far as ASM is concerned. It is unlikely that a remote ASM operation can fulfil the same ESG standards as a modern mining operation. If differentiation is not being practiced, that risks sidelining ASM altogether, leaving the sector in a state of 'perpetuate informality'. And even that will not be a cheap solution, as it is almost unavoidable that supply chains will be kept clean of ASM products.

2.4.1 Existing initiatives related to responsible sourcing policies

In recent years, with increasing awareness about the ESG issues, the governments, civil society organizations, investors and the general public are expecting more from the mining and manufacturing industries. The companies are required to ensure they are practicing responsible operations, are acting in responsible value chains, and are committed to minimizing negative ESG impacts (BGR 2022). As a result, various initiatives and agreements at international, regional, national and sectoral level have been developed and implemented. These actions implement various approaches from developing principles with a broad sustainability scope, to the development of regulatory or voluntary frameworks, standards or reporting templates for a specific sector or commodity. Consequently, key stakeholders involved in development of these initiatives may vary between international institutions and governments to industry associations, industry representatives (i.e. companies) and civil society associations (Farooki et al. 2020).

Among others, the UN Guiding Principles on Business and Human Rights (2011), the UN Sustainable Development Goals (SDGs) and the International Labor Organization (ILO) Labor Convention are some of the examples of international guidelines and agreements that address the ESG issues with a broader perspective and within global sustainability agendas.

The **OECD Due Diligence Guidance for Responsible Mineral Supply Chains (2016)** is one of the key guiding documents developed to help companies that would potentially source minerals and metals from conflict-affected and high-risk areas to respect human rights and avoid contributing to conflict through their purchasing decisions and practices. The guidance document provides a five-step framework for risk-based due diligence process and has a special focus on ASM and 3TGs (tin, tungsten, tantalum and gold). At regional level, the **US Dodd Frank Act** (Section 1502) passed in 2010 can be highlighted. The act requests the US companies to carry out proper due diligence processes for their supply chain when sourcing 3T from the DRC or neighboring countries.

Based on the OECD guidance document, the EU developed the **Conflict Minerals Directive** (passed in 2017 and applied in 2021) as a compliance-based instrument, which sets out (different) rules and requirements for upstream and downstream companies to ensure they import 3TGs

from responsible and conflict free sources[5]. In 2021, the European Commission and the Raw Materials Supply Group developed **non-mandatory principles for sustainable raw materials** with the aim to align the understanding of sustainable raw materials extraction (from exploration to post-closure) and processing operations in the EU amongst Member States and to define the general direction towards SDGs. These principles are defined within the key social, economic-and governance and environmental pillars and cover different stages of the raw materials production (Figure 12).

Among other relevant EU directives, the **Non-Financial Reporting Directive (NFRD)**[6] can be highlighted as a non-compliance-based instrument, that requires large companies to publish information related to their environmental, social and governance performance. In January 2023, the EU introduced new rules on **Corporate Sustainability Reporting Directive (CSRD)**[7] that requires large companies and listed companies to publish regular reports on the social and environmental risks they face, and how their activities impact people and the environment.

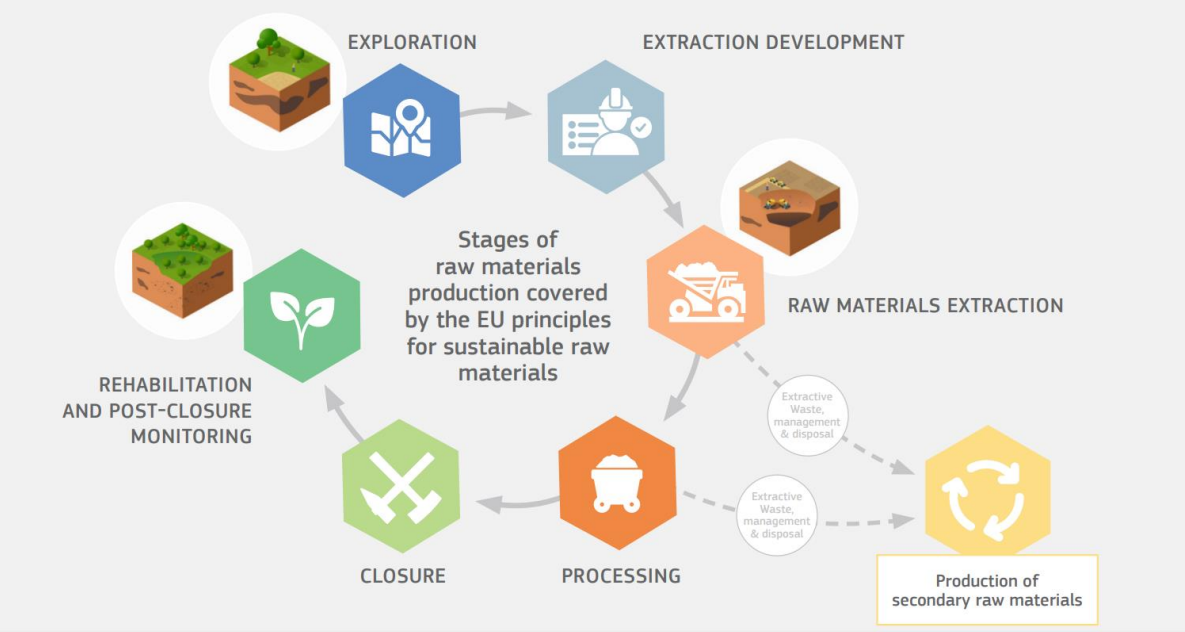


Figure 10: An overview of the stages of raw materials value chain covered by the EU Principles for sustainable raw materials (EU, 2021)

In line with the main objectives of these international and governmental initiatives, various non-compliance guidance documents and principles are developed by international or regional forums or industry associations. The guidance document developed by IGF (Intergovernmental

[5] The Regulation was signed into law in June 2017 and the requirements for EU importers apply from 1 January 2021.
[6] The rules introduced by NFRD remain in force until companies have to apply the new rules of the CSRD.
[7] https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en

Forum on Mining, Minerals, Metals and Sustainable Development) in 2021, the mining principles defined by the International Council on Metals and Minerals (ICMM), the Global Industry Standard on Tailings Management (2020), and the London Metal Exchange (LME) Responsible Sourcing Requirements can be mentioned as examples (Farooki et al. 2020).

The other approach towards minimizing ESG issues and achieving responsible supply chains is the development of standard and assurance systems with defined requirements or targets. In recent years, various standard systems and certification schemes have been developed with a general scope for the industry or focusing on different commodities or parts of the value chain. One of

Mineral Commodity	Standard System / Responsible Organisation	Sustainability Standard	Systems' abbreviation
All mineral resources	International Council on Mining and Metals (ICMM)	Sustainable Development Framework (SDF)	ICMM
	Initiative for Responsible Mining Assurance (IRMA)	Standard for Responsible Mining	IRMA
	Towards Sustainable Mining (TSM)/ Mining Association of Canada (MAC)	TSM Protocols and Frameworks	TSM
	CERA 4in1 / DMT GROUP	CERA 4in1 Performance Standard (CPS)	CERA 4in1
	International Finance Corporation (IFC) / World Bank Group	Performance Standards on Environmental and Social Sustainability	IFC
	Responsible Minerals Assurance Process (RMAP)/ Responsible Minerals Initiative (RMI)	RMAP Mineral Supply Chain Due Diligence (DD) Standards + (voluntary) ESG Standard	RMAP
Gold	World Gold Council (WGC)	Responsible Gold Mining Principles	RGMPs
Diamonds, gold, silver & PGE	Responsible Jewellery Council (RJC)	• RJC Code of Practices (COP) • RJC Chain-of-Custody Standard (CoC)	RJC
Copper, (+ lead, nickel, zinc & their by-products)	The Copper Mark	• The Criteria Guide for the Risk Readiness Assessment • Joint Due Diligence Standard for Cu, Pb, Ni & Zn	The Copper Mark/CM
Aluminium (+ bauxite, alumina)	Aluminium Stewardship Initiative (ASI)	• ASI Performance Standard • ASI Chain-of-Custody Standard	ASI
Steel	ResponsibleSteel	ResponsibleSteel Standard	RS

Figure 11: Existing ESG initiatives (BGR 2022)

the key findings of a recent study conducted by BGR[8] on eleven relevant standard systems (Figure 13), is that most of these standards have addressed relevant social and environmental issues that are highlighted in the EU principles for sustainable raw materials. However, the more general EU

[8] Bundesanstalt für Geowissenschagren und Rohstoffe

principles related to e.g. circular economy, materials stewardship or product stewardship are less covered by the current standards.

Development and implementation of harmonized templates and formats for reporting is another approach towards documenting and monitoring the performance of companies in addressing ESG issues in their supply chains. Global Reporting Initiative (GRI) is one of the commonly used reporting templates which requires the businesses to follow predefined set of economic, social and environmental indicators for measuring their performance at local, regional or global level. The other example is the Copper Mark (developed by the Responsible Minerals Initiative) which is a framework specifically defined for the that allows for auditing of information provided by a company defined for the copper industry to support responsible production that allows for auditing of information provided by a company (RE-SOURCING State of Play, 2021). Other certification, assessment or traceability programmes such as the CTC Cobalt (Certified Trading Chains, developed by BGR) and the International Tin Supply Chain Initiative (ITSCI, developed by the International Tin Research Association) for traceability in the upstream mineral chains can be also highlighted.

Despite the availability and comprehensiveness of these initiatives and tools, one of the main challenges that the companies are facing is the fragmentation and diversity of these approaches. This can lead to inconsistency in the level and type of ESG issues they choose to address. Furthermore, while businesses have demonstrated that they are formally committed to improve their ESG performance, there are still gaps in implementing, tracking and monitoring their performance on particular issues (Responsible Mining Foundation, 2020).

2.5 Integrating Artisanal and Small Scale Mining (ASM) as reliable suppliers

While this is somewhat linked to the subsequent discussion on the promotion of the Africa Mining Vision(AMV), since artisanal and small-scale mining (ASM) is an important consideration of the vision, this point is nevertheless worthwhile to be discussed as a separate strength.

While ASM, largely due to its informality, has long been considered by various governments as primarily a socio-economic challenge and obstacle to the general development of the mining industry, recent efforts have shown that through guided support, ASM can not only contribute to local economic development, rural employment and taxation, but can also be a reliable supplier of mineral resources, including of certain CRMs.

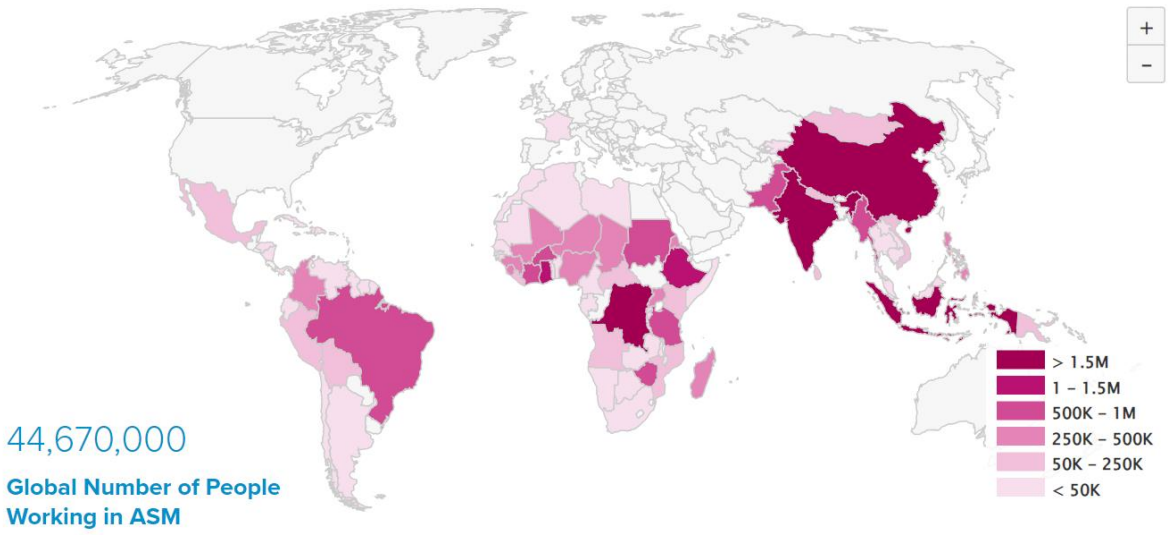


Figure 12: ASM in Africa and globally - in numbers. Source: https://delvedatabase.org/data

Efforts often focused on easing registration and thus formalization, supporting the development of cooperatives, and strengthening mining techniques and environmental rehabilitation. Often however, this type of support was dependent on external donors such as the World Bank or the United Nationd Development programme(UNDP), and hence had a limited time horizon. Providing market access opportunities on the other hand was often a missing link, connecting these programs with market incentives. And this is exactly what the AfricaMaVal project can add: As long as ESG parameters are transparent and the supply chains are sufficiently transparent, cooperatives can be offered the access to European markets, thereby providing them with

additional ESG and community support initiatives. In other words, while ESG is seen as an investment, the option to gain long-term access to European markets makes this investment worthwhile (and market-driven). It is important to outline (as will be pointed out again further below in the strategy chapter) that, specifically with regard to ASM, a pragmatic approach to ESG is required. It will not be pertinent to demand the same levels of ESG and information provision as with LSM. Close collaboration with the geological surveys and other organizations of practice will be useful in agreeing on such standards, that could and should be raised over time. However, in many of the more traditional ASM support projects, this market-driven initiative of linking ESG improvements with access and long-term planning was missing as ASM tended to sell to their limited network (often to their financiers), providing them with little incentives for formalization or other improvements. Having access to the AfricaMaVal business exchange platform and thus having market access could be a more effective incentive and solution for ASM.

2.6 Integrating secondary sources as reliable supplies

In order to meet the increasing demand for CRMs over the next two decades, all possible sources of these materials must be taken into account. As such, it is very important to consider secondary resources, be it scrap metals, or materials recycled from mine waste (including waste rock, tailings and slags) and from end-of-life products. . The integration of secondary sources is suited to bolster existing sources of primary supplies. A thorough mapping exercise is being conducted in WP2 of the project, to assess the total number of recycling and scrap metal companies that are operative in Africa and that could work as reliable suppliers. Most of them are active in , South Africa, but also in DRC and Zambia. Copper, steel and alumina are among the top-three metals which are being recycled on the continent. In addition to recycling and scrap material, additional sources of secondary raw material supply include tailings retreatment facilities, of which 10 are operative (South Africa with seven, Zambia with two, and DRC with one operation), mining waste re-processing, and finally also the recycling of waste electrical and electronic equipment (WEEE or e-Wastes), end-of-life vehicles (ELV), batteries, and other scrap metals.

2.7 Development and centralization of geoinformation and CRM project data

One of the key benefits of the AfricaMaVal project is that it brings together more than 22,000 points regarding the ECRM mining potential situation in Africa, including mineral and mining clusters, ore processing and refining capacities, artisanal and small-scale mining and processing developments. Where possible, this information will be underpinned by resource/reserve data, but of course for primary resources only. Furthermore, the project will determine where in the minerals value chain the specific identified project will be located, promoting the identification of potential constraints to development, as well as of regional areas where infrastructure or other constraints may hamper development. Conversely, such an analysis helps to identify where a specific project could benefit from development or investment to unlock the constraints that hamper their engagement and full participation in EU markets.

While the information exists, it would be scattered around various sources, including that of national geological surveys (of both in Europe and Africa). it needs to be pointed out that already at this stage of the project (Month 12) 262 ECRM projects along the value chain have been identified in 10 African countries. More is to be expected when the groundwork will be completed (to be expected between M14 and M20). While the subsequent versions of the strategy (stage 2 and final stage) will be able to juxtapose the supply scenario with the needs as identified under the twin transition chapter, the availability of data in the INSPIRE compliant database should help to reduce the costsof acquiring this information from alternative sources, although it needs to be pointed out at this stage that it is not yet clear what data can be made public to whom, as a lot is in principle confidential.

2.8 Building INSPIRE harmonized datasets

According to the guidelines published by the European Commission, INSPIRE-compliant datasets are those that follow one or more of the 34 spatial data themes set out in the INSPIRE Directive, allowing for interoperability through the possibility to combine spatial data and services from different sources across the European Community in a consistent way. Within the spatial data generated by AfricaMaVal, interoperability is achieved through the harmonization of the data generated. All this information is merged to create a single INSPIRE-compliant dataset that has the existing data and will be updated with newer data. In addition, one feature of AfricaMaVal will be a Web Mapping Service (WMS), which might at a later stage allowing mapping and spatial information visualization.

3. Potentially impeding factors(Gaps and Weaknesses)

Given the ongoing global race for resources in general, and for CRMs specifically, it is obvious that the project must address a number of challenges which will be described further below. As is apparent, a number of those challenges are out of reach for AfricaMaVal, whereas others can be touched upon by project activities directly or indirectly.

3.1 Supply restriction through geographic concentration and restrictive export policies

One of the major supply risks facing the EU is not so much geological scarcity on a global level, although that might be true for some specific minerals and metals, but rather the strong concentration of some raw materials in a few countries outside the EU. This geographic supply risk is reinforced when the countries in question are weakly governed, contribute to regional instability, are connected with international terrorism or similar issues. The map shown in Figure 11 provides an overview of the geographical concentration of some critical raw materials.

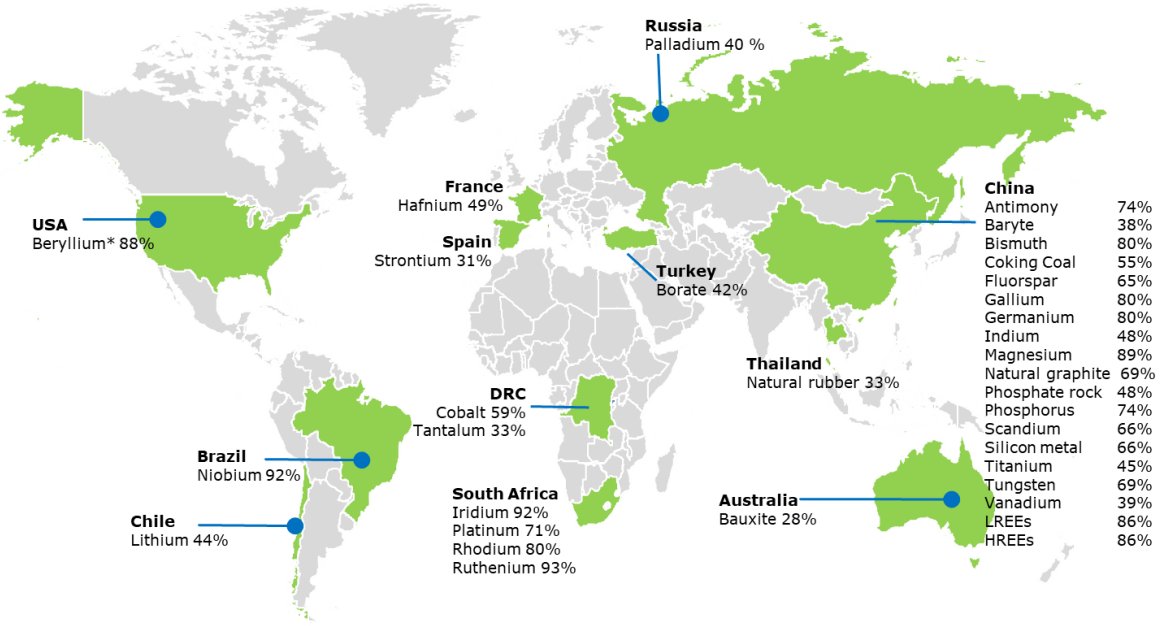


Figure 13: Geographic concentration of CRMs global supplier countries; Source: Raw Materials Information System (EU 2020,a)

The map highlights a few important points: The most notable being that, China is obviously a major source for a sweeping number of critical raw materials. Similarly, PGEsare heavily concentrated in Russia and South Africa, as is niobium in Brazil and Cobalt (59%) in DRC. Furthermore, this map only shows production, and not known resources/reserves which could and most likely will be mined in the future. This tendency of concentration is even becoming stronger when not looking at production, but at resources/reserves (or future production, once these current reserves are being mined). For instance, while DRC is already the largest producer

of cobalt, the country is likely to host more than 80% of total supplies (i.e. including known deposits).

Also, when putting on a geopolitical view, the domineering role of China is also being widened, given the high volume of Chinese investments into the African mining sector. Since the 1990s, China has been busy in forging its own bilateral ties with resource-rich nations. Most often, these ties have been constructed with a holistic view in mind, including a broad strategy of Chinese industrialization, the underlying value-chains to guide this industrialization and the roles that public, public-private and solely private companies play in it. The Chinese networks seem to follow a number of interlinked objectives:

- Securing access to resources to allow moderate prices for manufacturing and investment goods produced in China. These efforts are sidelined by political aspects, where China tried to link Africa closer to itself, for economic (market access for its own goods) and geopolitical reasons (de-link Africa from its more traditional and historic Western partners). Because of the close control over a large part of the value chain by the state, Beijing has managed to come up with a fairly concise strategy that combines meeting supply and demand, financing, as well as diplomatic and political aspects. For instance, the provision of infrastructure (roads, ports, airports) by Chinese firms and workers at below-market prices or granting of finance without strings attached are attractive 'packages' for African leaders, that can also be sold to the electorate. The conditions of grants or loans is a strongly debated topic, as some commentators believe that it is the relativly easy conditions under which African states can acquire loans or grants from China, as against the many layers of social, political and economic conditionalities that come with finance from Western countries.
- State-controlled and state-led resource access initiative also crowds out many other non-Chinese competitors that are hardly able to invest in countries with high political risks and/or protracted levels of instability, such as Sudan, South-Sudan, DRC, Guinea and others.
- As the 2009 report by Executive Research Associates 'China in Africa' points out, additional strategic and economic measures were implemented by the Chinese Government to allow their mining, oil, infrastructure and telecommunication companies to be of solid economic strength and of solid financial power to move on the resources access path. Politico-diplomatic measures like the establishment of the Forum of Africa-China Cooperation (FOCAC) or the China-Arab Consultative Forum (CACF) helped in preparing the diplomatic initiatives. These efforts culminated in the foundation of the Shanghai Cooperation Organization, which promotes even closer ties between China and its new allies.

Another factor that needs to be examined and constantly monitored is that of 'resource nationalism', i.e. the propensity of states to back off pure mining and mineral market forces and safeguard deposits, mine-sites or the extracted products to gain higher price benefits for certain minerals at a later time. While some of the policies might well be justified, we prefer to call this set with the more neutral term 'export-restrictive policies'. These strategies have become rather common during the first post-millennium mineral 'super-cycle', a period when many raw materials experienced substantial long-term growth in prices due to rapid demand increase in the large developing economies of East Asia (see for instance EC 2008). The tactics applied could range from limiting or even reducing the number of mining permits, placing moratoriums on mining and export, or a combination thereof: 'Over 450 export restrictions on more than 400 different raw materials … have been identified. China, Russia, Ukraine, Argentina, South Africa and India are among the key countries involved in applying such measures (ibid, p. 5). As was mentioned further above, DRC, Namibia, Uganda and Zimbabwe have already put in place export moratoria for a number of unprocessed minerals. There is a positive relationship between mineral prices increase and the incidence of resource-nationalism tactics. As such, more such moves should be expected in the coming years, when the markets for many identified CRMs change from a buyer market to a supplier market, i.e., a situation where the supplier can select buyers, as competition for decreasing supplies looms large.

While these are not classic 'resource nationalism' strategies, they could well be seen as justified and policies to promote downstream development, the effect for sourcing countries such as the EU could be similar. Specifically, it is not known at this stage how the Namibian moratorium will be influencing the raw materials partnership. Furthermore, adequate reactions to such policies are also not clear yet, as building up beneficiation facilities, including auxiliary infrastructure, can not happen overnight. Finally, beneficiation-enforcing policies leave unaddressed important economic questions, such as prices, quality, delivery networks etc. Since these questions are still open, and that more countries are likely to join the 'club of export-restrictors', the current risk levels of investing and sourcing from the African continent can be increasing.

3.2 Geopolitics, limited strategic coherence by Europe and post-colonial resentments

While the geopolitical setting can not be influenced by the project, it needs to be taken into account. The spheres of influence in Africa, which will continue to change and shift over the next years also will, at least partially, command which projects will be open to which interested party, something which might be called 'preferential access to resources'. As a matter of fact, mineral deals, and CRM projects in particular, have left the sphere of open and competitive markets, which is of course one reason why AfricaMaVal has been set up. But this also means that bilateral trade and investment negotiations have the overall say also with regard to availability of individual projects. In other words, not all of the investment opportunities that will be identifiedby the AfricaMaVal project might be available for European offtakers or investors at the end. To overcome this challenge, close coordination with and political leadership by the EU actors is necessary. This would in turn require coordinated political and diplomatic efforts and initiatives at high levels.

Another geopolitical challenge is the existing gap in the European strategic expertise as far as coordinated action for sourcing (in Africa and elsewhere) is concerned. China has started in the mid-1990s to increase its presence and influence on the African continent, as well as in other regions, while European countries and the EU itself have shown limited activities to counter this influence or come up with their own strategies. A necessary step to overcome this challenge is the alignment of different interests, for instance between the purchasing industry/offtakers, financiers and investors, and the long-term policy imperatives by European national states and the EU. For instance, limiting the strategic dependence, specifically on CRMs and CRM value chains is one of the key imperatives of Europe, while this does not necessarily need to be the case also for industry, at least not in the short term, if supply chains with China allow for reliable and cheap imports.

Last but not least, the potential for post-colonial resentments also needs to be taken into account. Independent of whether this is being exploited for political reasons, it is a vague perception that might counter the objectives of the project. This is why aligning European and African interests is of major importance, as will be discussed in the strategy part in more detail. Guiding investments in a way that they also promote local value-added, promote business development and employment are important tools in this direction.

3.3 Limited support for exploration capacities in the EU

The relative weakness at the beginning of the CRM value chain is true at the time of writing, but could also change to the positive over the next years. In the end, mining will return to Europe, making it more feasible for European exploration companies to open doors again. After all, most countries still do have the required skills available. At present however, this capacity is limited. Most exploration in Africa is by companies from Canada, Australia, the United Kingdom, South Africa, but increasingly also by Chinese explorers (even though data is less clear, since most Chinese explorers are not listed) which between them accounted for 80%of exploration expenditure on the continent in 2022 (ECFR, 2023). Independent of that, Africa has large untapped resources, but receives relatively little share of global exploration expenditure adding to the prevailing geographical supply concentration risk. According to a report from the European Council of Foreign Relations (ECFR 2023), governance concerns, resource nationalism, and the lack of infrastructure are the factors responsible for this exploration investments discrepancy. This means that there is still a lot of room for additional exploration, including from Europe, to enter the African market. Bringing in European exploration activities could be promoted by communicating to the industry potential advantages they could have in line with the bilateral EU-African Union (AU) CRM partnerships. It is hence critical that this information reaches the industry.

While one can not draw a line between the origin of an exploration company and the later transfer of minerals and metals to the same origin, having exploration companies on the ground has considerable advantages. Development and access to geological knowledge is one of the key benefits for the European companies. The companies can use this knowledge for exploring similar deposit types and understanding the geographic and geological characteristics of the areas. Also, it increases the chances of the potential mine operation being developed by the same company (even though this is not necessarily the case). In these cases, the typical vertical integration between mines and end-users can be employed, leading to increased purchasing opportunities for European industry.

3.4 Risk perception, specifically with regard to investments and finance

Mining is considered a risky business per se. One of the key drivers for this is the price volatility of mineral markets coupled with very long planning and execution horizons, which may render projects uneconomic over an extended time. It is however possible that the expected demand pressure for CRM could partially diminish this risk, as a positive trend in demand for most ECRMs is expected at least for the next 10-15 years. On the other hand, mining projects located in Africa would add to that risk. The reason is a mix of political instability and often low scores on various good governance indices (like the World Bank's Corruption Perception Index - CPI) in African countries. Limited knowledge about African markets by many western lenders adds to this. It is therefore advisable to point out the substantial differences in terms of political stability and governance levels that prevail on the African continent, specifically towards the mining industry. Mali for instance is a country that ranks low on the CPI, and would also be perceived as having weak governance in many other accounts and rankings. However, its mining industry seems partially unaffected by this, and enjoys having strong international finance activities both for existing mines and new exploration activities. This leads to the conclusion that Mali is an attractive and rather reliable destination for the mining industry, independent of its otherwise complicated political and governance situation. .

Limited awareness about Africa as a destination for productive mining industry capital, at least from a European perspective, is however not a natural law. Both the AfricaMaVal project and the EU should do their share to increase this awareness and highlight the many opportunities that exist for the European industry. Specifically, as discussed in the 'finance' section, the EU may apply strategic funding for specific (strategic) projects to decrease the risk for private capital. This also needs to be communicated in a proactive manner.

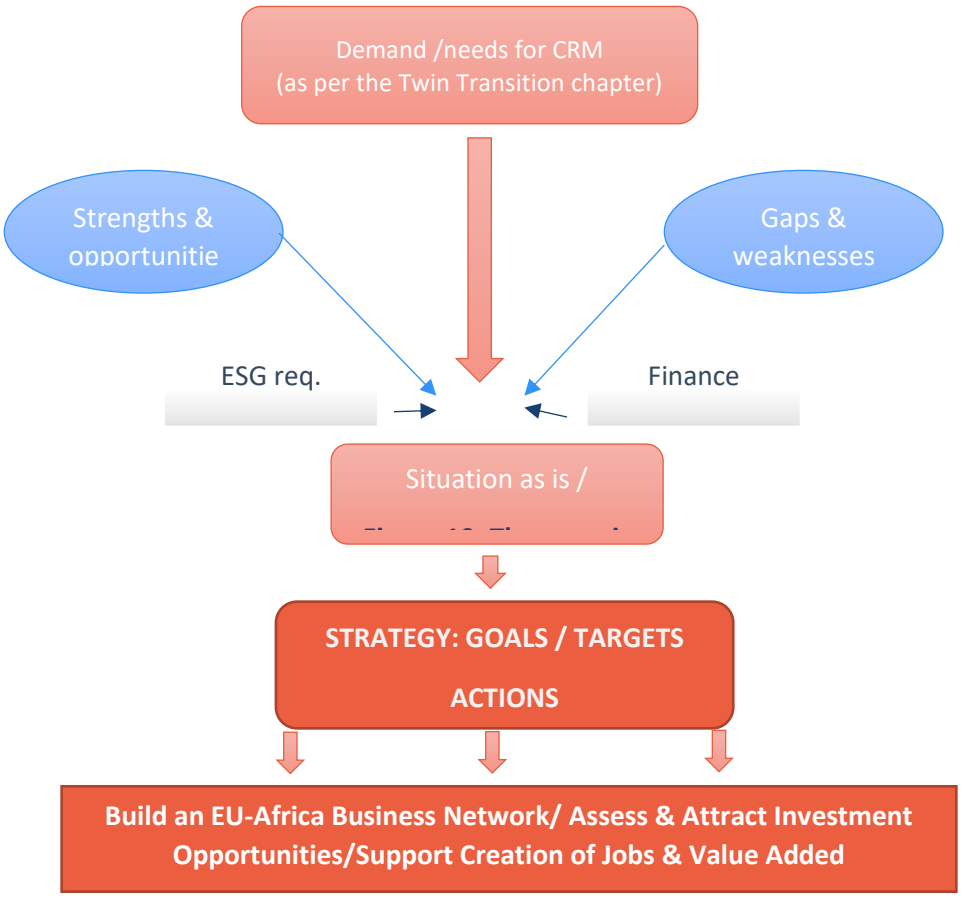
4. Synopsis - The Environment for European Responsible Sourcing in Africa and the enabling AfricaMaVal Strategy

The overall objective of the AfricaMaVal project to integrate the supply chains for ECRM between Europe and Africa in order to promote distinct benefits for both parties (as well as additional stakeholders) is met by a number of challenges that could only partly be addressed by the project. By mobilizing its strengths and benefiting from the opportunities, the project will attempt to overcome these challenges and achieve its objectives.

The strategy then is a set of targets and goals which, through a set of aligned actions, should ensure that the operational targets (Build an EU-Africa Business Network/ Assess & Attract Investment Opportunities/Support Creation of Jobs & Value Added) can be met by:

- limiting the exposure to identified gaps and weaknesses, and
- exploiting the identified opportunities and strengths

Figure 14: The genesis and role of the AfricaMaVal strategy



Funded by
the European Union

4.1Goals to reach the Operational Impact of AfricaMaVal

4.1.1 Sourcing as a partnership arrangement

Partnerships of course go beyond sourcing, and require commitment from both sides. They aim to integrate industrial and mineral value chains with partner countries, and cooperate with them to identify strategic projects. To be able to do so, partnerships will need to result in a win-win outlook for both sides. While the prospect for the European side and its industry in particular should be clear and is largely embodied in increased supply security, these aspects need more in-depth thinking by European stakeholders. It can be stated that every African country will have its own particular needs, whether this is support in infrastructure development, upgrading existing industry on ESG aspects, promoting and securing investments, training, trade etc. Europe, being the biggest single market in the world and housing world leaders in various industry fields is an attractive partner, and the fact that Europe is bound by strict ESG and other social principles should even increase this attractiveness. The European Commission can draw upon a number of sources to realize such benefits, the Global Gateway being one important tool for this. Under this initiative, up to € 300 billion are earmarked for connectivity projects in the fields of energy, transport, digital, health and education cooperation in the coming years. Particularly, the Global Gateway initiative is also meant to be a competitor to China's Belt & Road initiative.

The question remains of 'how to'? What approach should Europe, including the EU, industry, and finance, together with its African partners pursue in order to ensure sustainable, reliable and responsible sourcing of ECRM?

4.1.2 Political leadership

The pressure to secure supply is already paramount, and it will even increase, with Chinese state-owned or state-controlled companies already having firm access in many African countries. Given that the majority of refining capacities for key energy raw materials like lithium and cobalt, as well as the production of components is located in China, the country has a first mover advantage for the upcoming boom in international demand for these materials and components. In other words, even though demand will raise, it is unlikely that supply from 3rd countries will increase by the same scale, as China will not disappear as competitor.

One important factor will be of relevance to address the point made further above. A state-driven and state-concerted effort, as it is being executed by China, can only be met by at least a level of political involvement. The political economy of Europe can not copy the Chinese model, but it is nevertheless evident that the AfricaMaVal matchmaking platform will gain substantially from EU-driven resource partnerships that can apply a number of financial, diplomatic and development cooperation tools. This should include directorates from the EC such as DG-Grow , DG Trade, and the Directorship for International Partnerships, but also the EU delegations. The precise form of this involvement needs to be worked out, but in general it should be clear that the upcoming years will need politics and diplomacy as a door opener.

The EU Critical Raw Material Act will in the future play an important role through its definition of "strategic projects" which may receive funding/subsidies – it will be important to ensure that African ECRM projects qualify as "strategic projects".

4.1.3 Promoting the implementation of the Africa Mining Vision

One of the most valuable efforts that the AfricaMaVal project can promote is the implementation of the African Mining Vision (AMV). The AMV, adopted through the African Commission in 2017 is a commonly agreed framework that guides the development of the mining sector towards broader and more sustainable growth effects in the individual African economies. While being endorsed by the African Union (AU) as well as its member states, further promoting its implementation by the AfricaMaVal project should lead to acceptance by African mining stakeholders. And indeed, what the AfricaMaVal does need in order to live up to its own commitment is the interconnection with a long-term partner. This is because the goals of the vision rely on planning, investments, and coordination of various actors, which again is feasible only if a long-term plan and framework, as the AfricaMaVal project as well as the European Union CRM-partnerships are offering, exists.

Already during the last metal and mining boom, which lasted from the late 1990s to around 2010, Africa has recognized that it didn't employ its natural resource wealth in a way that promotes economic long term growth. For that, a more holistic strategy needed to be employed, which came in 2009 by way of the African Mining Vision (AMV). The AMV, a continent-wide accepted framework which has been built upon broad academic research in the area of minerals and economic development sees mining as a catalyst for broader economic and fiscal activities, which in turn would have the potential to stimulate multi-sector growth potential, leading to broad-based economic development processes. The implementation of the AMV is entrusted upon the AMDC[9], which is supporting individual national governments to draw their own versions of the AMV, emphasizing specific aspects of the continental framework as they see fit.

The key points the AMV is to promote:

- Human Resources Development
- Infrastructure constraints
- Downstream Development
- Corporate Governance

[99] The African Minerals Development Center is mandated by the African Union to guide and lead the implementation of the African Mining vision on national levels in close collaboration with the individual Governments. It is housed in Conakry, Guinea

- Public Private Partnerships (PPP)
- ASM

It is evident that these points share a significant overlap with a number of impacts which are envisioned by AfricaMaVal project. In combination with bilateral EC CRM partnerships, and also including discussions between the EU and the AU/AMDC, individual African countries have now an additional framework at hand that can help to drive the implementation of the mining vision on a national level. Also, by way of offering long-term market access combined with investments in local economic development, the development of additional linkages and more complex forms of economic integration such as cluster development may expect additional impetus.

Other partnerships that promote long-term sustainable development can sometimes be found between the national industry and governments, and more frequently, through donor-assisted programs. The latter should be taken note of as potential partners on national level as they too are in most cases dependent on long-term partnerships as well as reliable investments. While at this stage it is not yet very clear how to bring in donor programs best, it seems logic that they can help to promote AMV within government structures – at least those that are present in the country for a while and that enjoy positive standing and relations with the governments.

The case is more complicated when looking at downstream development policies in general, and local content specifically. Local content directives have become highly popular in a number of African mining countries. While useful to promote local industry in general by way of local subcontractors, supporting local business development etc., many have been set up in an overambitious way, or with too little regard for prevailing market conditions, posing a threat to mining projects if the mining companies can not meet the required targets. In such cases however where downstream development- or local content policies and strategies seem to be well thought through, they as well can be seen as an argument to build partnerships with the AMV, as the project can bring both sides of the equation together and discuss the options to meet the goals as set out in the roadmaps.

4.1.4 Encourage early investment and promote long-term contracts

It will be important to bring in European involvement early on in the value chain in order to acquire information and possibly also to mobilize industry or finance as early as possible to increase the chance of European control. This will require concerted efforts between the European Commission and the EU Delegations and European industry. Furthermore, in order to become a reliable partner, long-term investments will also be beneficial for both European and African industry, and ways how to promote long-term contracts, possibly supported by pro-development work such as training, infrastructure development, support for ASM etc. should be encouraged.

4.1.5 Reduced transaction costs through matchmaking

While the AfricaMaVal business platform will need to be politically led and its interests protected towards the outside, it will have to be business-driven and deal-focused in practice. . This will also need to be reflected in the membership. Besides official policymakers from the EU and their African counterparts (e.g. the AMDC, ministerial and/or geological survey representatives), the bulk part of its members should be made up from industry and finance, possibly supported by business consultancies and legal services.

In order to ensure ESG and associated regulatory compliance for investments in a potential project, the AfricaMaVal platform gives the opportunity to the firms, for example through dedicated consulting offers to identify and adopt to the standards relevant to their operations. As such, the AfricaMaVal platform can guarantee its members that it will put the conditions in place for responsible sourcing.

The AfricaMaVal network will be sustainable only when it is focused on long-term partnerships, benefiting both sides in the trade. In this matter it should be pointed out that benefits for African partners are most likely subject of political and diplomatic discussions, so somewhat outside the scope of the AfricaMaVal partners. The EU Commission is already working on several diplomatic, aid, trade and political benefits for African partner governments. The AfricaMaVal business platform and EIT-RMcan support these efforts for instance through access to learning and innovation resources, thus providing knowledge, technical and vocational education & training (TVET) opportunities to partner countries.

Benefits to AfricaMaVal business partners also can take a variety of forms, but it will be important to point them out to industry to showcase the attractiveness of the AfricaMaVal concept:

Inside and high-value knowledge: Close collaboration with decision makers of African Governments, geological surveys from Africa and Europe will help to have a solid analytical understanding about the supply pattern. This is broadened by an equally deep analysis of existing value-chain projects, providing knowledge to industry and policymakers about currently existing and upcoming refining capacities in Africa. Given that supply capacity for mined and refined products (producing and pipeline projects) is known for the EU-space, the analytical underpinning of the AfricaMaVal Network allows a pan-African & EU assessment about availability of CRM, raw and refined. The network provides additional services to industry by a detailed assessment of more than 100 investment opportunities, as well as by a detailed examination on sourcing opportunities in ten African countries, namely DRC, Senegal, Zimbabwe, Mozambique, Gabon, Namibia, Tanzania, Morocco, Madagascar and South Africa.

Access to support services: With financiers and probably other service providers as well as EU and AU officials also being part of the network, the industry partners in the network will have

unparalleled support services through their memberships. Such a network can almost be considered a one-stop shop for important investments, as all relevant information, political support and underlying services are accessible.

4.1.6 Increase African ownership and economic participation in responsible sourcing efforts

Currently, most standards are perceived as international/western standards imposed on African mineral industry. People may therefore seek to avoid them (and supply to non-EU jurisdictions) or will only comply without appreciating the underlying reasons for these regulations (= improving local conditions). A solution could hence be to promote partnerships where, for example, auditors from Africa rather than foreign auditors perform due diligence assessments, to meet at least national standards, or, where applicable, also international ones such as IRMA. Equally, downstream companies should be incentivized to use local civil society to perform on-going monitoring rather than focusing on few audits and institutionalized industry initiatives only.

4.1.7 Apply a pragmatic and phased approach to ESG

It is important for both Europe and Africa to apply a pragmatic approach with regard to ESG. Such an approach needs to ensure that the general situation with regard to ESG standards will be strengthened, but it will also prevent skipping investments into Africa altogether for fear of not meeting ESG standards that might simply be too complex to implement, and especiall to control and monitor. Therefore continuous dialogue with countries on ESG standards with the goal to use countries own ESG perspectives will remain crucial. The definition of a progressive framework to r achieve compliance, rather than setting the bar too high from the beginning should be an outcome of these dialogues. Equally important, define realistic expectations in terms of LSM vs. ASM ESG performance, which can not and should not be identical. Overall, the aim should be to decrease risks and risk perception on African mining and mineral supply chains. If risks are deemed too high by downstream stakeholders or financial institutions, they will not engage at all or demand prohibitive interest rates. Therefore, the role of the OECD due diligence approach which calls for “good faith” efforts in the right direction, rather than perfectly fulfilling expectations and requirements right from the start should be emphasized. ;

As a first principle, it needs to be stated that it is the individual sourcing states’ responsibility that their national laws, all of which include ESG-related provisions, are being followed. We may argue that specifically as far as large scale mining (LSM) and downstream processing is concerned, the likelihood for compliance is high. While most sourcing states in Africa tend to have low public oversight capacities, those capacities that exist are usually mobilized to monitor large-scale industrial activities due to their strategic impact on the countries.

The issue of course becomes more complex when moving towards mid-scale and ASM mining. These operations become increasingly difficult to monitor, and numerous research as well as practical experience proofs that the bulk of ASM operates without any public oversight, and even fully informal. Neither the project nor international buyers will have the capacities, access to ASM

sites or knowledge to change this situation. However, due to the key role of the ASM sector in increasing supply capacity and the importance of their inclusion in international markets,. the project will need to tackle this area in a phased approach. Accredited and audited traders/ exporters for instance could act as an entry-gate to ASM, as could be dedicated ASM sourcing programs as conducted by Trafigura in collaboration with the Congolese enterprise EGC.

To broaden the ASM supplier base, an efficient strategy could be to invest in capacity building and training programs for the actors in this sector. These programs could address the concepts and materials developed under AfricaMaVal WP4, or could include the development of project screening checklists for suppliers. EU does already organize trainings for exporters, for instance for agriculture. Such trainings could hence act as examples for potential capacity building programs for mineral exporters.

4.1.8 Integrate legacy efforts

What happens at the mine sites once mining activities have stopped, 10, 20 or 30 years from now? These questions are important features for instance with regard to leaving positive legacies by standards such as IRMA. On the other hand, the present-day situation at Kolwezi, the world's cobalt capital, is the opposite, with downstream buyers mainly being concerned with artisanal miners and child labor risks whereas there are major long-term social and environmental impacts are neglected. Positive long-term legacy management could form an important foundation to consider for raw material partnerships with different African countries.

The following table provides an overview of identified targets and goals, and proposes a set of activities including responsibilities.. This set of actions and targets embody the AfricaMaVal strategy.

Targets / goals	Suggested Activity	Aiming at (which of the identified gaps and weaknesses are being addressed?)	Responsibility
Partnership arrangements	Outline long-term partnership schemes; foster partner development needs, specifically AMV implementation	Resource nationalism Preferential access	EU EU Delegantions
Political leadership	Concerted efforts for 'door-opening'; various	Resource nationalism Preferential access	EU EU Delegations AU/AMDC

Targets / goals	Suggested Activity	Aiming at (which of the identified gaps and weaknesses are being addressed?)	Responsibility
	trade/aid/market access tools will be available Examples from previous MoU: Joint development of projects, new business models, promotion and facilitation of trade and investment linkages; Cooperation on research and innovation along the raw materials value chains, including on minerals knowledge Deployment of hard and soft infrastructure for projects development Strengthening capacities, vocational education and training and skills development, considering the whole supply chain		National gov's
Promote implementation of AMV	Consider how investment, long-term deals, training etc can best help to implement the Vision on a national level (see 6.1.3 below)	ESG Resource nationalism Preferential access	EU National gov's Industry partners
Increase African ownership of responsible sourcing methods	Promote training of African auditors and lawyers; involve regional / local CSO groups; promote training of CSO; support development of national	ESG Risk perception Preferential access	National gov's AMDC CSO

Targets / goals	Suggested Activity	Aiming at (which of the identified gaps and weaknesses are being addressed?)	Responsibility
	standards and monitoring capacity		
Pragmatic and phased approach to ESG	Differentiate between LSM and ASM, but also including mid-size projects (non listed projects); possibly agree on national standards, and if lower than international ones, agree to raise standards over time	ESG Risk perception Preferential access	CSO Industry partners
Offer long-term access & agreements	Multi-year agreements offer security for both sides of the partnership, but also can promote long-term planning and thus implementation efforts for instance for the Africa mining vision on a local or even regional scale	Resource nationalism Preferential access Risk awareness	Industry partners EU
Reduced transaction costs for both parties	Key output of the AfricaMaVal matchmaking platform (WP 5) and the investment proposals (WP 7); matchmaking based on solid information and a	Risk awareness	AfricaMaVal

Targets / goals	Suggested Activity	Aiming at (which of the identified gaps and weaknesses are being addressed?)	Responsibility
	possible network of additional services (e.g. legal) would be a strong selling point of the platform and the project		
Promote early investments	Early investments increase the chance of becoming a strong partner and preventing project owners from seeking non-European partnerships; risk-awareness of companies must be taken into account	Limited exploration capacities Risk awareness	EU Industry partners
Include legacy issues	Take into account early on positive legacies by standards such as IRMA	ESG	Industry partners Nat gov's

Conclusion

While challenges for increasing responsible sourcing for ECRM from Africa are substantial, the project has already identified a number of opportunities which could counter those challenges. By implementing a stringent strategy by way of defined targets, and which will involve all partners of the project, including the AU (AMDC), the EU and industry (European and African), the project can further promote strong partnerships between Europe and Africa with substantial benefits for both sides. It will be important to adapt this strategy over time, since at the time of writing there is still limited experience of actual negotiations and deals on the ground. Also, industry (on both sides) is not yet a fully integrated partner. For this reason, the subsequent stages of the strategy must take these upcoming developments into account.

Funded by
the European Union

Bibliography

African Minerals Development Center (2017): Report on Artisanal & Small-Scale Mining in Africa - Selected Countries Policy Profile on ASM European Commission (2008): The raw materials initiative — meeting our critical needs for growth and jobs in Europe

African Union (2009): Africa Mining Vision

Bundesanstalt für Geowissenschaften und Rohstoffe (2022). Sustainability Standard Systems for Mineral Resources – A Comparative Overview. Erdmann, M., Franken, G. Available online: https://www.bgr.bund.de/DE/Themen/Min_rohstoffe/Downloads/studie_sustainability_standard_systems_2022.pdf?__blob=publicationFile&v=7

DELVE (2023). A Global Platform for Artisanal & Small-Scale Mining Data. Available: https://delvedatabase.org/

Farooki, M. et al (2020). The Responsible Sourcing Agenda. State-of-Play (RE-SOURCING Deliverable 1.1). Available online: https://re-sourcing.eu/content/uploads/2022/11/d1.1_in-rs-template_final.pdf

European Commission (2020a): 2020 Study on the review of the EU's list of Critical Raw Materials

European Commission (2020b): Critical materials for strategic technologies and sectors in the EU - a foresight study

European Commission (2023): Study on the Critical Raw Materials for the EU – Final Report

European Commission (2023): Supply chain analysis and material demand forecast in strategic technologies and sectors in the EU – A foresight study. Luxemburg: Publications Office of the European Union

European Council of Foreign Relations (2023): Why mining is central to the EU's critical raw materials ambitions in Africa

Initiative for Responsible Mining Assurance (IRMA) (2019): IRMA Standard for Responsible Mining – Guidance Document

IRP (2020). Mineral Resource Governance in the 21st Century: Gearing extractive industries towards sustainable development. Ayuk, E. T., Pedro, A. M., Ekins, P., Gatune, J., Milligan, B., Oberle B., Christmann, P., Ali, S., Kumar, S. V, Bringezu, S., Acquatella, J., Bernaudat, L., Bodouroglou, C., Brooks, S., Buergi Bonanomi, E., Clement, J., Collins, N., Davis, K., Davy, A., Dawkins, K., Dom, A., Eslamishoar, F., Franks, D., Hamor, T., Jensen, D., Lahiri-Dutt, K., Petersen, I., Sanders, A. R. D. A Report by the International Resource Panel. United Nations Environment Programme, Nairobi, Kenya. Available online: https://www.unep.org/resources/report/mineral-resource-governance-21st-century

Levin Sources (2022). Understanding the Artisanal and Small-Scale Mining Sector. AfricaMaVal project-Internal workshop.

Muench, S., Stoermer, E., Jensen, K., Asikainen, T., Salvi, M. and Scapolo, F.,(2022): Towards a green and digital future, EUR 31075 EN, Publications Office of the European Union: Luxembourg

OECD (2016), OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas: Third Edition, OECD Publishing, Paris. Available online: http://dx.doi.org/10.1787/9789264252479-en

Raw Material Information System (RMIS): Available at https://rmis.jrc.ec.europa.eu/

Responsible Mining Foundation (RMF), RMI Report (2022). Available online: https://2022.responsibleminingindex.org/resources/RMI_Report_2022-Summary_EN.pdf

UNEP (2020). Discussion paper for regional consultations on the implementation of the United Nations Environmental Assembly Resolution on Mineral Resource Governance (UNEP/EA.4/Res. 19). Available: https://www.greenpolicyplatform.org/sites/default/files/downloads/resource//Mineral%20Resource%20Governance%20Discussion%20Paper_UNEP.pdf

Volker, Z., Simons, J., Reller, A., Ashfield, M., Rennie, C. (2014): Materials critical to the energy industry — An introduction