

STRATEGIC IMPLEMENTATION PLAN
FOR
THE EUROPEAN INNOVATION PARTNERSHIP
ON
Raw Materials

Part I

FINAL VERSION – 18/09/2013

Foreword

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Acronyms

AMDC	African Minerals Development Centre
BBI	Bio-based Industries
C&D	Construction and Demolition
CEN	European Committee for Standardization
CENELEC	European Committee for Electro-Technical Standardization
CRM	Critical Raw Material
CYTED	Programa Iberoamericano de Ciencia y Tecnologia para el Desarrollo
EC	European Commission
EEE	Electrical and Electronic Equipment
EERA	European Energy Research Alliance
EGVI	European Green Vehicles Initiative
EIA	Environmental Impact Assessment
EIP	European Innovation Partnership
EP	European Parliament
ERA-NET	European Research Area Network
ERA MIN	ERA-NET on non-energy mineral resources
ETP	European Technology Platform
ETP SMR	ETP on Sustainable Mineral Resources
EU	European Union
EURMKB	European Raw Materials Knowledge Base
FCH JU	Fuel Cells and Hydrogen Joint Undertaking
FET	Future and Emerging Technologies
FTP	Forest-based Sector Technology Platform
FSC	Forest Stewardship Council
ICMM	International Council on Mining and Metals
ILO	International Labour Organisation
IPR	Intellectual property rights
ISO	International Organisation for Standardization
ITO	Indium Tin Oxide
JRC	Joint Research Centre
KIC	Knowledge and Innovation Community
LED	Light-emitting diode
MS	Member State
NEEI	Non-Energy Extractive Industry
NGO	Non-Government Organization
NMP	FP7 'Cooperation' - Research theme: 'Nano sciences, nanotechnologies, materials and new production technologies'
OG	Operational Group
OLED	Organic Light-Emitting Diode
PEFC	Programme for the Endorsement of Forest Certification
PGM	Platinum Group of Metals
PPP	Private-Public Partnership
R&D	Research and development

REE	Rare Earths Element
RM	Raw materials
SAGE	Sustainable And Green Energy
SET	Strategic Energy Technology
SIP	Strategic Implementation Plan
SME	Small and Medium Enterprises
SSL	Solid State Lighting
TBT	Technical Barriers to Trade
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
WBCSD	World Business Council for Sustainable Development
WEEE	Waste Electrical and Electronic Equipment

Units Conventional SI units and prefixes used throughout: {k, kilo, 1,000} {M, mega, 1,000,000} {G, giga, 10⁹} {kg, kilogramme, unit mass} {t, metric tonne, 1,000 kg}

1 INTRODUCTION

This Strategic Implementation Plan (SIP) has been developed on the basis of input from a wide range of European stakeholders dealing with raw materials (governments, industries, academia, NGOs), which are involved in the European Innovation Partnership (EIP) on Raw Materials. To steer the work on the Plan, a High-Level Steering Group was formed in 2012. To collect input to the Plan, the European Commission established five operational groups with experts on raw materials and various aspects of raw materials policy. From May to July 2013, four draft versions of the Plan were issued by the services of the European Commission and commented on by the members of the High-Level Steering Group or their representatives (“Sherpas”) prior to this final version.

The first part of this SIP presents the objectives, targets and methodology of the EIP and defines the overall strategy. The second part explains in detail the actions proposed in order to achieve the objectives and targets for each priority area and action area.

1.1 The challenges

Raw materials challenges

The EU is highly dependent on imports of raw materials that are crucial for a strong European industrial base, an essential building block of the EU's growth and competitiveness. The increasing demand for unprocessed minerals and metals and volatility in the prices of certain raw materials, as well as the market distortions imposed by some countries on a number of them, have shed light on the importance of raw materials for our economy and society.

The EU is self-sufficient in the production of **construction minerals**, including aggregates (sand, gravel, and crushed natural stone), various brick clays, gypsum and natural ornamental or dimension stone. Europe's production of aggregates is approximately 3 billion tons per year. Around 91% of all aggregates produced are from natural resources, 5% are recycled aggregates, and 2% are of marine origin or manufactured. The EU also has a large production of **industrial minerals** supplying a very wide range of industries. For some minerals, such as magnesite, fluorspar, bentonite, kaolin and potash, Europe is an important global producer. The EU however is a net importer for many of these industrial minerals. Due to large quantities of construction and industrial minerals produced and consumed, there is a need to improve the overall sustainability performance, the materials range of the primary production and to ensure a higher proportion of recycling.

The European economy is highly dependent on **ores and metals** imports. Only a small number of metal ores are extracted within the EU, which is still a relatively important producer for some, such as chromium, copper, lead, silver and zinc. This production is by far not sufficient to meet European demand. Regarding recycling, the use of recycled metal scrap represents around 40% to 60% of input to EU metal production, according to industry estimates. For several metals, including rare earths and PGMs, the EU completely relies on imports.

Regarding **wood-based raw materials**, the EU is, to a large extent, self-sufficient. However, there is a growing necessity to secure its sustainable supply, partly due to increasing demand from other EU end-users, notably bio-energy, and also demand from outside the EU. The development of a bio-based European economy calls for new bio-

based products, which will also contribute to a stronger demand for wood-based raw materials and thereby putting increased pressure on their supply. Conversely, EU industry relies completely on imports of **natural rubber**. More than 1.2 million tons of natural rubber is used annually in the EU (e.g. mostly by the European automotive industry), which represents 11% of world production. In addition, the high concentration of production in a few countries, leading in recent years to high price volatility, and the growing demand for natural rubber by emerging markets is putting increased pressure on the supply of this raw material at affordable prices.

Some **other materials** serving as industrial feedstock may face similar challenges. Import dependency is over 90%, either directly in the case of phosphates or indirectly for ethylene and propylene (oil derivatives). Developing alternative sources (e.g. for ethylene, sources based on cellulosic and waste feedstock) and recycling technologies is a challenge for Europe.

Value chain challenges

In order to secure a sustainable supply, Europe is therefore confronted with a number of challenges along the entire raw materials value chain composed of exploration, extraction, processing/refining, recycling as well as substitution.

Knowledge on both primary and secondary raw materials is dispersed, terminology and reporting standards often heterogeneous throughout the Member States, having an impact on the reliability and comparability of European data, thereby making exploration and extraction activities within the EU more difficult.

Europe's mineral potential is **under-explored** both with regard to subsurface (particularly deeper than 150 meters) and at sea in the EU Member States exclusive economic zones. The higher costs for deeper exploration, extended time for permitting, and the technological and economic feasibility of mine development are challenges to tackle, anywhere in the world.

Major opportunities of access to raw materials exist within the EU today, especially for **mining** operations at greater depths, in non-conventional surface deposits or in small deposits. The ocean bed could also contain valuable raw materials, such as copper, zinc, gold, silver and rare metals, leading to growing world-wide competition for marine mineral deposits. The main economic, technological and environmental challenges of mining include reducing high investment costs, eliminating generation of waste and large tailings, and improving flexibility, automation, safety of operations, and in the case of sea mining, the impact on the marine environment and efficient transport and logistics.

The framework conditions for primary raw materials can also sometimes represent a challenge to exploration, mining and metallurgy, whilst it is important to preserve and better implement the objectives of environmental legislation, thereby contributing to the raw materials sectors' sustainability and resource efficiency. Minerals policies are not always clear and effective enough (e.g. dispersed among other policies, no public implementation support, uncoordinated between different levels (EU, Member States regional, local) and with other sectorial policies (land use planning policy, environment policy including biodiversity and waste management)). The permitting procedure for mining can be lengthy and sometimes lack transparency. While the overall potential for mining and quarrying in Europe is high, access to land is another key challenge for the extractive industry, where competing land uses may sterilise deposits for future use. Public mistrust of the raw materials industry, which in some Member States is based on its mining legacy and accidents, often derives from lack of awareness of the importance of raw materials for society. Finally, there is also a need to explore all relevant means,

such as Trans-European Transport Networks, to develop the necessary transport and logistics infrastructures and technologies for a sustainable and competitive raw materials supply within the EU.

In addition, forest ownership is often fragmented and forest management insufficiently developed, leading to sub-optimal productivity. A potential therefore exists to increase sustainable wood **mobilisation** from EU forests.

Available raw materials' feed stocks are becoming more complex and low-grade, and they may also vary in composition over time, making their processing and refining more complex, with growing energy and water requirements per unit of concentrated produce. Their efficient and sustainable **processing and refining** require a series of complex and integrated technologies, systems and processes leading to high investment installations. Combined with the fact that energy prices are higher in the EU, the new solutions can only be economically viable when operating at a certain size and for a predictable and sufficiently long period of time.

Moreover, evolution towards more complex products containing a multitude of metals (including Critical Raw Materials [CRM] and other technology metals), minerals, wood-based materials, or polymers creates new challenges for the **recycling** of the raw materials as described (for minerals and metals only) in a recent UNEP International Resource Panel Report "Recycling of Metals: Options, Limits and Infrastructure"¹. Generally, the related recovery schemes are complex and imply different steps, including collection and logistics, disassembly and mechanical pre-treatment aimed at selectively removing hazardous and valuable components; concentration of desirable materials using mechanical and/or chemical processing; and refining/metallurgy and purification of desirable materials. The major challenge is to avoid losses appearing in different recovery steps and ensure recycling of high quality. This implies, among others, providing technological solutions as well as the right economic and framework conditions to improve their recovery.

Many high-tech metals, essential for the EU's high-tech industries, still have global recycling rates below 1% after decades of use². Very low collection rates for certain end-of-life consumer products containing critical raw materials or other raw materials (e.g. wood), prevent end-of-life products from entering the recycling chain, although existing recycling technology would allow the recovery of a range of these materials, thereby losing an opportunity to increase the supply of valuable secondary raw materials. There are inadequate economic conditions for collection and recycling of certain valuable and critical materials within the EU and not all collection practices allow for optimal recycling (comingled vs. separate). Although EU waste legislation includes a combination of collection targets and recycling/recovery targets, these are weight-based, providing no incentive to recycle critical materials present in small amounts. Therefore, in Europe some scrap³ metals and minerals end up in slag, road construction or waste deposits, whilst wood still ends up in landfill or is incinerated or discarded instead of being re-used and turned into value added products.

¹ Available for download:

http://www.unep.org/resourcepanel/Portals/24102/PDFs/Metal_Recycling_Full_Report.pdf

² See UNEP International Resource Panel Report: "Recycling rates of metals", http://www.unep.org/resourcepanel/Portals/24102/PDFs/Metal_Recycling_Full_Report.pdf

³ Scrap may refer to materials that are considered as waste under the EU waste legislation or that are considered as production by-products or end-of-waste secondary raw materials.

In addition, products are sometimes designed in a way that makes their use along the value chain suboptimal, their life shorter or makes their repair or dismantling – with a view to the recycling of rare metals or other materials – difficult, thereby uneconomic or simply impossible. Recyclers also sometimes miss information on the presence of critical raw materials in products or on how they may be recovered. There is also sometimes an insufficient trust by end-users in the quality of recycled materials, which could be partly due to poor communication and marketing.

Over the last decades, EU exports of valuable waste materials have increased considerably, while imports have dropped significantly. Illegal shipments of waste are difficult to quantify, but are said to be around 20-25% of all shipments⁴. Illegal shipments and poor recycling have adverse effects on human health and the environment, create unfair competition for law abiding operators and give rise to losses of valuable resources in case of poor or no treatment.

Even if recycling rates for some materials could be optimised to the highest possible extent, the overall increasing CRM demand calls for Europe to also roll-out **substitution**-based solutions within the next decade. The huge number of devices in all consumer and business fields using substantial amounts of certain CRM and the high production volumes of a very wide range of alloys, hard materials and steels using substantial amounts of refractory metals (W, Mo, Ta, Nb, Hf, Zr, Cr, V, Ti) and other scarce metals (e.g. REE, Re, Ir) that are key to the development of low carbon technologies, illustrate the need to also resort to substitution. Developing alternative solutions may also enable Europe to diversify the supply of raw materials sources needed, e.g. as in the case of natural rubber, or to reduce the demand for specific critical raw materials through the development of new materials requiring less materials. In this context, bio-based substitutes can be considered, where appropriate.

Moreover, research and development (R&D) in the area of raw materials is still scattered amongst different players. Major R&D funding comes from individual companies, EU Research Framework Programmes and the Member States. More coordination between industrial players and researchers in the EU and across the whole value chain is needed. And effective communication between EU and Member States' authorities, industry and research community needs to be facilitated. The number of professionals in the raw materials sector (for both primary and secondary raw materials sectors) should increase, and interactions should be fostered between producers and end-users as well as between sub-sectors including (but not restricted to) geology, geochemistry, geophysics, mineral processing, recycling, mining engineering, metallurgy, material scientists, forest owners and managers, forest-based value chains, social and human sciences, economy, etc.

Given the high dependency of European industry on the international market to secure its raw material inputs and the global nature of raw materials value chains, **international co-operation** forms an important and cross-cutting aspect of a sustainable supply of raw materials. Europe is a continent with long mining traditions, a developed mining education system, a very advanced technology base and high environmental standards, and could also be an attractive target for foreign investment. There are opportunities for dialogue and cooperation between the EU and the technologically-advanced and raw materials-producing countries, as well as with international organisations and companies.

With regard to Research and Innovation, , there is a need to better exploit the synergies between relevant research programmes with technologically-advanced countries, and to

⁴ <http://impel.eu/wp-content/uploads/2012/01/IMPEL-TFS-EA-II-Project-Final-report-adopted-v1-4.pdf>.

promote European technology transfer to less developed countries. Knowledge and raw materials flows also require cooperation with international partners to obtain a full view at the global level. Raw materials-related policies, skills and experience are the areas where Europe can exchange good practices with international partners having advanced mining and recycling policy frameworks. Europe can offer its help and support to partners in Africa, Latin America or EU neighbours, for example through the Pan-African Programme. Moreover, European mining standards and achievements are not always successfully exported worldwide, while European environmental requirements, which must be met by mining companies, are not globally recognised.

The EU Member States could benefit from a better coordination of their approach to non-Member States and thereby avoid duplication of actions, in areas where EU and national actions can be mutually supportive.

1.2 A vision for innovation across the value chain

The long term vision is to tap the full potential of primary and secondary raw materials and to boost the innovation capacity of the EU raw materials sector, turning it into a strong sustainable pillar of the EU economy and an attractive industry, whilst addressing societal challenges and increasing benefits for society.

This can only be done by gaining relevant knowledge about raw materials in Europe and if all the stakeholders, including the relevant authorities, raw materials and downstream industries, research communities and society work towards the same objectives.

The knowledge base on raw materials will help all EU actors better target their efforts. Improving knowledge is a continuous process and will constantly support all other initiatives, actions and decision making.

The EIP will bring advantages to all the actors in a longer term horizon. The idea is to develop (a) new exemplary cost-effective, environmentally sound and safe technological solutions for securing supply of raw materials, and (b) knowledge and skills in the EU to attract investment by industry bringing new jobs and growth to the EU economy. This will build the innovation capacity in Europe and will help citizens increase their living standard while meeting sustainability criteria and feeling safer and comfortable in terms of their living environment. The new solutions, however, would need support to enter the market. This is a field where the competent authorities at the EU, Member States or regional and local levels could help and prepare modern raw materials' policies and improve the framework conditions to facilitate innovation and promote entrepreneurship in the EU, taking SMEs into account.

In the medium term up to 2020, a number of concrete research and innovation actions are targeting the beginning of the raw materials value chain and integrating with the downstream industries in order to start the process of transformation of the EU raw materials sector and to contribute to the reindustrialisation and resource-efficiency of the EU.

The actions will cover all relevant raw materials and their value chains including exploration, extraction, processing, refining, recycling and substitution. The viability of the solutions shall be demonstrated in pilot actions in the real environment by 2020.

1.3 Role of the EIP on Raw Materials

The concept of EIPs was established by the Commission in 2010 as part of the Innovation Union flagship⁵ initiative with the two-fold aim of:

- Improving conditions and access to finance for research and innovation in Europe
- Ensuring that innovative ideas are turned into products and services that create growth and jobs.

EIPs were launched for policy areas where the Commission identified that the combined strength of public and private efforts in innovation and R&D at regional, national and EU level, as well as demand-side measures, were needed to achieve key targets faster and more efficiently. This is the case for raw materials.

The EIP on Raw Materials will promote both technological and non-technological **innovation along the entire value chain** of raw materials (i.e. exploration, extraction, processing, refining, re-use, recycling, substitution) involving stakeholders for relevant **upstream and downstream sectors**.

Non-energy non-agricultural raw materials used for industrial purposes are included in the scope, including metals, industrial minerals and construction materials, and natural rubber and wood-based materials.

This SIP addresses all actions necessary to achieve the objectives and targets, including research and development along the value chain, raw materials knowledge, exchange of best practice, improved implementation or revision of selected legislation, licensing steps, standardisation, and policy dialogues.

⁵ COM(2010) 546 final

2 OBJECTIVES AND TARGETS

2.1 Objectives

The overall objective of the EIP on Raw Materials is to contribute to the 2020 objectives of the EU's Industrial Policy⁶ - increasing the share of industry to 20% of GDP - and the objectives of the flagship initiatives 'Innovation Union'⁷ and 'Resource Efficient Europe'⁸, by **ensuring the sustainable supply of raw materials to the European economy** whilst increasing benefits for society as a whole.

This will be achieved by:

- Reducing **import dependency** and promoting production and exports by improving **supply conditions from EU, diversifying raw materials sourcing** and improving **resource efficiency (including recycling) and finding alternative raw materials**.
- Putting Europe **at the forefront** in raw materials sectors and mitigating the related negative **environmental, social and health impacts**.

2.2 Targets

A number of **concrete targets** should be achieved by the EIP by 2020, as indicated in the Communication proposing the EIP on Raw Materials⁹ and further refined by the EIP:

- Up to **ten innovative pilot actions** on exploration, mining, processing, and recycling for innovative production of raw materials;
- **Substitutes for at least three applications of critical and scarce raw materials;**
- **Framework conditions for primary raw materials** that would provide a stable and competitive supply from EU sources and facilitate its public acceptance;
- **Framework conditions for enhanced efficiency in material use and in waste prevention, re-use and recycling, and raw materials efficient product design;**
- **European raw materials knowledge base with information, flows and dynamic modelling system for primary and secondary raw materials;**
- **Network of Research, Education and Training Centres** on sustainable raw materials management organized as a Knowledge and Innovation Community;
- **Pro-active international co-operation strategy of the EU** at bilateral and multilateral level, promoting synergies with countries such as the US, Japan, Australia, Canada, Latin America and African Union across the different areas covered by the EIP.

The following sections define the priority areas and action areas relating to each of these concrete targets, as discussed at the EIP meetings.

⁶ http://ec.europa.eu/enterprise/policies/industrial-competitiveness/industrial-policy/index_en.htm

⁷ http://ec.europa.eu/research/innovation-union/index_en.cfm

⁸ <http://ec.europa.eu/resource-efficient-europe/>

⁹ COM(2012) 82 final

3 DEFINING PRIORITY AREAS AND SPECIFIC ACTIONS

The work under the EIP is structured under three pillars reflecting the nature of the actions:

- **Technology Pillar**
- **Non-technology Pillar**
- **International cooperation Pillar**

Criteria for prioritising actions

In order to make sure that all actions of the SIP contribute to achieving the objectives of the EIP, partners have developed a set of criteria to be applied to proposed actions. Based on this assessment, the action areas and related actions have been developed and prioritised¹⁰ as contained in this Part I and in Part II.

The criteria selected were:

1. Economic benefit to EU industry, taking into account:
 - 1.1. Availability of raw materials/security of supply
 - 1.2. Competitiveness of EU industry leading to European jobs
2. Level of innovation (*for technology-based actions*) and implementation readiness (*for non-technology-based actions*), taking into account:
 - 2.1. Responsibility of implementation
 - 2.2. Possibility to evaluate impacts
 - 2.3. Excellence
3. Sustainability, taking into account:
 - 3.1. Economic, social and environmental sustainability
 - 3.2. Public acceptance
 - 3.3. Transferability/possibility to replicate

Selected criteria have a clear link to the objectives of the EIP developed in the Communication of the European Commission and further refined by the EIP (see above).

I TECHNOLOGY PILLAR

The technology pillar aims to better integrate and push Europe to the forefront in the raw materials sectors and to contribute to improving supply conditions in the EU and reducing import dependency through new integrated technological solutions to access raw materials, better resource efficiency of industrial processes and improved recycling, as well as through finding new alternatives to supply rare and critical raw materials through substitution, while mitigating the related negative environmental and social impacts.

¹⁰ The prioritisation exercise was carried out at the Sherpa Group meeting on 5 June 2013.

This will be achieved through the actions in the following priority areas:

- Raw materials research and innovation coordination;
- Technologies for primary and secondary raw materials production;
- Substitution of raw materials.

I.A Priority Area: Raw materials research and innovation coordination

The aim is to strengthen the coordination of research efforts among all relevant players in the EU, knowledge, tools and research infrastructures in order to maximise impacts of all R&D actions in the technological pillar and link them to the research initiatives in the EU, such as Horizon 2020, ERA-MIN, PPPs and ETPs.

This priority area is covering the following EIP target:

- Up to **ten innovative pilot actions** on exploration, mining, processing, and recycling for innovative production of raw materials;
- **Substitutes for at least three applications of critical and scarce raw materials.**

The following action area is proposed to fulfil the objectives of the priority area:

- Action area n° I.1 Improving R&D&I coordination in the EU: The actions shall contribute to strengthening the coordination of the research initiatives (such as Horizon 2020, ERA-MIN, PPPs and ETPs), efforts, knowledge, tools and research infrastructures in order to maximise the impacts of the research initiatives and actions in the area of raw materials carried out by the EU, Member States, industry and research communities for the benefit of society. It shall support all R&D&I actions in the technology pillar and complement the Priority Area "Knowledge, skills and raw materials flows".

I.B Priority Area: Technologies for primary and secondary raw materials' production

The aim is to promote pilot actions developing new industrially viable technological solutions for sustainable production of raw materials in the EU, both from primary and secondary sources.

The priority will also be linked to Horizon 2020 activities under the Societal Challenge 5 "Climate action, resource efficiency and raw materials". The experience acquired from the pilot actions could be used to speed up development and implementation of innovative breakthrough solutions, ideas and concepts to sustain in the long term global population growth, the increased demand for raw materials; to ease land use limitations in Europe; and to replace depleted deposits.

This priority area is covering the following EIP target:

- Up to **ten innovative pilot actions** on exploration, mining, processing, and recycling for innovative production of raw materials.

The following action areas are proposed to fulfil the objectives of the priority area:

- Action area: n° I.2: Exploration: The actions shall investigate new concepts, technologies and models for exploration on the continent and in the sea-bed and shall serve as tools to the raw materials data providers (geological surveys, industry) to create a new reliable data-base (link to EU mineral potential) in order to feed the EU Knowledge base on primary and secondary raw materials. The newly developed tools can be used by authorities to better develop land use planning. The ultimate goal is to discover new resources and open new mines.
- Action area: n° I.3: Innovative extraction of raw materials: The actions shall enable and facilitate the development of global sustainable competitiveness by the exemplary raw materials exploitation activities in a sustainable way. It will also provide examples of new clean and safe solutions facilitating public acceptance of mining and forest harvesting, and supporting streamlining of the permitting process, ultimately increasing domestic EU production of raw materials.
- Action area: n° I.4: Processing and refining of raw materials: The actions shall develop innovative flexible help to recover valuable materials from low grade and/or complex feeds of raw materials in Europe by increasing the range and yields of recovered raw materials. The actions shall also reduce environmental footprint and import dependency, and facilitate public acceptance of raw materials supply operations.
- Action area I.5: Recycling of raw materials from products, buildings and infrastructure: The actions shall tackle the challenge of recycling the valuable raw materials from complex consumer products, buildings and infrastructure, and other waste streams in a cost-effective, resource and energy efficient and environmentally sound way in order to increase domestic EU production of raw materials.

I.C Priority Area: Substitution of raw materials

The aim is to set the framework to develop innovative and sustainable appropriate substitutes for applications using critical and/or scarce raw materials for which supply could be insufficient to meet demand.

This priority area is covering the following EIP target:

- **Substitutes for at least three applications of critical and scarce raw materials.**

Substitution needs to be considered carefully on a case-by-case basis and targeted appropriately towards selected applications. For some applications it may be possible to reduce the use of a particular material or to replace it completely. However, the use of a particular critical material can confer exceptional performance that may justify the associated supply risks and additional costs incurred.

There are several approaches to substitution which may be relevant, including 1) Reduction - use less material to achieve the same level of functionality in a given product; 2) Alternative material - replace one material for another without loss of functionality; 3) Alternative system - replace one/several components within the same product; 4) Alternative products - replace existing technology with different products and/or services.

Choices and combinations of approaches must be made between increasing production of a critical raw material, recycling of the material and some form of substitution or reduction of material use. When possible, bio-based substitutes should be considered. This highlights a clear need for this priority area to link with the other actions of the EIP to ensure that the applications targeted for substitution are indeed appropriate.

Impact will be maximised where alternatives are identified for applications; which have significant economic value to the EU and where European industry sits at an appropriate position in the value chain; that use a significant proportion of the critical material in question; where demand is expected to grow or remain high, European production potential is limited and where potential substitution technologies and alternatives are at an appropriate stage of development to be demonstrated in applications within the timeframe of the EIP.

The following action areas will target different highly economic important applications where substitution will make a substantial difference to the competitiveness of European industry while taking into account the required specific materials properties of raw materials:

- Action area: n° I.6: Materials for green technologies. The actions shall cover the most important application areas in sectors related to the greening of energy, chemical, and automotive industries for which CRM are a key component.
- Action area: n° I.7: Materials for electronic devices. The actions shall cover the most important application areas in sectors related to the electronic and lighting industries for which CRM are a key component.
- Action area: n° I.8: Materials under extreme conditions. The actions shall cover the most important application areas in the steel and metallurgy sectors for which CRM are a key component.
- Action area: n° I.9: Applications using materials in large quantities. The actions shall demonstrate that the substitution of raw materials used in large quantities is feasible in a sustainable and affordable way without loss of functionality.

II NON-TECHNOLOGY PILLAR

The objective of the non-technology pillar is to facilitate raw materials supply to the EU economy and society, reducing import dependency and pushing Europe to the forefront in the raw materials sectors, while increasing resource efficiency and reducing negative environmental impacts, by: (a) improving framework conditions for primary and secondary raw materials'; (b) increasing the knowledge and information infrastructure base; (c) improving education and skills; and (d) enhanced cooperation along value chains to optimise raw materials flows along value chains.

This will be achieved through the actions in the following priority areas:

- Improving Europe's raw materials framework conditions;
- Improving Europe's waste management framework conditions and excellence;
- Knowledge and skills and optimised raw materials flows.

II.A Priority Area: Improving Europe's raw materials framework conditions

The aim is to facilitate the exchange of best practice among Member States in order to improve the sustainable and safe supply of raw materials to the EU economy and society.

This priority area is covering the following EIP target:

- **Framework conditions for primary raw materials** that would provide a stable and competitive supply from EU sources and will facilitate public acceptance.

This priority area is dealing primarily with the identification and exchange of best practice in the Member States, access to mineral potential within the European Union and industry-focused initiatives. The improvement of the raw materials framework conditions would foster a stable and competitive supply from EU sources and facilitate public acceptance whilst contributing to increased environmental protection.

The following action areas are proposed to fulfil the objectives of the priority area:

- Action area n° II.1: Minerals Policy Framework. Following the experience of the Raw Materials Initiative this action area addresses mineral policy, permitting, environmental management and reporting by public institutions and is structured around three sub-areas: Member States' practices, EU guidance and legislation as well as communication. The objective is to provide a stable and competitive supply of raw materials from EU sources while promoting good governance and facilitating public acceptance. It will be achieved by strengthening the exchange of best practices in the area of mineral policies and related regulation among Member States, by streamlining the permitting procedure along the whole chain of mining activities (prospecting, exploration, extraction, processing, refining, closure, post closure activities) with regard to the regulatory co-authority regime, the administrative conditions, and ensure a stable, predictable environment. Another objective is to increase transparency on raw materials availability in the EU, which is strongly influenced by environmental protection (EIA, NATURA 2000, and Mining Waste Directive) on different levels and by reporting on mineral resources by public institutions. Information on exploration, mineral production, trade, reserves and resources should be standardized and systematically reported by EU and Member States, when information is available and without breaching competition rules. The information on supply should be assessed in parallel with the information on current and future demand and production capacities of the European industry.
- Action area n° II.2: Access to Mineral Potential in the EU. This area is dealing with the concept of mineral deposits of public importance and land use planning, both aiming at increasing access to the mineral deposits within the EU. The objective is to foster access to known and still undiscovered mineral deposits, improve the conditions for sustainable access and supply of raw materials in the EU and safeguard the mineral wealth for future generations by classifying within a regulatory framework, the importance for society of certain mineral deposits. With regard to the land use planning or marine spatial plans, the aim is to ensure that NEEI are considered on equal terms as all other, often competing sectors such as agriculture, forestry, housing, industrial areas, etc. This would ensure an appropriate time frame for long term investment into minerals extraction and processing/refining.

- Action area n° II.3: Public Awareness, Acceptance and Trust. The initiative, mostly industry-led, but also supported by all concerned stakeholders (communities, institutions and regulatory bodies at all levels – local, regional, national, European – medias, NGOs, academia, schools, etc.) is dealing with increasing at first the public awareness of the benefits and potential costs of the raw materials supply, secondly obtaining its acceptance and finally gaining the trust for the activities of the sector throughout its production cycle. This action area aims at enhancing public acceptance and trust by improved communication and transparency, notably during the permitting procedure and the production cycle (exploration, mine operation, after-mining).

All themes of this priority area need to be strongly aligned towards the same objectives; they have strong links with other priority areas, in particular knowledge base and skills and both priority areas of the technology pillar.

II.B Priority Area: Improving Europe's waste management framework conditions and excellence

Resource efficiency has been widely proposed as a solution to Europe's combined challenges of resource security, environmental protection and business competitiveness. The EIP recognises that Europe's resource efficiency policies and product and waste regulatory framework are key aspects in ensuring innovation-friendly framework conditions relating to raw materials.

The EIP has examined whether any measure to improve the framework conditions for products and waste, as well as to promote the excellence of the EU industry, could support raw materials efficiency in order to meet the overall objectives of the EIP and ensure access to secondary raw materials. There may be an opportunity to ensure better implementation, and where appropriate to adapt waste management regulations and other resource efficiency policies.

This priority area is covering the following EIP target:

- **Framework conditions for enhanced efficiency in material use and in waste prevention, re-use and recycling, and raw materials efficient product design.**

The actions areas identified will cover product design, optimised waste flows, preventing illegal shipment of waste, and optimised material recovery.

- Action area n° II.4: Product design for optimised use of (critical) raw materials and increased quality of recycling. The actions shall minimise critical and other raw materials needed in products to perform particular functions, support product life extension and maximise the recyclability/re-use of materials through the development of new design strategies for various product ranges, taking into account the entire life cycle.
- Action area n° II.5: Optimised waste flows for increased recycling. The actions shall boost the quality and quantity of collected waste/end-of-life products, in particular those containing technology/critical metals and minerals in significant quantities – and improve the life-cycle management of products, thereby preventing losses of valuable raw materials and to then ensure their high quality treatment and recycling.

- Action area n° II.6: Prevention of illegal shipments of waste. The actions shall aim at preventing illegal shipments of waste from the EU to non-EU countries, thereby preventing losses of valuable raw materials, to ensure that more waste is treated in a way that increases reuse and recycling, taking into account effects on human health and the environment (implementing the environmental sound management principle provision of the EU Waste Shipment Regulation¹¹), and to avoid unfair competition, taking into account all players of the value chain.
- Action area n° II.7: Optimised material recovery. The actions shall aim at improving the quality of recycled material by developing standards for e-waste recycling and encouraging the transition from waste to secondary raw materials.

Several action areas contained in this priority area have to be seen in conjunction with some of the recommendations made by the European Resource Efficiency Platform (EREP). The objective of EREP is to provide high-level guidance to the European Commission, Member States, local and regional authorities and private actors on the transition process towards a more resource-efficient economy. On 17 June 2013, the Platform issued a number of relevant recommendations to: 1) set objectives, measure and report progress; 2) improve information on environmental and resource impacts for decision making; 3) phase out environmentally harmful subsidies; 4) move towards a circular economy and promote a high-quality of recycling; 5) improve resource efficiency in business-to-business relations; 6) take forward a coherent, resource efficient product policy framework; 7) deliver a stronger and more coherent implementation of Green Public Procurement; 8) develop instruments for SMEs.

II.C Priority Area: Knowledge, skills and raw materials flows

The aim is to enhance the EU knowledge base in order to improve the sustainable and safe raw materials supply to the EU economy and society, which includes: (a) building an innovative knowledge base of EU resources, both primary and secondary and (b) improving the quantity and quality of higher education (skilled experts) in conjunction with research and business in the EU for the entire raw materials value chain. The conditions of raw materials supply would also be improved to optimise use of raw materials along the value chains through improved cooperation between different value chain players.

This priority area is covering the following EIP targets:

- **European raw materials knowledge base with information, flows and dynamic modelling system for primary and secondary raw materials;**
- **Network of Research, Education and Training Centres** on sustainable raw materials management organized as a Knowledge and Innovation Community;
- **Framework conditions for primary raw materials** that would provide a stable and competitive supply from EU sources and facilitate its public acceptance;
- **Framework conditions for enhanced efficiency in material use and in waste prevention, re-use and recycling, and raw materials efficient product design.**

¹¹ Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste

Specific actions with regards to the knowledge base on the EU's raw materials have been defined as an EU raw materials service; and a network of research, training and education centres on sustainable raw materials management potentially organised through the development of an EIT Knowledge and Innovation Community (KIC) (involving also the business community) or similar initiative.

- Action area n° II.8: The European Union Raw Materials Knowledge Base (EURMKB) will provide EU level data and information on raw materials from different sources in a harmonized and standardized way. This will encourage activities of the raw materials sector, not only regarding exploration, extraction, processing/refining and recycling, but also trade, development, skills and education. This will consequently increase the supply of raw materials as well as strengthen Europe's position at the forefront of the raw materials sector. The action on knowledge base is the foundation for the technology and non-technology pillars as well as a base for the international cooperation pillar.
- Action area n° II.9: Possible EIT Knowledge and Innovation Community (KIC) in 2014 - In order to boost excellence in the raw materials sector, a network of research, education and training centres on sustainable raw materials could be created as a KIC, which also involves the business community and bases its activities on education, entrepreneurship and technology innovation). Technological innovation applies to the exploration and extraction sector as well as to processing/refining and recycling technologies (including substitution) that is to the whole production chain in the present and in the future.
- Action area n° II.10: Optimised raw materials' flows along value chains. The actions shall enhance the conditions of the raw materials value chain to optimise raw materials flows along value chains and improve the combined use of primary and secondary raw materials without the loss of quality through improved cooperation of actors along different value chains.

III INTERNATIONAL COOPERATION PILLAR

Given the dependency of much of European industry on the international market to secure an important part of its raw material inputs and the global nature of raw materials value chains, **international co-operation** forms an important and cross-cutting part of the EIP on Raw Materials. This pillar considers how best to balance the benefits of international trade and international dialogues with the need to support other pillars of the EIP, by encouraging greater recovery and production of raw materials from within Europe (primary and secondary raw materials), international co-operation on improving access to raw materials globally, substitution, resource efficiency and knowledge/best-practices sharing.

The international pillar should support the other pillars on both technology and non-technology issues from the international perspective. It identifies several action areas within which new dialogues and partnerships are needed and co-ordinated closely with other pillars, priority areas, action areas and actions.

This pillar covers the following EIP target:

- **Pro-active international co-operation strategy of the EU** at bilateral and multilateral level, promoting synergies with countries such as the US, Japan, Australia, Canada, Latin America and African Union across the different areas covered by the EIP.

Defined targets will accordingly adapt the different scopes of potential cooperation.

The actions areas identified will cover technology, global raw materials governance and dialogues, health, safety and environment, skills, education and knowledge, and investment activities.

- Action area n° III.1: Technology. The actions shall help shorten the implementation time of new technologies in exploration and modern mining through cooperation with international players; utilising synergies between most advanced players in developing substitutes for applications using Critical Raw Materials (CRM); developing ore metallurgy and processing techniques in an innovative way to increase metal recovery, decreasing energy consumption and improving by-products recovery; engaging the EU's partners in a dialogue on recycling technologies with the aim of improving the environmental performance of end-of-life products, improving the quality of recycling (from an environmental, health and process efficiency perspective); and developing technical cooperation related to IT-based environmental monitoring, including the development of new technologies and an appropriate use of obtained information , as well as capacity building and institutional strengthening to support pro-sustainable development strategies to develop national/regional minerals industries.
- Action area n° III.2: Global Raw Materials Governance and Dialogues. The actions shall cover economically important raw materials in general, and specifically two types: (1) Critical Raw Materials (CRM) in accordance with the EU definition¹² and (2) natural rubber. They will aim to ensure the fair and unrestricted access to raw materials worldwide, by improving supply conditions for EU companies, ensuring a level playing field of all actors present in the trade of raw material commodities. Fairness from an economic point of view is extremely important in order to avoid competitive distortions and different regulatory frameworks being contradictory to the principles of fair and undistorted trade.
- Action area n° III.3: Health, Safety and Environment. The actions shall, on the one hand, contribute to improving the health, safety and environmental performance of mining activities worldwide and contribute to the development of sustainable mining in partner countries; and on the other hand they shall endeavour to improve the framework conditions for raw materials supply both in the EU and in its partner countries through dialogue on best practice, sharing experiences with regulatory solutions for raw materials supply and engagement with technology providers globally. It will also tackle the issue of social acceptance of mining. Furthermore, the aim of these actions is to facilitate free and fair trade of metallic and non-metallic raw materials. Attention could also be given to ensuring better transparency in the sector of conflict minerals, inter alia by looking at legislative improvements.
- Action area n° III.4: Skills, Education and Knowledge. The actions shall first seek to increase competence and expertise levels in Europe in selected areas of the mining sector by cooperating with the leading educational and research

¹² 'Critical raw materials for the EU', Report of the RMSG Ad-hoc working group on defining critical raw materials, June 2010

institutions in third countries (US, Canada, Chile, South Africa, Japan, Australia just to name a few) and improve the availability of workforce and skills in mineral resource related sectors. Secondly, they aim to establish the African Mineral Development Centre (AMDC) or other similar bodies. Thirdly, they shall aim to define a dialogue on skills and knowledge with Latin American countries involved in the mining sector. Fourthly, they seek to establish a functioning knowledge base system on material flows with the cooperation of international partners to better understand the shortages and adapt to market developments, including the use of already existing data.

- Action area n° III.5: Investment activities. The actions shall (1) support, through specific policy tools, the European mining, research and geological companies in exploration and development of mining projects abroad, (2) promote mining investment in Europe, and (3) foster cooperation with some countries on promoting the positive impacts of mining (economic, social and environmental), including exchange of best practices in raw materials policy and social acceptance of mining.

4 NEXT STEPS

4.1 Next steps in the European Institutions

To start the implementation of the SIP, the Commission is invited to launch a call for commitment in order to achieve the objectives in the different priority areas.

The Commission is also invited to respond to the SIP, and to present a Communication to the European Parliament and the Council, which should explain how the Commission, but also the Member States, industry and academia that have answered the call for commitments, intend to implement the SIP.

The current SIP consists of several recommendations inviting relevant stakeholders to take action in the different fields identified as priorities by the Partners. As far as actions relating to EU legislation are concerned, the Commission keeps its right of initiative whether to take on board any suggestion for action. Any legislative proposal would be subject to a fully-fledged impact assessment.

4.2 Implementing and monitoring of actions

The EIP members shall develop a monitoring scheme to assess the progress made in the implementation of the SIP, as well as its results in achieving the objectives and targets of the EIP. This scheme shall be prepared in the second half of 2013. Specific and quantifiable metrics for the EIP will be agreed.

The implementation of the SIP should be evaluated at mid-term (i.e. in 2017) and, if necessary, the SIP could be reviewed to ensure that all priority actions defined are still needed or to propose new ones reflecting the state of the art and new information available (e.g. update of the EU list of critical raw materials).