FORAM

TOWARDS A WORLD FORUM ON RAW MATERIALS

ANALYTICAL DASHBOARD

For a World Forum on Raw Materials

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Deliverable D.3.4

Analytical Dashboard including a Scenario Contingency Plan

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Executive Summary

The project Towards a World Forum on Raw Materials (FORAM) is developing and setting up a platform of international experts and stakeholders that will advance the idea of a World Forum on Raw Materials, strengthening international cooperation among G20 Member countries as well as other third countries active in the extraction, processing and recycling of non-energy abiotic raw materials. The mission of the World Forum on Raw Materials is *to establish multilateral dialogues aiming to minimise trade distortions and avoid trade barriers, promoting better and informed raw materials global governance and enforcing long term sustainable practices along the mineral raw materials value chain*.

This document defines performance indicators and an analytical dashboard that will be used to monitor the future operation of the World Forum on Raw Materials, given the stakeholders and partners involved, the goals and strategy defined, and the activities to be performed. The analytical dashboard will illustrate the full extent of the activities of the World Forum on Raw Materials, displaying relationships between different data points, and contributing to enhance the effectiveness of management decisions.

The organisational structure of the World Forum on Raw Materials is still not established, and this document assumes its structure can vary between an informal assembly and a formal prescribed formula, depending on the international experts and stakeholders' decision. It is, however, assumed that the progresses of the Forum will shadow the characteristic life cycle evolution of organisations. Because the alignment between the organisation's life cycle and the performance indicators used is paramount, the indicators advanced in this document are adapted to five life cycle stages, that correspond to the usual life cycle of *not for profit organisations* (NPOs): Stage One- Imagine and Inspire; Stage Two- Found and Frame; Stage Three- Ground and Grow; Stage Four- Produce and Sustain; and Stage Five- Review and Renew.

The dashboard will combine strategic indicators (to measure if the organisation is doing the right things) and operational indicators (to measure if the organisation is doing things right). The number of indicators is adjusted to each stage of the life cycle of the Forum, and is limited to relevant, easy to assemble information.

A maximum of 21 strategic indicators will be included in the analytical dashboard, distributed over seven dimensions:

1. Governance (*Board composition* and *Nr. of stakeholders engaged in the Forum*);
2. Staff leadership (*Notoriety and reputation of the management team*, *Staff engagement scores*, *Budget execution*, *Days ahead or behind schedule* and *Percent of performance goals met*);
3. Financing (*Cash flow*, *EBIT Growth*, *Donor retention rate*, *Average contribution per donor*, *Diversity of funding sources*);

4. Admin systems (*Funding grant status*, *Coverage of ERP system*);
5. Programming (*Nr. of stakeholders' commitments made vs. completed*, *Number of cooperation agreements enabled*, *Stakeholders' satisfaction rate*);
6. Staffing (*Staff satisfaction scores*, *Employee turnover/ retention rate*, *Time to hire for position vacancies*);
7. Marketing (*Nr. of endorsements by influencers and opinion makers*).

A total of 23 operational indicators is also included in the dashboard, distributed along the same dimensions. It must be stressed that the number of indicators used in the dashboard expands accordingly with the organization development, following its life cycle: in the initial stage of the World Forum on Raw Materials only four strategic indicators and six operational indicators will be monitored; the maximum number of indicators is achieved in the life cycles stages four (*Produce and Sustain*) and five (*Review and Renew*).

The pertinence of the 21 strategic indicators was contrasted against three possible future scenarios on the world of raw materials (in 2050). This exercise identified the strategic indicators that should always be monitored, despite the contextual environment of the Forum. At the initial life stage the critical indicators are *Board composition* and *Cash flow*. In the life cycle stages three, four and five *EBIT*, *Nr. of stakeholders' commitments made vs. completed* and *Nr. of endorsements by influencers and opinion makers* are added to the group of critical strategic indicators.

The dashboard will be displayed in an html format, either in an intranet or internet system. The information will be organised in easy to understand bars and sections, and dial gauges and graphical trends should be available to reflect progress or changes in data. The fonts and graphical design features will be easy to read, to ensure users can extract and process information effortlessly. Related information will be visually united, and all elements will be aligned to display connections between them. The dashboard will use familiar patterns and a consistent colour scheme, to guarantee users can find their way easily. To avoid jam-packed information, the dashboard will have different user access levels, tailored to the needs of different staff positions. The user access levels will be defined by the management team of the World Forum on Raw Materials

To prevent the main problems of building the dashboard, data harvesting will be automatic, from applications (invoicing, accounting, CRM, ERP, etc.) that use and generate compatible data structures and formats, such as Microsoft SQL Database, Excel spreadsheets or Access DB. Data storage will be centralised and managed by a responsible person, and the indicators used by the dashboard will be periodically revised, to ensure consistency between the external context and the Forum mission, strategic goals and activities.

The analytical dashboard will create a common language among all parts of the organisation, facilitating transparent and effective interactions, hence boosting the effectiveness of the World Forum on Raw Materials.

The indicators presented in this document and the corresponding analytical dashboard should be revised at the launch of the World Forum on Raw Materials, to ensure consistency with the organisational structure adopted.

1 Introduction

The project Towards a World Forum on Raw Materials (FORAM) is developing and setting up a platform of international experts and stakeholders that will advance the idea of a World Forum on Raw Materials, strengthening international cooperation among G20 Member countries as well as other third countries active in the extraction, processing and recycling of non-energy abiotic raw materials.

Advancing the idea of (and establishing) a World Forum on Raw Materials entails a participative and structured discussion involving all interested stakeholders, guided by a common understanding of the purpose and fundamental aspirations of the future World Forum on Raw Materials. This discussion started at the launch of FORAM, and the mission statement[1] of the World Forum on Raw Materials is the product of that discussion and the result of a large consensus[2].

To reach its beneficiaries and fulfil its mission the World Forum must engage with relevant stakeholders interested by the mineral raw materials value chain. The key activities that must be performed to establish the World Forum on Raw Materials include the design of an organisational structure and the advancement of strategic alliances to fulfil its mission.

The organisational structure of the World Forum is still not established. It can vary between an informal assembly and a formally prescribed formula, with detailed functions and roles' descriptions. This will naturally depend on the stakeholders that will lead the first steps, and on the alliances they will build to support their action. These alliances can be built with existing incumbents, and according to the Strategic Position of the Forum[3] its most obvious key partners are international intergovernmental organisations, matching forums, organisations promoting international cooperation and inclusive industry associations.

This report corresponds to deliverable D3.4 of FORAM, and it defines performance indicators and an analytical dashboard to monitor the future operation of the World Forum on Raw Materials, given the stakeholders and partners involved, the goals and strategy defined, and the activities to be performed. The dashboard will facilitate the collection of relevant data and insight, and will boost the efficiency and effectiveness of processes, contributing to a quick response to changes in the contextual environment.

[1] See FORAM deliverable D3.3. "Strategic Position".
[2] The mission of the World Forum on Raw Materials is "*to establish multilateral dialogues aiming to minimise trade distortions and avoid trade barriers, promoting better and informed raw materials global governance and enforcing long-term sustainable practices along the mineral raw materials value chain*".
[3] See FORAM deliverable D3.3. "Strategic Position".

2 Strategic Context

The development and launch of the World Forum on Raw Materials requires a cohesive assessment system that aligns activities and resources to maximise value delivered to beneficiaries. The description of the purpose, vision, mission, positioning, beneficiaries, activities, channels, partners and resources[4] of the Forum is presented in this section to give a context to the performance indicators and analytical dashboard described in this report.

2.1 Strategy

The Consortium that is implementing FORAM agreed that the organisational **purpose** of the World Forum on Raw Materials will be:

> **To enhance international cooperation between all key-stakeholders on raw materials policies and governance**.

This purpose supports the implementation of the Raw Materials Initiative and the Strategic Implementation Plan[5] of the European Innovation Partnership on Raw Materials.

FORAM's deliverable 3.2 advanced the **vision** of the World Forum on Raw Materials, expressed as follows:

> **The World Forum on Raw Materials will become an authoritative, independent and neutral organisation that supports cooperative actions to uphold a sustainable, reliable and affordable global supply of mineral resources**[6].

This vision is aligned with the mission statement, goals and positioning.

The **mission** statement of the World Forum on Raw Materials, is:

> **To establish multilateral dialogues aiming to minimise trade distortions and avoid trade barriers, promoting better and informed raw materials global governance and enforcing long term sustainable practices along the mineral raw materials value chain**[7].

The organisational purpose and the attainment of the vision and mission of the World Forum on Raw Materials are sustained by four **strategic goals**:

1. To enhance inclusive international cooperation on mineral raw materials policies and governance;

[4] For more details see FORAM deliverable D3.3. "Strategic Position".
[5] "Strategic Implementation Plan (SIP)". European Commission. Accessed June 18, 2017. https://ec.europa.eu/growth/tools-databases/eip-raw-materials/en/content/strategic-implementation-plan-sip-0
[6] In this context mineral resources encompass all non-energy abiotic raw materials, either obtained from primary sources (mines, quarries) or from secondary sources (recycling).
[7] Using a circular economy framework, the value chain of non-energy abiotic raw materials includes mining/extraction, processing, product development, design & substitution, re-use, recycling and substitution.

2. To foster dialogues aiming to minimise trade distortions and avoid trade barriers;
3. To provide to policy makers independent and neutral information on raw materials and understandable solutions;
4. To promote long term sustainable practices along the mineral raw materials value chain.

The **positioning** of the World Forum on Raw Materials is expressed as "**promoter of cross-cutting dialogues and generator of understandable solutions**".

The factors that frame this positioning are:

- Strong networks/alliances in place;
- Inclusive, independent forum specialised on raw materials;
- Wide pool of experts and stakeholders, capable of addressing cross-cutting topics;
- Capacity to overcome barriers of complex technical language, foster dialogues across stakeholders and create win-win solutions.

2.2 Implementation

2.2.1 Beneficiaries

A successful deployment of the World Forum on Raw Materials requires the active engagement of the Forum with definitive, dominant and dependent stakeholders (Erdmann and Tercero, 2017) interested by the mineral raw materials value chain. Engaging all stakeholders will require proactive actions conceived to reach out to dominant stakeholders (manufacturing industry, investors, intergovernmental organisations and international groups affecting raw material policies) and to dependent stakeholders (all industry sectors potentially affected by mineral raw materials and civil society organizations).

To reach and connect to the mentioned groups of stakeholders it was outlined a two steps approach that considers:

1. The establishment of alliances and partnerships with relevant groups of dominant and dependent stakeholders (e.g. NGOs, organisations/think tanks promoting dialogues and cooperation, industry associations, research networks);

2. The development of joint tailored initiatives, with the groups mentioned above, to build awareness and interest in mineral raw materials topics, and to shore up enrollment and support of their audiences to the activities of the World Forum on Raw Materials.

Aside dominant and dependent stakeholders, policy-makers are beneficiaries of the cross-cutting dialogues and solutions generated by the World Forum on Raw Materials. The engagement of policy makers will be obtained through influencers and opinion-makers, such as journalists, civil society and business leaders, (bodies and representatives of) international intergovernmental organisations and specific think-thanks.

To ensure a global and inclusive participation of all groups of stakeholders in the Forum, the mentioned alliances and partnerships must encompass regionally diverse and global groups and organisations.

2.2.2 Key activities

Key activities of the World Forum on Raw Materials are the activities that need to be performed well to reinforce the organisation's positioning and the accomplishment of its mission.

The key activities of the Forum are:

- To delineate an action plan and a business plan, detailing tasks, financial resources, responsible, an implementation schedule and key performance indicators that need to be considered for the establishment of the World Forum on Raw Materials;
- Design the organisational structure and advance the strategic alliances needed to fulfil the mission of the World Forum on Raw Materials;
- Secure the financial resources needed to propel the creation and support at least one year of activity of the World Forum on Raw Materials;
- Engage, motivate and expand the pool of experts set in place by the FORAM project;
- Map and target groups of dominant and dependent stakeholders interested by mineral raw materials topics;
- Develop alliances and joint tailored initiatives with the groups mentioned above, to build awareness and interest in mineral raw materials topics;
- Engage influencers and opinion-makers;
- Reach policy-makers;
- Ensure that its activities (e.g. conferences, workshops, decision papers) promote cross-cutting dialogues and advance comprehensive solutions to problems.

2.2.3 Channels

To reach out and deliver value to beneficiaries (trough its activities) the promotors of the World Forum on Raw Materials can use the following distribution channels and touch points:

- Network of FORAM and FORAM Consortium;
- Advisory Board of FORAM Consortium;
- Participation on joint tailored initiatives with target groups, including meetings, workshops, conferences (promotion);

- Organisation of activities of the World Forum on Raw Materials back to back with relevant raw materials conferences / fairs / other industry initiatives (dissemination);
- Influencers (public relations);
- Social media (videos, newsletter).

2.3 Key partners

Key partners are individuals and organizations that can leverage the activities of the World Forum on Raw Materials. The members of the FORAM Consortium and Advisory Board are obviously key partners of the future World Forum on Raw Materials.

But other organisations, either complementary in terms of aims or capacity can be targeted as key partners of the Forum on Raw Materials. From the analysis of the list of existing incumbents, the most obvious (and desirable) key partners of the Forum are:

- Global/international intergovernmental organisations (e.g. United Nations, OECD, European Union, World Bank, World Trade Organisation);
- Complementary forums and organisations promoting international dialogues and cooperation (e.g. World Circular Economy Forum, World Forum of Local Economic Development, World Materials Forum, World Resources Forum, International Raw Materials Observatory, KIC EIT Raw Materials);
- Inclusive industry associations (e.g. ICMM, Euromines, IMA-Europe, WEEE Forum);
- Certification providers (e.g. IRMA, EITI).

The list of key partners can naturally be enlarged when/if specific purposes/themes are being address (e.g. World Wildlife Fund, in the case of nature conservation or Industry4All in the case of labor relations).

2.4 Key resources

Key resources are the assets of the World Forum on Raw Materials indispensable to create value to beneficiaries. Having in consideration the vision, the mission, the positioning and the goals of the Forum, alongside the activities of the FORAM project, the key resources are:

- The pool of experts and stakeholders set in place by the FORAM project, including the Advisory Board, the Stakeholder Network and the Consortium;
- The management team of the World Forum on Raw Materials;
- The financial resources needed for the creation and support of at least one year of activity of the World Forum on Raw Materials.

3 Organizational life cycle

It is widely accepted in management that organisations follow a certain path of uniformity in their course of expansion (Kimberly, 1980, Mintzberg, 1984). This insight is relevant to the promotors of the World Forum on Raw Materials because they will be establishing a new entity, regardless of the organisational formula (less or more formal) used. It is also relevant for this report because the alignment between the lifecycle and performance indicators to be used in the assessment of the World Forum on Raw Materials is paramount to boost the effectiveness of the organisation.

One of the first studies that contributed to define the life cycle of an organisation from its creation to its termination was made by Tuckman (1965), who defined four development stages in team dynamics[8]. Each of these stages reflects a mode of activity within the team and how a team starts, grows and eventually dissolves. At each stage, the dynamics of the team change dramatically from periods of inefficiency and uneasiness through to periods of high performance. These changes are described in Table 1, according with the dimensions *content*, *processes* and *feelings*.

Table 1. Stages in group development and corresponding characteristics (Tuckman, 1965).

	Forming	Storming	Norming	Performing
General Observations	Uncertainty about roles, looking outside for guidance.	Growing confidence in team, rejecting outside authority.	Concern about being different, wanting to be part of team.	Concern with getting the job done.
Content Issues	Some attempt to define the job to be done.	Team members resist the task demands.	There is an open exchange of views about the team's problems.	Resources are allocated efficiently; processes are in place to ensure that the final objective is achieved.
Process Issues	Team members look outside for guidance and direction.	Team members deny the task and look for the reasons not to do it.	The team starts to set up the procedures to deal with the task.	The team is able to solve problems.
Feelings Issues	People feel anxious and are unsure of their roles. Most look to a leader or coordinator for guidance.	People still feel uncertain and try to express their individuality. Concerns arise about the team hierarchy.	People ignore individual differences and team members are more accepting of one another.	People share a common focus, communicate effectively and become more efficien and flexible as a result.

[8] The study can be applicable to all sorts of groups, including business organizations, non-profit foundations or social networks.

Later, Tuckman and Jensen (1977) added a fifth stage called 'adjourning' to this model. This final stage involves the disengagement of relationships between team members and a short period of recognition for the team's achievements. This model is relevant and particularly useful when applied to virtual teams. Virtual teams are increasingly used in today's business environment and they can be defined as teams with members that work remotely and use technology to function across time and cultural boundaries. This is relevant to the World Forum on Raw Materials because, much probably, part of the activities of the organization will be made by virtual teams.

The generic organizational life cycle model also considers four development stages (Daft and Willmott, 2010): 1) Birth; 2) Youth: 3) Midlife; and 4) Maturity. The main characteristics of organisations on each of these stages are represented in Table 2.

Table 2. Characteristics of the four stages of the organizational life cycle (Daft and Willmott, 2010).

	Birth	Youth	Midlife	Maturity
Size	Small	Medium	Large	Very large
Bureaucratic	Nonbureaucratic	Pre-bureaucratic	Bureaucratic	Very bureaucratic
Division of labor	Overlapping tasks	Some departments	Many departments	Extensive, with small jobs and many descriptions
Centralization	One-person rule	Two leaders' rule	Two department heads	Top-management heavy
Formalization	No written rules	Few rules	Policy and procedures manuals	Extensive
Administrative intensity	Secretary, no professional staff	Increasing clerical and maintenance	Increasing professional and staff support	Large multiple departments
Internal systems	Nonexistent	Crude budget and information system	Control systems in place; budget, performance, reports, etc.	Extensive planning, financial, and personnel added
Lateral teams, tasks forces for coordination	None	Top leaders only	Some use of integrators and task forces	Frequent at lower levels to break down bureaucracy

Recognising that non-profit organisations (NPO) have usually a higher capacity to regenerate and a different scope, when compared to business organisations, Simon (2001) categorised five development stages in the life cycle of NPOs[9]:

- Stage One: Imagine and Inspire ("*Can the dream be realized?*");
- Stage Two: Found and Frame ("*How are we going to pull this off?*");
- Stage Three: Ground and Grow ("*How can we build this to be viable?*");
- Stage Four: Produce and Sustain ("*How can the momentum be sustained?*");
- Stage Five: Review and Renew ("*What do we need to redesign?*").

The author considers that the factors that influence the organizational stage of an NPO are: 1) Age; 2) Size; 3) Growth rate; 4) Social environment; and 5) Characteristics of primary leader(s). And the relevant dimensions that change across the organisational life cycle are:

1. Governance;
2. Staff Leadership;
3. Financing;
4. Administrative Systems;
5. Programs, Products and Services;
6. Staffing;
7. Marketing.

Because this life cycle model is particularly well adapted to NPOs, the performance indicators to be used in the assessment of the World Forum on Raw Materials will monitor these seven dimensions.

[9] Simon (2001) also mentions, without detailing, a sixth stage, 'Decline and dissolve', that corresponds to the termination of the NPO.

4 Performance Indicators

Measuring the performance of an organisation strengthen its accountability and enhances value-added processes. Organisations with more extensive performance measurement systems, especially ones that include objective and subjective nonfinancial measures, have higher performance (Van der Stede, Chow, and Lin, 2006). The measurement normally requires the collection and analyses of data and information concerning individuals, systems or components. Effective performance measurement needs to be tailored to the size, structure and mission of the organisation, and it is paramount to use a comprehensive set of metrics that foster alignment between the organisation structure, goals and expected outputs.

4.1 Strategic Indicators

Strategic indicators "translate an organization's mission and strategy into a comprehensive set of performance measures that provide the framework for a strategic measurement and management system" (Greenfield, 2001). Strategic Performance Measurement Systems (SPMS) normally combine financial indicators with a set of non-financial indicators focusing on long term outcomes and linked to cause-effect relationships. The most widely used SPMS are the Balanced Scorecard (Kaplan and Norton, 1992) and the Business Excellence Model (EFQM, 1999). The overall aim of using SPMS is to ensure the organisation is "doing the right things".

4.1.1 Balanced Scorecard

The Balanced Scorecard (Kaplan and Norton, 1992) combines financial measures (that express the results of actions taken) and operational measures on customer satisfaction, internal processes, innovation and improvement (the drivers of future financial performance). Typical financial metrics used commonly include EBIT, revenue, gross margin, ROI, cash flow and growth. Non-financial metrics include customer service and loyalty, quality, market share, employee turnover and productivity.

The Balanced Scorecard favours a clear focus on the actual strategies and associated implementation activities adopted by an organisation, providing a robust tool onto which other management processes can be built – at the expense of a more complex design processes: the Balanced Scorecard is based on a dynamic and individual abstraction rooted in explicit cause and effect relationships.

4.1.2 Business Excellence Model

The Business Excellence Model was developed by the European Foundation for Quality Management (EFQM) to "assist management in adopting and applying the principles of Total Quality Management" (EFQM, 1999). It enables the calculation of scores against several criteria that can be used for either internal or external "benchmark" comparisons. The metrics consider five enabling activities (leadership; people; policy and strategy; partnerships and resources; processes), seen as necessary

antecedents to the results intended, and four “results” criteria (performance; customers; people; society).

The Business Excellence Model has only implicit representations of the “generic” cause and effect relationships that link the strategic objectives together. The use of this standard model facilitates the use of a much simpler design process and enables the benchmarking of Business Excellence Model outputs between organisations using this system.

4.2 Operational Indicators

Operational indicators seek to monitor the organization activity, providing information on systems, processes and people on regular short-term (from hourly to monthly) basis. These indicators provide important information about areas falling behind, enabling immediate corrective action. The overall aim of using operational indicators is to ensure the organisation is “doing things right”. This real-time performance monitoring is not required for strategic measurement.

Examples of operational indicators include number of website page views, number of interactions in social media, number of monthly quotes, inbound calls handled per representative, monthly prospects, financial contributions received, feedback from stakeholders on quality, relevance and added-value of activities, number of activities organized, budget variance, operating revenue mix, current accounts receivable and current accounts payable.

Selecting the right operational indicators is vital for effectiveness. The choice of indicators depends on the organisation purpose, vision, mission, positioning, size, structure and life cycle stage. It needs to consider indicators that measure the financial performance and indicators that boost activities needed to foster strategic goals.

4.3 Limitations

There are five main limitation in the development and implementation of performance indicators:

1. Indicators need to be linked from the lower-level (operational measure) to the higher-level (strategic assessment);
2. Data collection needs to be made in a systematic manner and on a reasonably routine basis;
3. Data collected must be accurate, trustworthy, and timely to make a beneficial contribution to the organisation development;
4. It is vital to have a central location and responsible to collect, store, and report data and information on performance indicators, providing operational and strategic metrics in a unified map;
5. The pertinence of the indicators used must be periodically revised, because organisations’ structure and model change over time.

Combining automated data collection and routine reporting in a “dashboard” with dial gauges and graphical trends giving highly visible, visual feedback to groups and individuals on their operational and strategic performance is the best way to overcome these limitations. The gauges can appear in user web-based home pages and graphic alerts can be auto-generated when changes in performance occur, signalling either successful improvements or failures of existing asset strategies.

5 Analytical Dashboard

The analytical dashboard is a set of graphical menus and interfaces that provide at-a-glance view of relevant data and information on strategic and operational indicators. The dashboard is very useful to illustrate all relevant activities of the World Forum on Raw Materials, and to uncover interconnections between data by directly relate different data points to one another.

The analytical dashboard will be accessible to the promotors (and later to the staff) of the Forum. To maximise the value of the data provided the staff will be having different access levels to information, defined by the Forum management team.

This section details the strategic and operational indicators that should be included in the dashboard in the different life cycles of the World Forum on Raw Materials, having in consideration the data available and the Forum's purpose and overall strategy.

5.1 Data Inventory

In the design/development of the internal structure/organisation of the World Forum on Raw Materials key recurring reporting processes should be automated and data silos manually compiled or managed within specific departments only should be prevented.

To facilitate automatic data acquisition, it is critical to select/use applications (invoicing, accounting, CRM, ERP, etc.) that use and generate compatible data structures and formats, such as Microsoft SQL Database, Excel spreadsheets or Access DB.

Data to be used in the dashboard will be harvested from three components:

1. Internal Report System;
2. Marketing Intelligence System;
3. Decision Support System.

Naturally, these components will evolve over time as the organisation expands, providing additional data sets and information over the organisational life cycle. Hence, some data/data sources might not be available in the initial development stages. The suggested dashboard content (see section 5.2) had this in consideration.

The Internal Report System includes/provides the following data/data sources:

- Human Resources information system;
- Sales/Invoices/Donations;
- Cross-selling tracking sheet;
- Purchases;
- Inventory;

- Digital banking program;
- Accounting general ledger application;
- Document/image management program;
- Facilities management;
- Capital projects.

The Marketing Intelligence System includes/provides the following data/data sources:

- Program/events enrolment;
- Fundraising tracking;
- Market surveys;
- Marketing Campaign ROI Tracking Sheets;
- Consumer Suggestions and Complaints;
- Third Party Mobile App Management;
- External environment (legal/social/political framework, market segments and community expectations, incumbents, changes in skills and behaviours);
- Website and social media interactions.

The Decision Support System includes/provides the following data/data sources:

- Enterprise Resource Planning (ERP);
- Constituent Relationship Management (CRM);
- Product Profitability Spreadsheet;
- Lifecycle management and forecast.

5.2 Dashboard Content

The assumptions considered in the definition of the dashboard content are:

- The strategic indicators that will be used will focus on the implementation of the World Forum on Raw Materials mission, strategic goals and positioning, linking the strategy to relevant implementation activities;
- The use of indicators that enable the benchmark of strategic outputs is dispensable;
- The number of operational indicators will be adjusted to each stage of the life cycle of the Forum, and will be limited to relevant, easy to assemble information;

- The operational and strategic indicators will monitor seven areas of the organisation, following the life cycle assembly proposed by Simon (2001; refer to section 3).

It must be highlighted that the organisational structure of the World Forum on Raw Materials is still not established, and it can vary between an informal and a formal format, depending on the stakeholders' future decision. It is, however, assumed that the progresses of the organisation will shadow the characteristic life cycle evolution. Table 3 details the strategic and operational indicators that should be included in the Analytical Dashboard of the future World Forum on Raw Materials, on each stage of the organisation life cycle. It is assumed that the current life cycle stage of the World Forum on Raw Materials corresponds to *Stage One: Imagine and Inspire*.

Table 3. Strategic and operational indicators that should be tracked across the life cycle of the World Forum on Raw Materials.

Dimension / Life Cycle Stage	Indicator	Stage 1: Imagine and Inspire	Stage 2: Found and Frame	Stage 3: Ground and Grow	Stage 4: Produce and Sustain	Stage 5: Review and Renew
Governance	Strategic	Board composition (skill sets and represented groups)	Board composition (skill sets and represented groups) Nr. of stakeholders engaged in the Forum	Board composition (skill sets and represented groups) Nr. of stakeholders engaged in the Forum	Board composition (skill sets and represented groups) Nr. of stakeholders engaged in the Forum	Board composition (skill sets and represented groups) Nr. of stakeholders engaged in the Forum
	Operational	Board engagement rate (number of activities/ period)	Board engagement rate (number of activities/ period) Nr. of alliances and partnerships to reach stakeholders	Board engagement rate (number of activities/ period) Nr. of alliances and partnerships to reach stakeholders	Board engagement rate (number of activities/ period) Nr. of alliances and partnerships to reach stakeholders	Board engagement rate (number of activities/ period) Nr. of alliances and partnerships to reach stakeholders
Staff leadership	Strategic	Notoriety and reputation of the management team	Notoriety and reputation of the management team	Notoriety and reputation of the management team	Notoriety and reputation of the management team	Notoriety and reputation of the management team

Dimension	Life Cycle Stage / Indicator	Stage 1: Imagine and Inspire	Stage 2: Found and Frame	Stage 3: Ground and Grow	Stage 4: Produce and Sustain	Stage 5: Review and Renew
			Staff engagement scores Budget execution	Staff engagement scores Budget execution Days ahead or behind schedule Percent of performance goals met	Staff engagement scores Budget execution Days ahead or behind schedule Percent of performance goals met	Staff engagement scores Budget execution Days ahead or behind schedule Percent of performance goals met
	Operational	Nr. of internal commitments made vs. completed	Nr. of internal commitments made vs. completed	Nr. of internal commitments made vs. completed Level of resources utilisation Number of innovative ideas implemented	Nr. of internal commitments made vs. completed Level of resources utilisation Number of innovative ideas implemented	Nr. of internal commitments made vs. completed Level of resources utilisation Number of innovative ideas implemented
Financing	Strategic	Nr. of funders/ donors by type (corporate, foundation, individual, etc.) Cash flow	Nr. of funders/ donors by type (corporate, foundation, individual, etc.) Cash flow Diversity of funding sources (% of total for each type)	Cash flow EBIT Diversity of funding sources (% of total for each type) Growth	Cash flow EBIT Diversity of funding sources (% of total for each type) Growth Donor retention rate (i.e. repeat donors from year to year)	Cash flow EBIT Diversity of funding sources (% of total for each type) Growth Donor retention rate (i.e. repeat donors from year to year)

Dimension	Life Cycle Stage / Indicator	Stage 1: Imagine and Inspire	Stage 2: Found and Frame	Stage 3: Ground and Grow	Stage 4: Produce and Sustain	Stage 5: Review and Renew
					Average contribution per donor	Average contribution per donor
	Operational	Months of cash on hand	Months of cash on hand Operating revenue mix Expense mix	Months of cash on hand Operating revenue mix Expense mix	Operating revenue mix Expense mix Operating surplus/deficit Net asset composition	Operating revenue mix Expense mix Operating surplus/deficit Net asset composition
Admin systems	Strategic		Funding grant status (% awarded, submitted, pending submission)	Funding grant status (% awarded, submitted, pending submission) Coverage of ERP system	Funding grant status (% awarded, submitted, pending submission) Coverage of ERP system	Funding grant status (% awarded, submitted, pending submission) Coverage of ERP system
	Operational	Number of suggestions and complaints received	Number of suggestions and complaints received Average response time to complaints and suggestions	Average response time to complaints and suggestions Percentage of activities where stakeholders' feedback is requested Average response time to helpdesk requests	Average response time to complaints and suggestions Percentage of activities where stakeholders' feedback is requested Average response time to helpdesk requests	Average response time to complaints and suggestions Percentage of activities where stakeholders' feedback is requested Average response time to helpdesk requests
Programming	Strategic		Nr. of stakeholders' commitments	Nr. of stakeholders' commitments	Nr. of stakeholders' commitments	Nr. of stakeholders' commitments

Dimension	Life Cycle Stage / Indicator	Stage 1: Imagine and Inspire	Stage 2: Found and Frame	Stage 3: Ground and Grow	Stage 4: Produce and Sustain	Stage 5: Review and Renew
			made vs. completed Number of cooperation agreements enabled Stakeholders' satisfaction rate	made vs. completed Number of cooperation agreements enabled Stakeholders' satisfaction rate	made vs. completed Number of cooperation agreements enabled Stakeholders' satisfaction rate	made vs. completed Number of cooperation agreements enabled Stakeholders' satisfaction rate
	Operational	Nr. of initiatives/ events held	Nr. of initiatives/ events held Number of participating countries and stakeholders Nr. of invitations for third parties' initiatives/ events	Nr. of initiatives/ events held Number of participating countries and stakeholders Nr. of invitations for third parties' initiatives/ events Nr. of policy briefs issued	Nr. of initiatives/ events held Number of participating countries and stakeholders Nr. of invitations for third parties' initiatives/ events Nr. of policy briefs issued	Nr. of initiatives/ events held Number of participating countries and stakeholders Nr. of invitations for third parties' initiatives/ events Nr. of policy briefs issued
Staffing	Strategic		Staff satisfaction scores	Staff satisfaction scores Employee turnover/ retention rate Time to hire for position vacancies	Staff satisfaction scores Employee turnover/ retention rate Time to hire for position vacancies	Staff satisfaction scores Employee turnover/ retention rate Time to hire for position vacancies
	Operational		Absenteeism	Absenteeism Hours of staff training/ professional	Absenteeism Hours of staff training/ professional	Absenteeism Hours of staff training/ professional

Dimension	Life Cycle Stage / Indicator	Stage 1: Imagine and Inspire	Stage 2: Found and Frame	Stage 3: Ground and Grow	Stage 4: Produce and Sustain	Stage 5: Review and Renew
				development offered and completed	development offered and completed	development offered and completed
Marketing	Strategic		Nr. of endorsements by influencers and opinion makers	Nr. of endorsements by influencers and opinion makers	Nr. of endorsements by influencers and opinion makers	Nr. of endorsements by influencers and opinion makers
	Operational	Social media activity	Social media activity Website page view and bounce rates Number of materials downloaded	Social media activity Website page view and bounce rates Number of materials downloaded Average response time to complaints and suggestions Media placements and press coverage	Social media activity Website page view and bounce rates Number of materials downloaded Average response time to complaints and suggestions Media placements and press coverage	Social media activity Website page view and bounce rates Number of materials downloaded Average response time to complaints and suggestions Media placements and press coverage

5.3 Dashboard Design

The dashboard design is paramount to help users understand what is important. The dashboard shall be displayed in a html format, either in an intranet or internet system. The information should be organized in easy to understand bars and sections, and dial gauges and graphical trends should be available to reflect progress or changes in data.

The fonts and graphical design features should be easy to read, to ensure users can extract and process information effortlessly. Related information should be visually united, and all elements should be aligned to display connections between them (Figure 1). To guarantee users can find their

way easily, the dashboard should use familiar patterns (e.g. tabs on the top, left-handed menus, pop-up windows) and a consistent colour scheme.

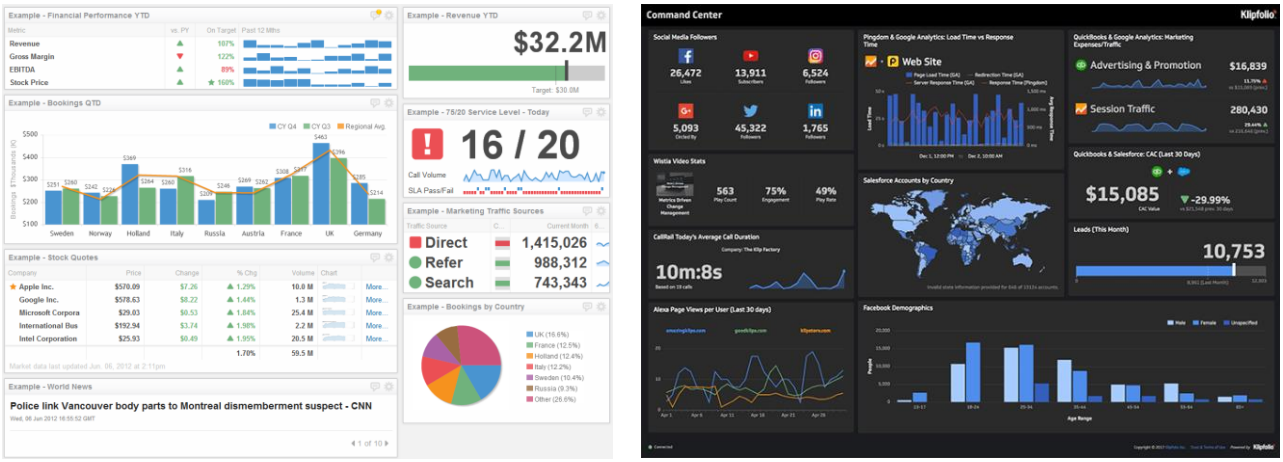

Figure 1. Examples of graphical design of analytical dashboards (from Klipolio.com).

To avoid jam-packed information, and to provide valuable information to different users and needs, the dashboard must include step by step intuitive navigation features that allow to navigate data, to collect additional details and to understand variations over time. The dashboard will have different user access levels, tailored to the needs of different staff positions. The user access levels will be defined by the management team of the World Forum on Raw Materials.

5.4 Dashboard Flexibility

Cloud apps dashboards (e.g. Looker, Klipfolio, Wrike), are easier to reconfigure than spreadsheet based (Excel) or programme-based dashboards (Silverlight, Microsoft Dynamics).

The dashboard content should be periodically revised. Although changes in the set of indicators used are nor recommended, a periodic appraisal of the relevance and value-added of data collected is advisable. Whenever there is the need to reconfigure internal and external competencies of the World Forum on Raw Materials to respond to external changes, to dashboard must be adapted to ensure it provides relevant information to its users.

5.4.1 Changes in Contextual Environment

The dynamics of raw materials trade and supply are driven by social, political, technological and environmental drivers. In an international order that is being disputed, and with several regions experiencing social unrest and political turmoil, it is possible that the implementation of the World

Forum on Raw Materials' strategy will require the redefinition of activities and performance indicators.

A recent evaluation of potential future scenarios concerning raw materials supply, having as time horizon 2050, developed three possible future scenarios (Schimpf and Sturm, 2017) that encompass defined regimes of political, economic, and technological parameters (Appendix 1). The concise description of these scenarios is as follows:

- *Sustainability Alliance:* In 2050, the circular economy has become the norm in the big advanced economies, a new generation of political leaders has pushed forward a series of reforms that focus on increasing sustainability, not only in the raw materials industry. Almost every product is produced in an environmentally-friendly way with the aid of green technologies. Decision makers are under pressure to meet public demands for more environmentally-friendly solutions and policies.
- *Unlimited Trade:* In 2050, the world of raw materials has experienced steady growth, mainly due to ever-growing consumption. International cooperation and dialogue have created new opportunities to produce and trade raw materials. Access to capital has led to industry integration, technology development and productivity improvements alike.
- *National Walls:* In 2050, the world of raw materials got stuck as social and demographic pressures triggered a long period of economic standstill, which eventually lead to a rise of protectionist measures. The absence of leadership and insufficient political approach does not help to improve the situation. Each country fights for its own agenda. There is little progress in mining practices in the EU as reforms have stalled and private investments are low.

For selecting the most relevant performance indicators of the World Forum on Raw Materials, the pertinence of the strategic indicators listed in Table 3 was contrasted in each of these three possible future scenarios. The result of the evaluation made is presented in Table 4. Only the strategic indicators that were considered pertinent in the three scenarios are listed.

Table 4. Most relevant strategic indicators that should be tracked across the life cycle of the World Forum on Raw Materials.

Dimension	Stage 1: Imagine and Inspire	Stage 2: Found and Frame	Stage 3: Ground and Grow	Stage 4: Produce and Sustain	Stage 5: Review and Renew
Governance	Board composition (skill sets and represented groups)	Board composition (skill sets and represented groups)	Board composition (skill sets and represented groups)	Board composition (skill sets and represented groups)	Board composition (skill sets and represented groups)

Dimension	Stage 1: Imagine and Inspire	Stage 2: Found and Frame	Stage 3: Ground and Grow	Stage 4: Produce and Sustain	Stage 5: Review and Renew
Staff leadership		Staff engagement scores Budget execution	Staff engagement scores Budget execution	Staff engagement scores Budget execution	Staff engagement scores Budget execution
Financing	Cash flow	Cash flow	Cash flow EBIT	Cash flow EBIT	Cash flow EBIT
Admin systems			Coverage of ERP system	Coverage of ERP system	Coverage of ERP system
Programming		Nr. of stakeholders' commitments made vs. completed	Nr. of stakeholders' commitments made vs. completed	Nr. of stakeholders' commitments made vs. completed	Nr. of stakeholders' commitments made vs. completed
Staffing		Staff satisfaction scores	Staff satisfaction scores	Staff satisfaction scores	Staff satisfaction scores
Marketing		Nr. of endorsements by influencers and opinion makers	Nr. of endorsements by influencers and opinion makers	Nr. of endorsements by influencers and opinion makers	Nr. of endorsements by influencers and opinion makers

This exercise highlights the importance of a maximum of nine strategic indicators (depending on the organizational life cycle stage) that should always be tracked despite the objective, design and content of adaptative responses of the World Forum on Raw Materials to changes in the contextual environment.

6 Conclusions

The execution of strategy is critical to an organisation success. To help drive strategy execution and performance improvement, the stakeholders and the management team of the World Forum on Raw Materials will use a performance measurement system that combines strategic and operational indicators. The organisational structure of the World Forum on Raw Materials is still not established, and it can vary between an informal assembly and a formal prescribed formula, depending on the stakeholders' future decision. The choice of indicators will be adapted to the organisation structure (to be defined), the stage of development of the organisation (life cycle stage) and the maturity of the relevant groups of stakeholders engaged.

The results of the measuring activities will be grouped in an analytical dashboard, shared with relevant stakeholders, contributors and/or staff of the organisation, providing an ongoing mechanism to monitor progress toward the strategic goals and activities through simple and intuitive graphical menus and interfaces, displayed in a html webpage.

The analytical dashboard will illustrate the full extent of the activities of the World Forum on Raw Materials, displaying relationships between different data points, and contributing to enhance the effectiveness of management decisions.

To prevent the main problems of building the dashboard, data harvesting will be automatic, from applications (invoicing, accounting, CRM, ERP, etc.) that use and generate compatible data structures and formats, such as Microsoft SQL Database, Excel spreadsheets or Access DB. Data storage will be centralised and managed by a responsible person, and the indicators used by the dashboard will be periodically revised, to ensure consistency between the external context and the Forum mission, strategic goals and activities.

The information in the dashboard will be organized in easy to understand bars and sections, including intuitive navigation features that allow to navigate data, to collect additional details and to understand variations over time. The fonts and graphical design features will be easy to read, to ensure users can extract and process information effortlessly.

The dashboard will have different user access levels, defined by the Board and the management team of the World Forum on Raw Materials, tailored to the needs of different staff positions.

The dashboard flexibility will be guaranteed by the preferential use of cloud apps dashboards, and by the periodic appraisal of the set of indicators used. Nevertheless, there is a group of nine strategic indicators that shall always be monitored, regardless the objective, design and content of adaptative responses of the World Forum on Raw Materials to changes in the contextual environment.

The analytical dashboard will create a common language among all parts of the organisation, facilitating transparent and effective interactions, hence boosting the effectiveness of the World Forum on Raw Materials.

7 Bibliography

Daft, R. L., Murphy, J. and Wilmott, M. H., 2010. *Organization theory and design.* Cengage Learning, EMEA.

EFQM, 1999. *Assessing for Excellence: A Practical Guide for Self-Assessment*, European Foundation for Quality Management, Brussels Representative Office, Brussels.

Erdmann, L. and Tercero, L., eds. (2017). *Map of RMI Stakeholders Needs*. Report of the H2020 Mica project, retrieved September 2 from http://www.mica-project.eu/?page_id=99

Greenfield, J. M., 2001. *The Nonprofit Handbook*. New York: John Wiley.

Kaplan, Robert S., Norton, D. P., 1992. *The Balanced Scorecard – Measures That Drive Performance*. Harvard Business Review (January–February), pp. 71–79.

Kimberly, J. and Miles, R., 1980. *The Organizational life cycle*. San Francisco: Jossey-Bass Publishers.

Mintzberg, H., 1984. *Power and organization life cycles*. Academy of Management review, 9(2), pp. 207—224.

Schimpf, S., Sturm, F., 2017. *The World of Raw Materials 2050*. Report of the H2020 INTRAW project., retrieved August 4, 2018 from http://www.intraw.eu/the-world-of-raw-materials-2050/

Simon, Judith S., 2001. *The 5 Life Stages of Nonprofit Organizations*. St. Paul, Minn.: Amherst H. Wilder Foundation.

Stede, V., Chow C., and Lin, T., 2006. *Strategy, Choice of Performance Measures, and Performance*. Behavioral Research in Accounting, Volume 18, pp. 185–205.

Tuckman, B. W., 1965. *Developmental Sequence in Small Groups*. Psychological Bulletin 63.

Tuckman, B. W., and Jensen, M., 1977. *Stages of small group development revisited*, Group and Organization Studies, vol.2, no.4, pp. 419-427.

Appendix 1: Future scenarios of the world of raw materials

1.1 Scenario 1: Sustainability alliance

In 2050, the circular economy has become the norm in the big advanced economies. A new generation of political leaders has pushed forward a series of reforms that focus on increasing sustainability, not only in the raw materials industry. Almost every product is produced in an environmentally-friendly way with the aid of green technologies. The civil society puts sustainability above everything else to keep deposits for future generations.

The development until 2050 in Scenario 1 can be described through the following key characteristics:

- Severe environmental problems have reached a tipping point, Governments agree to place sustainability above growth and profit.
- Concerted actions incentivize the shift towards more sustainable approaches (not only in the raw materials industry but also in agriculture, energy, logistics etc.)
- Recycling and substitution technologies have reached a new level of maturity. Prices for secondary (recycled) material fell over time.
- Only high-tech, low-impact mining is tolerated. Consumers reward resource efficiency, waste reduction and durable products.
- Sophisticated environmental monitoring, prevention and mitigation technologies are being deployed.

More specifically, the scenario has emerged as follows:

1.1.1 Political situation

- Given the emergence of severe environmental problems, the biggest economies have come to a tipping point. Starting with the ratification of the climate change agreement by the U.S. and China in 2022, a political consensus was reached that a new, distinctly “green” approach was needed.
- Whether industrialized, resource-rich, or developing country – there is an unprecedented consensus that sustainable development is a must. Virtually all governments agree to place sustainability above growth and profit.
- Concerted actions by governments and the industry incentivized the shift towards more sustainable approaches to provide and use raw materials. In 2050, hydro-carbons are mainly used as raw materials, not as a source of energy anymore.
- Governance is the key in this scenario.

- The changes have encompassed a transformation of other industries, too. Agriculture, the energy sector, logistics, infrastructure etc. needed to be transformed to provide sufficient resources for a growing world population in a sustainable manner.

1.1.2 Economic situation

- Such change in the raw materials sector was only possible because prices for secondary (recycled) material fell over time. They became more attractive relative to primarily extracted material.
- Trade with secondary raw materials has increased dramatically. A truly circular economy has become reality in many aspects.
- Advanced western economies help to raise the mining standards in developing countries. Efficient and environmentally-friendly trade is the overall goal, including higher levels of transparency, equal access and fair trade.
- Strong independent institutions reduce the risk of raw material black markets.
- The shift towards green technologies generated its own economic growth, as spending in research and innovation increased to develop green technologies, to fight environmental degradation, climate change etc. For instance, carbon dioxide has become an asset, it can be recycled to create synthetic fuel.
- Mining companies want to benefit from the boom in secondary raw materials. Some of them acquire recycling companies, others have turned into vertically integrated RM companies, which produce further down the value chain. By doing so, they lower the risks of the volatile mining market.
- Green technologies, in turn, require raw materials. Often these raw materials are regarded as critical.

1.1.3 Society

- An entire generation has grown up to be environmentally aware and has developed a sustainable lifestyle, assimilating practices which are not based on the ownership of tangible products. Companies sell usage and service rather products. Corporate planning aligns commercial with sustainability goals.
- The overall public perception of mining tends to be negative, based on historical disasters. Despite this situation, society understands the need for minerals and mining and accepts the need for the production of primary minerals until substitution technologies have reached a new level of maturity and potential.
- Manufactured products now have to carry a label that specifies the origin of the (raw) materials used. Consumers prefer locally-produced products.

1.1.4 Technology

- Only high-tech and low impact mining is tolerated. Mining at new frontiers is a sensitive issue, tolerated by the public, but under continuous scrutiny by decision makers and environmental organisations.
- New technologies allow for more accurate exploration and new mines are opened, some in rather remote (uninhabited) and/or deep (depth at > 5000 m below surface) locations.
- Efficient processes along the whole raw materials value chain can be observed (e.g. less waste, less energy consumption).
- A bigger portion of innovation efforts is focused on resource efficiency, extended product lifetimes and waste reduction.
- New technologies are developed that accommodate the demand for raw materials from the reuse/recycle/substitution perspective. Recycling at the atomic level is the ambitious goal.

1.1.5 Environment

- Sophisticated environmental monitoring, prevention and mitigation technologies are being deployed. Compliance with the strongest environmental standards is now the biggest share of running costs in mining operations. Mine remediation is given priority.
- Mining in extreme environments has become standard practice, but also a subject to continuous discussion and debate. Lessons learned from past environmental incidents have been transposed to these new environments to avoid future accidents.

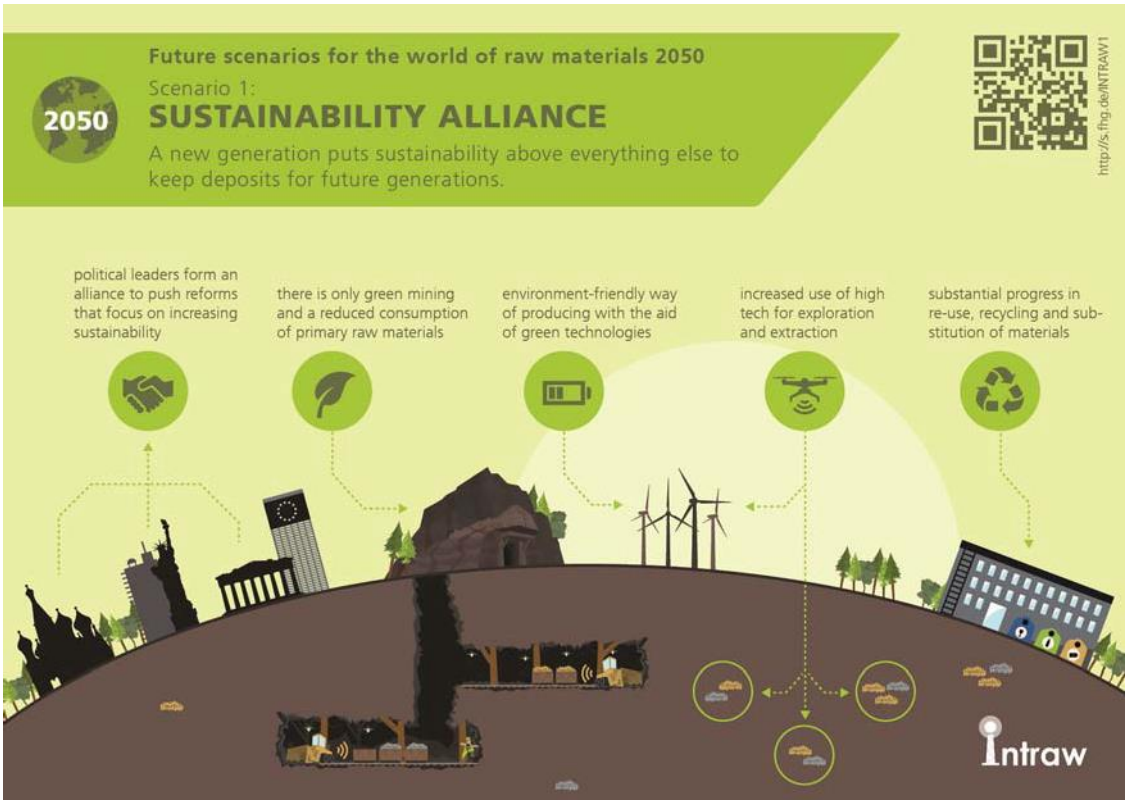

Figure 2: "Postcard from the future" moderation card for scenario 1: sustainability alliance.

1.2 Scenario 2: Unlimited trade

In 2050, the world of raw materials has experienced steady growth, mainly due to ever-growing consumption. International cooperation and dialogue have created new opportunities to produce and trade raw materials. Access to capital has led to industry integration, technology development and productivity improvements alike. Increased global consumption leads to raw materials growth.

The development until 2050 in Scenario 2 can be described through the following key characteristics:

- The Growth of the BRICS states has been amplified by other fast-growing economies (Mexico, Indonesia etc.).
- The world's economic giants (the U.S., China and India) have opted to intensify dialogue and to cooperate.
- As capital is available, the extraction of raw materials goes on and new mines are opened.

- Secondary raw materials play an increasingly important role but cannot satisfy total demand.
- Positive public image of mining – it is regarded as a diverse and high-tech industry.
- Technological progress has many effects (better exploration, higher automation, reduced need for energy & water, mining of previously sub-economic mines).

More specifically, the scenario has emerged as follows:

1.2.1 Political Situation

- Stakeholders in the raw materials business have learned from the ups and downs in the raw materials industry, which has experienced a number of shocks in the 2000 and 2010s.
- The growth of the BRICS states has been amplified by other fast-growing economies (Mexico, Indonesia etc.), which entered the material-intensive development phase. While economic growth is not steady, the total demand for raw materials increases as the world population growths.
- Under the pressure of large multi-nationals, the world's economic giants (the U.S., China and India) have opted to intensify dialogue and to cooperate rather than to pursue their self-interests only.
- They foster constructive relationships with countries that possess critical raw materials. Long-term trade agreements secure access to raw materials. Measures have been taken to regulate speculation with raw materials and to increase transparency. For instance, comprehensive inventories for primary and secondary raw materials have been established.

1.2.2 Economic situation

- Advanced economies are able to keep growth rates at 2% due to high levels of consumption. It is a win-win situation for both governments and the mining businesses, as total employment in mining has gone up, too.
- As capital is available, the extraction of raw materials goes on and new mines are opened. Virtually all countries have introduced more efficient regulatory frameworks that support governmental bodies, industry, local communities and other stakeholders to resolve conflicts and to reach a consensus on establishing new mines in shorter periods of time.
- Most countries have established stable tax regimes as part of the agreements between governments and the mining industry.
- Secondary raw materials play an increasingly important role in the provision of raw materials. However, the rate of recycling cannot keep up with the total demand. It has reached a plateau.

1.2.3 Society

- The mining industry and governments have invested heavily into shaping the public perception of mining.
- People now have a much more positive picture than some decades ago, mainly due to a better understanding of the contribution of mining to sustainable development.
- The absence of significant mining accidents and the implementation of higher environmental standards (e.g. reduction of energy consumption, less pollution) has contributed to increased acceptance.
- Student interest in mining increases. Mining is regarded as a diverse and high-tech industry, requiring advanced skills in geology, engineering and business. In the advanced, resource-rich countries it is not the blue-collar workers that dominate mining anymore.

1.2.4 Technology

- To achieve economies of scope, we observe a growing trend towards horizontal and vertical integration. The big mining companies have absorbed a range of suppliers (and their technologies) to enable what was once called "Mine of the Future". Most mines are now partly automated to reduce costs.
- Sites that were previously considered sub-economic are now found feasible due to advanced technology. Better technology has led to a dramatic reduction of the (relative) need for energy

  & water. Technology now allows to mine in remote and off-shore locations at reasonable costs.
- Significant technological progress also happens in downstream processing technologies and in recycling.
- Advanced mining technology spreads increasingly fast across borders as good practices are shared. This happens even in less developed countries, where manual labour is relatively cheap.

1.2.5 Environment

- Environmentally-friendly mining and extraction of raw materials, with strict environmental policies in the mine closure period that are followed around the globe have been strongly integrated.
- Effective recycling processes have substantially lowered the impact of the wider mining sector on the environment.

Figure 3: “Postcard from the future” moderation card for scenario 2: unlimited trade.

1.3 Scenario 3: National walls

In 2050, the world of raw materials got stuck as social and demographic pressures triggered a long period of economic standstill, which lead to a rise of protectionist measures. The absence of leadership and insufficient political will didn’t help to improve the situation. Each country fights for its own agenda. There is little progress in mining practices as reforms have stalled and private investments are low. Economic standstill gives rise to nationalist politicians and protectionist measures.

The development until 2050 in Scenario 3 can be described through the following key characteristics:

- Conflicts related to the access to raw materials arise. International institutions are weak, they can barely settle disputes.
- Big countries dominate the raw material value chain
- Disparities between countries got worse, there is little economic growth.
- Securing access to raw materials is a major challenge, especially for the resource-poor countries. Old alliances are re-established.

- Nations focus on solving their own problems. They run national economic development programmes.
- Resource-poor countries re-start mining and invest into recycling, reuse & substitution.
- Resource-rich countries favour technologies that are readily available. More specifically, the scenario has emerged as follows:

1.3.1 Political situation

- The world's biggest economies find it difficult to sustain growth. They focus on solving their own economic and societal problems.
- Disparities between countries got worse. There is a widespread tendency towards protectionism and trade agreement are breached.
- We repeatedly observe conflicts related to the access to raw materials. International institutions are weak, they barely manage to settle disputes. A wave of„neo-colonialism" can be observed.
- In this world, the dream of a united Europe is long forgotten. Europe is characterized by a number of blocks of countries that engage in cooperation. There is a free movement of goods (customs union) but the remaining „EU" institutions are weak, trying to balance the interests of the different geographical alliances.

1.3.2 Economic situation

- Global trade has stagnated during the 2030ies and 2040ies and there is a general sense of global insecurity. There is little and uneven economic development.
- For most countries, securing access to all required resources is a challenge. Some old alliances are re-established (e.g. USSR) to cope with shortages of raw materials.
- As demand for commodities stagnates, governments run national economic development programmes to boost their domestic economies.
- Investors don't know where to invest their money. Growth rates are slow and international investments are risky.
- Europe still benefits from an inheritance of large amounts of capital from the past. This means that although there are huge differences in the economic performance and the standard of living between the different „European blocks", Europe is still a nicer place to live in than most other countries - this higher standard of living is strongly protected against external influence.

1.3.3 Society

- In protectionist, resource-rich countries, mining has become an important job motor. Even

countries that almost abandoned mining, have re-started. However, globally speaking, we'll see less mining employees than 30 years ago, due to stagnating demand.

- Mining has turned into a somewhat dull industry. Mining companies fall from the top 20 most attractive employers list as other industries are much more attractive.
- Society is ageing rapidly. In the EU, migration is limited and strongly controlled by restrictive immigration policies, aimed to protect the national workforce. At the same time, the migration pressures increase.

1.3.4 Technology

- Mining has always been a conservative industry, but with a few exceptions mining practices are basically the same as 40 years ago. Technologies that are readily available are favoured.
- High-tech mining and low-tech mining co-exists as countries /blocks of countries pursue their own agendas with regards to the domestic production of raw materials.
- Technologies for recycling, reuse & substitution are developed – especially by resource-poor countries, but at a slow pace. Domestic R&D gets a boost.

1.3.5 Environment

- Environmental permitting procedures for mining are mostly a formality, any investment that meets basic environmental criteria and generates employment is approved very quickly.
- Environmental policies are in place but often ignored. Land degradation continues at an unsustainable scale globally, but this is met by indifference by society, whose primary focus is providing the means for survival.

Figure 4: “Postcard from the future” moderation card for scenario 3: national walls.